

Growing Table Grapes

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Grapes are a popular choice for the home garden. You can use the fruit in many ways, and properly managed grapevines are great additions to the home landscape. Though grapes can be grown throughout Oregon, they are considered temperate zone plants, requiring a cool winter to meet chilling requirements and a warm growing season (150 to 180 frost-free days) to develop and mature a crop.

Not all **cultivars** (varieties) are suited to a specific region. If the growing season is too short for a particular cultivar, the fruit may be of poor quality and low in sugar content at harvest. Also, the vines may not mature properly in the fall, leading to possible winter injury. In the cooler climate of the coast and the Willamette Valley, avoid choosing late-ripening cultivars. In eastern Oregon, choose only cold hardy cultivars and manage vines to reduce risk of winter cold injury (see "Choosing a cultivar").

Along with choosing a site and cultivar, you should also consider site preparation, planting, general planting management, pruning and training, harvesting, and pest management.

In many ways, grapevines are easy to grow, but you need to give the vines very good care to produce high-quality fruit. The hardest parts of grape production are pruning and training. To prune well and properly, you must have an understanding of grape growth.



Credit: Lynn Ketchum

Note: This publication is for the home gardener or small-scale grower. For information on establishing a larger vineyard, refer to commercial production guides for wine grape growers (see "For further reading").

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How grape plants grow

Here is an explanation of terms used to describe parts of the grape plant or its growth.

- **Cane.** A mature shoot after harvest and leaf fall; a shoot becomes a cane after the growing season.
- **Cordon.** An extension of the trunk, usually trained along a wire, from which spurs grow.
- **Fruiting zone.** The section of a shoot where fruit clusters appear.
- **Head.** The top of the trunk where it transitions to cordon, spurs, or canes.
- **Internode.** Portion of the shoot or cane between two nodes.
- **Lateral.** A branch of a shoot or cane.
- **Node.** (1) Thickened portion of the shoot where the leaf and lateral bud appear; (2) the place on a cane or spur where a bud appears.
- **Shoot.** New green growth with leaves, tendrils, and often flower clusters, developing from a bud on a cane or spur.
- **Spur.** A cane pruned back to one to five buds. A spur is on a cordon or at the head of the vine.
- **Sucker.** Also called a “water sprout”; a shoot growing from old wood, often at the trunk base or at the head of the vine.
- **Veraison.** The start of grape ripening, when color change begins. Green berries start changing to red or blue in a colored grape cultivar, or a green grape becomes more translucent. In the Willamette Valley, this change occurs in about mid-August.

A dormant grapevine is illustrated in figure 1a. In the spring, shoots grow from buds on canes, renewal spurs (if present), and sometimes the trunk. Each bud on a cane or spur may produce from one to three shoots. As the shoot grows, it can produce leaves, flower clusters, buds, and lateral branches (figure 1b and figure 2). Fruit is produced on the current season’s growth.

When the vine is dormant once again (generally from December through March), you must prune it. The buds that produce next year’s fruit are on the 1-year-old canes (last year’s growth). To prevent the vine from producing too much fruit (**overbearing**), you must prune to keep only some of the 1-year-old wood or canes and remove the rest. Overbearing delays fruit ripening, reduces fruit quality, and weakens the vine.

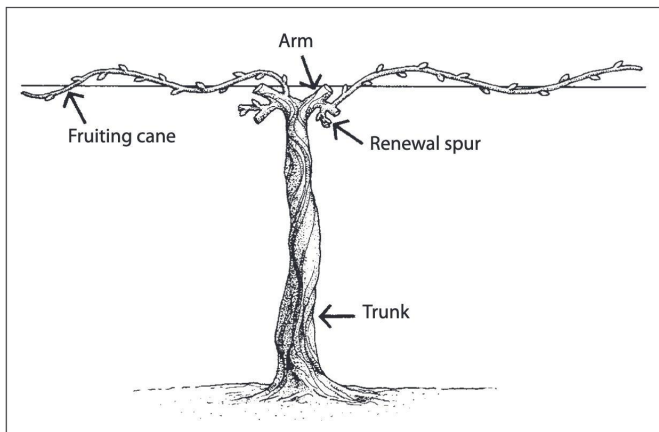


Figure 1A. Dormant grapevine after pruning .

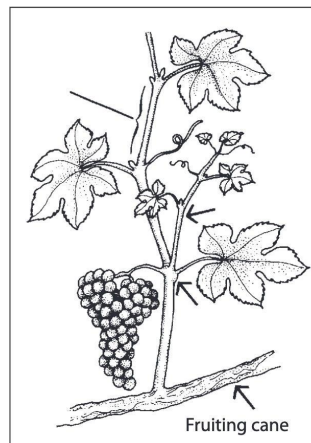


Figure 1B. Shoot.



Figure 2. Early grape shoot growth.

Establishing the planting

Grapevines require several years from time of planting to first harvested crop, and they normally do not reach full production until the fifth or sixth year. Grape plants live for 50 to 100 years, if you care for them properly. It's relatively easy to propagate a favorite vine (see "Propagation"), but well-established plants cannot be transplanted. Thus, it's important to consider carefully both where you will plant and how you will prepare the site before you plant.

Choosing a site

The first step toward consistent production of high-quality grapes is to choose a sunny place to plant. While some ornamental grapevine species perform adequately in partial shade, full sunlight is required to get good production of table grapes. If you plant a row that runs north–south, the fruit and leaves will be better exposed to sunlight than in east–west rows; this way, you'll produce better quality fruit.

Grapes can be grown on a wide range of soil types and soil nutrient status (for example, soil acidity or pH). European grapes may grow better than American types on soils with a pH greater than 7 (see "Choosing a cultivar"). Grapevines may have nutritional problems when grown on soils with a pH greater than 8.

Grape plants grow best in well-drained soils. Heavy clay soils with poor drainage or soils with an impervious subsoil clay pan are not ideal. Building up raised beds may improve growth on these soils.

When selecting a site, avoid areas prone to early spring frosts. New shoot growth in April and May is very susceptible to frost injury (see "Pests and problems"). Home surroundings or other sites that are sheltered from colder temperatures and wind are best. If possible, choose a sloping area, especially a south or southwest slope, because it generally has higher temperatures and is less likely to get frost.

Vines that are stressed due to drought or shade are more prone to diseases such as powdery mildew or botrytis fruit rot (see "Pests and problems").

Choosing plants

Purchase dormant bare-root vines or young, well-rooted, potted plants (generally grown in 1-gallon containers). There is no need to buy older plants. In retail nurseries, nongrafted vines (also called "self-rooted") are most commonly available. Nurseries may sell grafted plants of some cultivars. European wine grapes are often grafted onto a rootstock resistant to the root-feeding insect phylloxera (see "Pests and problems"). Many table grapes are tolerant or resistant to phylloxera.

When choosing a bare-root or container plant, pick one that will be easy to prune back to a few buds or to a vigorous basal shoot, to encourage development of a straight trunk (see "Training the young vine").

Propagation

Often, home gardeners want to propagate an older vine that is in the wrong spot or has become too old to rejuvenate (see "Pruning an old, neglected vine") or a wonderful variety a friend successfully grows. You must propagate grapes from cuttings rather than seeds, because seedlings don't have the same characteristics as the parent plant. Propagating by dormant, hardwood cuttings is simple.

It's easiest to take hardwood cuttings late in the dormant period. This ensures that the grapevine has had enough winter cold (**chilling**) to give buds a chance to grow normally in spring. Ideally, take cuttings right before pruning in February. Select 1-year-old dormant canes (those that were new shoots the previous summer). Choose healthy canes that look like they grew in full sunlight. Canes growing in partial shade may be spindly and may not have enough stored food to support the cutting until it has developed leaves and roots.

Select canes that are at least pencil-size in diameter. Avoid choosing canes that are too big or have very long internodes (longer than 6 inches between buds on a cane). Make each cutting long enough to include three buds. Take cuttings by making a straight cut just below the basal bud (bud closest to trunk) and a slant cut in the internode above the top bud of each cutting (figures 3A and 3B). This system allows you to easily identify the bottom and top ends of each cutting (cuttings won't root if they're placed upside down).

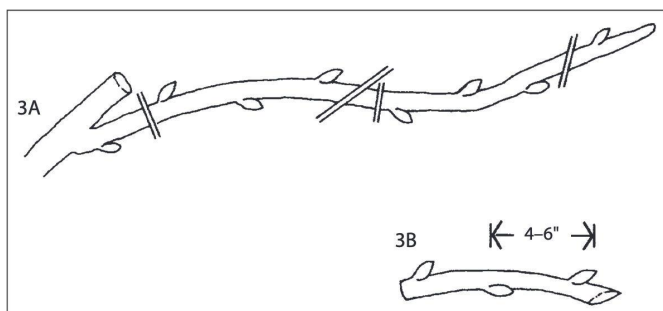


Figure 3A (top). Old cane, showing the cuts required to make two cuttings .

Figure 3B (bottom). Cutting, three buds long, showing basal and top ends .

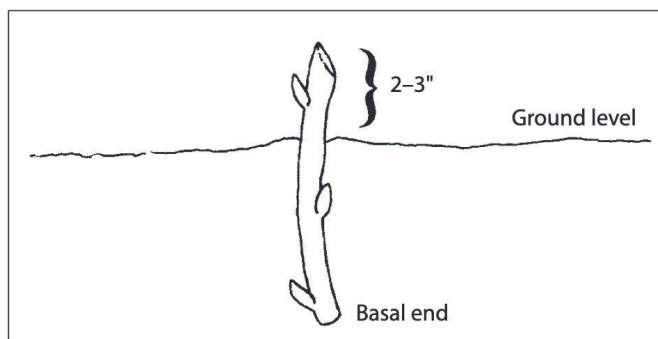


Figure 3C. Proper way to set a cutting in a propagating bed .

No matter how much careful attention you pay to grape cuttings the first year, some may not develop a strong root system. Therefore, it's generally preferable to root and grow grape cuttings for 1 year in a garden area or propagation bed before transplanting them to a permanent location.

Cuttings taken in February can be set directly in a propagation bed. If you take cuttings earlier in the dormant season, store them in vented plastic bags in the fridge (without any fruit) for about a month, to satisfy the chilling requirement.

Set cuttings 6 inches apart in rows 2 to 4 feet apart in well-drained, tilled soil. You may till a well-balanced fertilizer such as 16-16-16 at a rate of 1 cup per 10 feet of row into the top 3 to 6 inches of soil. You can also use 1-gallon pots containing good potting soil. Place only one cutting per pot. Pots must have drain holes.

Stick cuttings into the loose soil so that the basal and center buds are covered and the top bud is just above the soil surface (figure 3C). Make sure the cutting is right side up, with the slanted cut at the top. You don't need to use rooting hormones. Press soil firmly around the cuttings.

If you live in a cold area such as central or eastern Oregon, you must protect cuttings in the propagation bed from heavy frost. Cover the top of the cutting with soil and mulch. Carefully remove this material to expose the top bud once the danger of frost is past. Buds will break and shoots will grow slightly before root development.

Irrigate, when necessary, to maintain adequate and consistent soil moisture levels in the first year. Keep the propagation area free of weeds. Rooted cuttings can stay in the nursery row until you transplant them to their permanent location, before growth begins next spring. If you are propagating in containers—in a greenhouse, for example—make sure the newly rooted plant does not become root-bound, and that you transition plants carefully to the outside so that they become well-acclimated. Transplant well-rooted plants in early spring the following year when they are dormant.

Choosing a cultivar

There are many grape cultivars available. You’ll find descriptions of cultivars in the table “Characteristics of table grape cultivars grown in Oregon”.

Local climate or growing conditions greatly influence a cultivar’s performance. Be sure to choose a cultivar that is adapted to your region. Regions differ in minimum winter cold temperature, but also in summer temperature or **growing degree days** (GDD) (table 1). Some cultivars, such as Niagara and Concord, require at least 2,000 GDD to ripen fully. Canadice, Interlaken, Reliance, and many other early to mid-season cultivars require 1,500 to 2,000 GDD to ripen fruit. If you live in cooler regions, such as the Oregon coast and parts of the Willamette Valley, choose only early to mid-season cultivars. Late-season cultivars may not fully ripen their fruit every year in these regions, though this can be influenced by pruning (see “Pruning”).

Table 1. Average growing degree days in cities throughout Oregon	(base 50°F, from Jan. 1–Dec. 31; average of approximately 70 years)
<ul style="list-style-type: none">• Ashland: 2,355• Roseburg: 2,760• Corvallis: 2,121• McMinnville: 2,157• Portland: 2,455• Brookings: 1,736• Newport: 1,181• Astoria: 1,409• Hermiston: 2,981• Baker: 1,693• Ontario: 3,031• Bend: 1,478	<p>Source: Oregon Climate Summaries (http://www.wrcc.dri.edu/summary/climsmor.html)</p> <p>Growing-degree-day units are computed as the difference between the daily average temperature and the base temperature. (Daily Avg. Temp. - Base Temp.)</p> <p>One unit is accumulated for each degree Fahrenheit the average temperature is above the base temperature. Negative numbers are discarded.</p> <p>Example: If the day's high temperature was 95F and the low was 51F, the base 50 heating degree-day units are $[(95+51)/2] - 50 = 23$</p> <p>This is done for each day of the month and summed.</p>

It’s important to consider a cultivar’s disease and cold tolerance (see “Pests and problems”). Tolerance to winter cold temperatures involves the health of the vine, yield the previous season, how well the vine became dormant, how quickly the temperature gets cold and how long it stays cold, and other factors. Dormant buds may be damaged at one temperature and trunks at another temperature. See the table “Characteristics of table grape cultivars grown in Oregon” for comments on cold hardiness of cultivars.

Because grapes are self-fertile, you need only one cultivar for fruit production. But, for variety and to extend the fruiting season, you may choose to grow several very early, mid-, or late-season ripening cultivars (depending on your climate).

Each cultivar's fruit is unique in its aroma, flavor, and other qualities. When choosing a cultivar, try to determine which ones have a flavor you like. You can often find unique cultivars to taste at U-pick farms, farmers markets, or through your county's OSU Master Gardener Program.

Depending on the cultivar, fruit may be suited for fresh eating, juice, raisins, jellies, or wine. Some cultivars suit more than one purpose. Generally, sweet seedless grapes with tender skins are best for raisins.

Three types of grapes are grown in the Pacific Northwest: American, European, and European-American hybrids. Each has specific qualities.

- **American** cultivars (*Vitis labrusca*) have a strong “foxy” flavor and aroma (characteristic of Concord, the most common cultivar used for purple grape juice). Fruit generally have a **slip-skin** (pulp separates from the skin when you pop the berry in your mouth). American cultivars that have a slip-skin are noted in the table “Characteristics of table grape cultivars grown in Oregon”. The cluster can vary from tight to loose and berries from small to large, depending on cultivar.

Plants tend to be more tolerant of pests and more vigorous than the European type. This type of grape is tolerant or resistant to phylloxera, and it is more disease-resistant and cold hardy than the other types. These cultivars are used mostly for juice, jellies, pies, and fresh eating.

- **European** cultivars (*Vitis vinifera*) differ from American cultivars in fruit characteristics, vine growth habit, and climate adaptation. They have tight clusters, berries with thin skins that do not “slip,” and a more subtle aroma and flavor. Some cultivars have berries with a “crunchy” texture. In general, European grape cultivars are more sensitive to pests (such as phylloxera) and diseases (such as powdery mildew and botrytis bunch rot) and are less cold hardy than American types. For these reasons, European-type table grapes are not as commonly grown in home gardens in Oregon.
- **European-American** hybrids have some characteristics of both American and European types, depending on parentage.

Cultivars in the table “Characteristics of table grape cultivars grown in Oregon” are designated as European (E) or American (A). Hybrids are indicated as “A” with flavor and other attributes noted. See the graphics “Photographs of cultivars, by color” for photos of some cultivars.

Cultivars differ in ripening time, characterized by season as “very early” to “late.” Note that cultural practices (such as pruning) and weather can influence harvest time. In the Willamette Valley, very early season cultivars would be ready for fruit harvest in early September. Late-season cultivars, such as Concord, may not be ripe until mid-October when pruned well.

Yield per vine varies tremendously with vine age, site (climate, depth of soil, soil fertility), management (pruning, irrigation, plant fertility, pest management), and cultivar. Yield per plant, for a mature, well-managed vine, may be from 15 to 35 pounds.

Spacing

Spacing **within the row** depends on the cultivar you plant, the depth or fertility of your soil, and the training system you use (see “Training,”). Plant European cultivars (*Vitis vinifera*) 6 feet apart in the row. You can set American cultivars (*V. labrusca*) and hybrids 6 to 8 feet apart in the row, because they are more vigorous (produce longer shoots). If your soil is shallow or of low fertility, you can space vines closer together in the row to “fill” the trellis.

The spacing **between rows** depends, in part, on the training and trellis system you choose. In backyard plantings, 9 to 10 feet between rows is common for single canopy training systems (head trained, single downward hanging canopy, vertical hedgerow or VSP, and Scott Henry). If you plan to train to a Geneva Double Curtain (GDC) and will have more than one row of vines, use a between-row spacing of 11 to 12 feet.

Preparing the soil

Be sure soil is free of perennial weeds and well tilled before you plant. You can improve the organic matter content of heavy soil by incorporating well-aged sawdust, manure, or compost.

Don't place manure or compost directly in the planting hole. Instead, incorporate it into soil in the whole planting area. Apply organic matter the summer or fall before you plant. Manure applied at 2 to 3 cubic yards per 100 square feet is a good source. Use only materials that you believe are free from insects and weed seeds. Dig, plow, or till the material into the soil to ensure that it will be well decomposed by planting time.

If you incorporate large amounts of non-decomposed material into the soil, add calcium nitrate (16 percent nitrogen) or equivalent fertilizer at 2 pounds of product per 100 square feet to aid in decomposition. If you also use manure to improve soil structure, decrease the rate of fertilizer by half.

Planting

Plant grapes in early spring, as soon as you can work the soil. If you buy dormant, bare-root plants, make sure roots don't dry out before planting. If you're transplanting from a propagation bed or nursery, dig plants carefully to avoid breaking roots.

At planting, prune off all broken roots and trim very long roots. Set plants in a hole large enough to spread roots without bending them. For plants growing in a pot, remove the pot (whether it's fiber or plastic) and place the rootball into a sufficiently large hole. Plant all bare-root or potted plants at the same depth that they were growing in the nursery.

Firm the soil well around roots to remove air pockets, and water thoroughly. Continue to irrigate plants as required to keep soil adequately moist without saturating it.

Right after planting, prune off all but one vigorous 1-year-old cane from nursery-bought plants. Prune the cane back to two buds. On plants that are already growing, remove all but the most vigorously growing shoot near the base of the plant. This will become the new trunk.

Young grapevines can't compete with weeds or established lawn grass for water and nutrients. Keep the planting free of all weeds in the establishment years. Cultivate shallowly, no deeper than 1 to 3 inches, to avoid injuring roots.

Grapevines can be planted through black plastic. The plastic mulch reduces weed growth and increases soil temperature (which may benefit root growth in western Oregon). Place the plastic down the row before planting. Cut holes in the plastic about 1 foot in diameter where you will plant the vines. The black plastic lasts 1 to 2 years. Be sure to dispose of it appropriately before it deteriorates too much.

Fertilizing and irrigating

In general, fertilize grapes sparingly. More problems occur from overfeeding than from underfeeding. In the planting year, fertilize each plant with a total of 0.5 to 1 ounce of nitrogen (N), depending on soil fertility. Use a well-balanced fertilizer such as 16-16-16. To calculate how much product to apply, divide the desired amount of N (in this case, 1 ounce) by the percentage of N in the fertilizer:

$$16\% = 0.16$$

$$1 \text{ oz} \div 0.16 = 6.3 \text{ oz product per plant}$$

You also may use manure or compost.

In the second year, plants may be fertilized with 1 to 1.5 ounces of N per plant if needed. Broadcast the fertilizer in a circle about 6 to 18 inches from the trunk. Be careful not to get fertilizer right up against the trunk or to place it all in one spot near the vine. The best time to fertilize is around bud break.

Newly planted vines need proper watering to establish in any soil type. Keep the soil sufficiently moist without overwatering.

Training the young vine

The main goal of training the vine in the establishment year is to develop a well-established root system and a trunk. In the planting year, select the strongest shoot that grows from each newly planted vine and train it to a stake or twine that's attached to the trellis wire, so that it develops a straight trunk. Prune off all other shoots before they grow longer than 12 inches so the vine can direct its growth to the new trunk (figure 4).

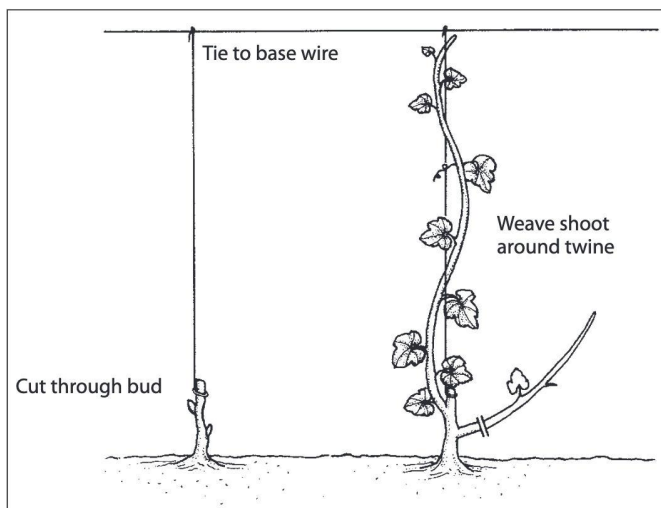


Figure 4. Training in the planting year (short parallel lines show pruning cuts).

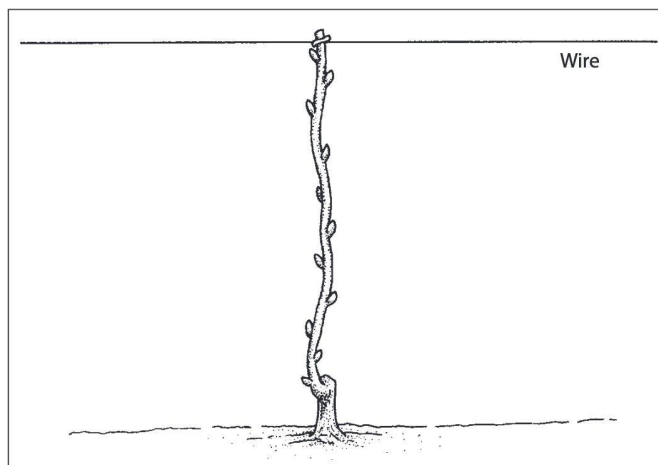


Figure 5A. Cane pruning, first winter

Sometimes the shoot won't reach the training wire or desired head height in the first year. If this happens, prune it back the next winter to three or four buds. It may seem you've wasted a whole year's growth, but the root system is considerably larger. Provided there is no adverse soil or pest condition, you should get much better trunk growth in the second year. In this case, train the strongest shoot that grows the following summer and prune off all others.

In colder regions, it is common just to grow a bush the first year and train the trunk in the second year. Also, you can train more than one trunk in cold regions to reduce the risk of losing the plant to cold injury (see "Pests and problems").

Once the shoot reaches the wire or desired head height, do not top it during the growing season. Instead, wait until the vine is dormant. Cut it at a node (through a bud) about 3 to 4 inches above the desired height, and tie it to the wire (figure 5A).

Further training and pruning depend on the training system you choose (see "Training"). Once you choose the training system, you'll build a trellis (see "Trellis").

No fruit is produced in the planting year.

Maintaining the planting

Fertilizing and irrigating

Young, establishing vines or plants grown on soil of low fertility may benefit from annual applications of fertilizer, manure, or compost (to supply about 1 ounce of N per plant).

Irrigate vines, if necessary, to help the plants survive dry periods and mature their fruit. If vines grow so vigorously that they develop dense canopies, increased disease, and reduced fruit production, be sure to gradually decrease amounts of water in mid- to late summer.

Older vines grown on sandy soils (such as those found in central and eastern Oregon) require irrigation to ensure good plant growth and fruit production. Grapes grown on clay-loam soils in the Willamette Valley can be grown without irrigation. But in the Willamette Valley's long, dry summers, it's often helpful to give plants a small amount of irrigation during the latter stages of fruit ripening. This helps prevent berry splitting, which can happen late in the season after rainfall on unirrigated vines.

In coastal areas and the Willamette Valley, be sure not to over-irrigate a producing vine. Always irrigate fruiting vines under the canopy to lessen the development of disease.

Pruning

The **framework** of an established vine—the way it looks after pruning—varies depending on the training system you choose. The pruning instructions that follow are for a vine trained to a single downward hanging canopy. Other training systems are described in the section on "Training".

Proper pruning and training are essential for producing a good yield of high-quality fruit and maintaining a balance between vegetative growth and fruiting. The most common problem in home garden grape production is that vines aren't pruned hard enough. When you prune, you must remove most of the wood produced the previous season—*prune off about 90 percent!* Leave relatively little wood to produce the following season's crop. If you prune properly,

your vine will be more manageable and have better fruit. Poor pruning year after year leads to a low yield and poor fruit quality.

Prune vines when they're dormant, from January through early March. If the vine bleeds sap from the cut portions, don't worry: there is no evidence that this harms the vine.

There are two methods of pruning: **cane pruning** and **spur pruning**. Once you understand these methods, you'll be able to prune a vine no matter what training system you use.

Some cultivars perform best when they are cane pruned, and others when they are spur pruned. The best pruning method to use (when known) is shown in the cultivar descriptions in the table "Characteristics of table grape cultivars grown in Oregon." In general, European grapes may be cane or spur pruned. Other cultivars, especially American types and many hybrids, produce only vegetative shoots on the basal buds of canes. If these are pruned to short spurs, they produce little or no fruit. For this reason, it's best to cane prune cultivars when no specific pruning method is recommended.

In cooler areas of the Willamette Valley or the coast, spur pruning can promote crowded shoots, thus increasing the risk of fruit rot. It may be an advantage to cane prune in these cooler regions.

Cane pruning

These instructions are for a single downward hanging canopy.

Second growing season

You've planted on a site with good fertility. At the end of the first growing season, you trained the vine to a stake or wire to attain the desired head height. You pruned the trunk the first winter (figure 5A).

In the second growing season, shoots develop from buds on the 1-year-old trunk. Retain two shoots that grow 2 to 6 inches below the training wire. Train these shoots, one on each side of the trunk, along the wire. These shoots become the fruiting canes for next year.

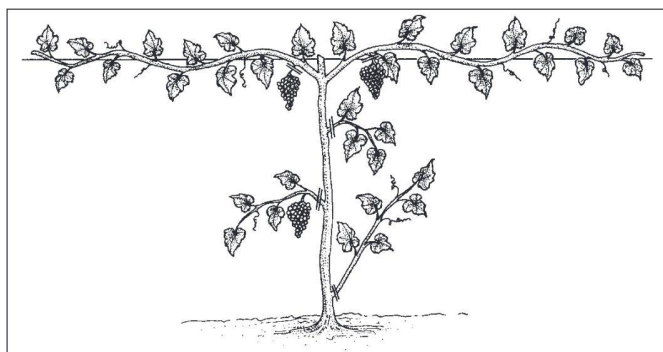


Figure 5B. Cane pruning, second growing season (double lines show pruning cuts).

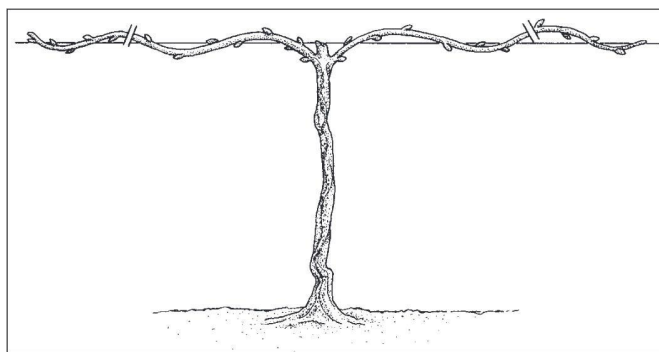


Figure 5C. Cane pruning, second winter (double lines show pruning cuts).

Remove all shoots, other than the two you selected, while they're still small. You want the vine to direct its energy to the two shoots you want to keep. The vine is too young to produce any fruit, so prune off any clusters before or at bloom. Also, remove any suckers that develop at the base of the vine (figure 5B).

In the second winter, prune back the two canes to 7 to 10 buds each, depending on vigor (14 to 20 buds per plant, figure 5C). These buds would produce fruit, and it's important not to let young vines overproduce.

Third growing season

Shoots grow from buds on the 1-year-old canes you left at pruning, and these shoots produce fruit (figure 5D). You may need to remove any extra shoots that develop from buds at the nodes (see “Shoot thinning”). If there is an average of more than one fruit cluster per shoot, prune off the extra clusters at bloom to prevent the young plant from overbearing (see “Fruit thinning”).

The grapevine in the third winter, before and after pruning, is illustrated in figures 5E and 5F. You must select new fruiting wood and remove the rest (*about 90 percent*) of the canes. When you choose fruiting canes, be aware that canes differ in **fruitfulness**.

The most fruitful canes are those that were exposed to light during the previous growing season, are at least pencil width in diameter, and have an average internode length for the cultivar. Long internodes indicate too much vigor, so poor fruiting is likely next year.

It's best to keep the vine's fruiting area as close to the trunk as possible. Choose two new, desirable fruiting canes (indicated by shading in figure 5E) that are close to the trunk. Cut back each cane to about 15 buds (or 30 per plant; figure 5F). Keep fewer buds on plants that are low in vigor. Wrap the canes loosely around the wire and tie at the end. It's best to use flexible tie-tape rather than string or twist-ties that can girdle the vine.

You can leave a one- or two-bud spur near the head of the vine (figure 5F). These **renewal spurs** often supply new fruiting canes when you prune the following year, and they also help keep fruiting close to the trunk.

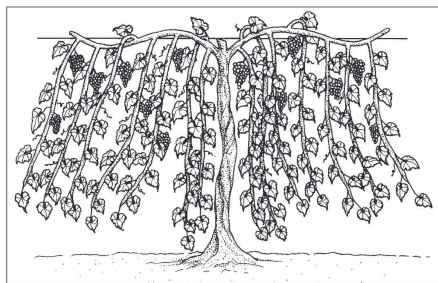


Figure 5D. Cane pruning, third growing season .

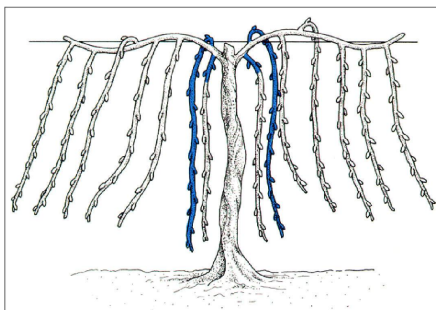


Figure 5E. Cane pruning, third winter before pruning (shaded canes will be retained for next season's fruiting wood).

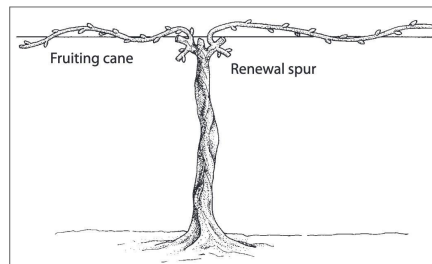


Figure 5F. Cane pruning, third winter after pruning.

Years 4 through maturity

In the fourth fruiting season and after, you will not need to do any fruit thinning if you prune vines well. However, thinning to one shoot per node is recommended every year to keep an open canopy, which improves fruit quality and reduces disease (see “Shoot thinning”). Continue to remove suckers at the base of the trunk and the head of the vine during the growing season.

Prune plants yearly in the dormant period to remove all growth except new fruiting canes and renewal spurs. Choose a fruiting cane from each of the renewal spurs. If the canes from a renewal spur are undesirable for some reason,

then choose a different cane that is close to the trunk (figure 5G).

Cut back each fruiting cane to control the number of buds per vine. The number of buds to leave depends on:

- *Climate*. Vines in cooler climates ripen less fruit and need fewer buds, particularly on late-season cultivars.
- *Soil*. Fertile soil increases vine vigor and the number of buds left at pruning.
- *Vine age*. Vines in years 4 and 5 can support fewer buds than those that are mature.
- *Cultivar*. American types can support more buds than European types.

In general, leave 20 to 60 buds per plant (or 10 to 25 buds per cane in this training example, figure 5H). Prune younger vines, in years 4 and 5, to the lower end of the range. You can adjust bud number at pruning up or down, with experience. If the vine is growing well and ripens its crop well, you can maintain or try slightly increasing bud number the following year.

When vines are grown in rows, mature vines are usually pruned without counting buds. Their cane is pruned to meet the cane from the adjacent vine with no overlap.

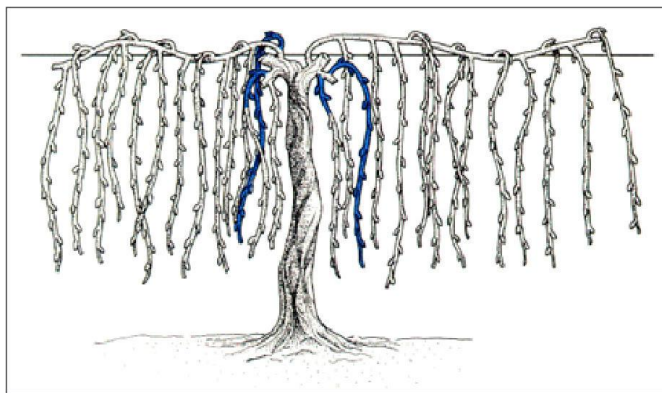


Figure 5G. Cane pruning, fourth winter before pruning (shaded canes will be retained for next season's fruiting wood) .

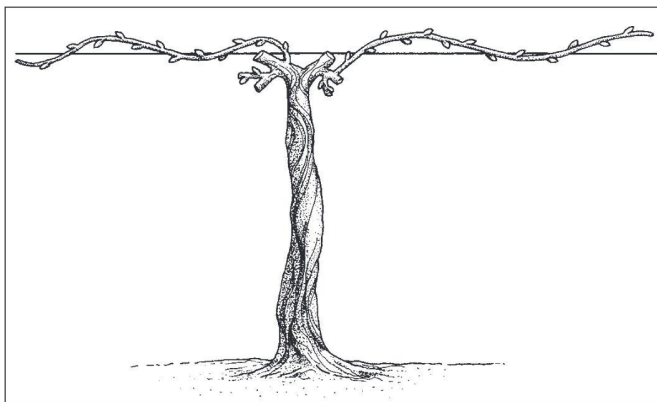


Figure 5H. Cane pruning, fourth winter after pruning.

Spur pruning

Establishing a vine for spur pruning is the same as for cane pruning in the early years. Until the third winter, prune the young vine as illustrated in figures 5A through 5D for a vine trained to a single downward hanging canopy.

Third growing season (Figure 5D)

Remove any extra shoots that develop from buds at the nodes (see "Shoot thinning"). If there is an average of more than one fruit cluster per shoot, prune off the extra clusters at bloom to prevent the young plant from overbearing (see "Fruit thinning").

In the third winter, cut back the selected canes (indicated by shading in figure 6A) along the older wood to two- or three-bud spurs. Spurs should be 4 to 6 inches apart. The 2-year-old cane that was trained to the wire the previous winter now becomes a "permanent" part of the vine, called the **cordon**. If more than one shoot grew from a node on the cordon (if you missed some when shoot thinning), choose the strongest one and cut off the others (figure 6B). Leave no more than about 30 buds per plant. If plants are low in vigor, leave fewer buds. Buds on spurs will produce fruit in cultivars that are adapted to this method of pruning.

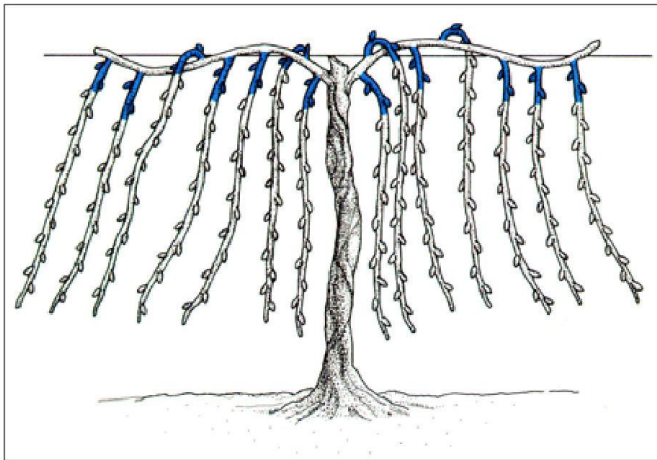


Figure 6A. Spur pruning, third winter before pruning (shading indicates fruiting spurs that will be retained for next season).

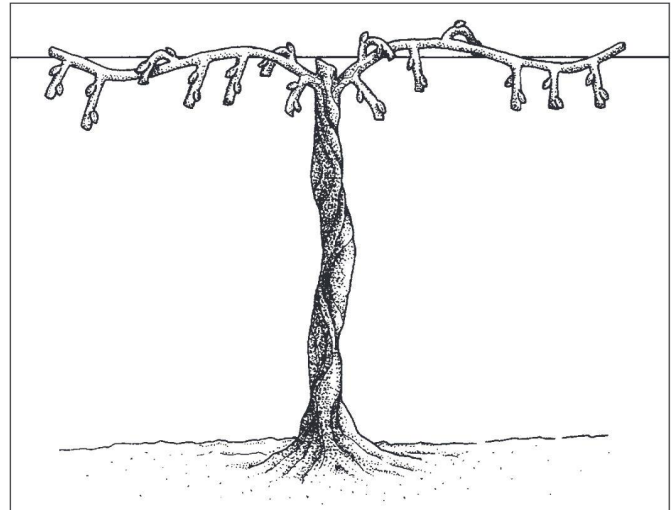


Figure 6B. Spur pruning, third winter after pruning.

Years 4 through maturity

In the fourth fruiting season and after, you will not need to do any fruit thinning if you prune vines well. However, thinning to one shoot per node is recommended every year to keep an open canopy, which improves fruit quality and reduces disease. Continue to remove suckers at the base of the trunk and the head of the vine during the growing season.

To prune mature plants, select new spurs (ideally those nearest the cordon), cut them back to two to six buds, depending on cultivar, and remove all other canes (figures 6C and 6D). In general, leave 20 to 60 buds per plant. However, the number of buds per plant depends on the same factors as for cane-pruned vines (climate, soil, vine age, and cultivar).

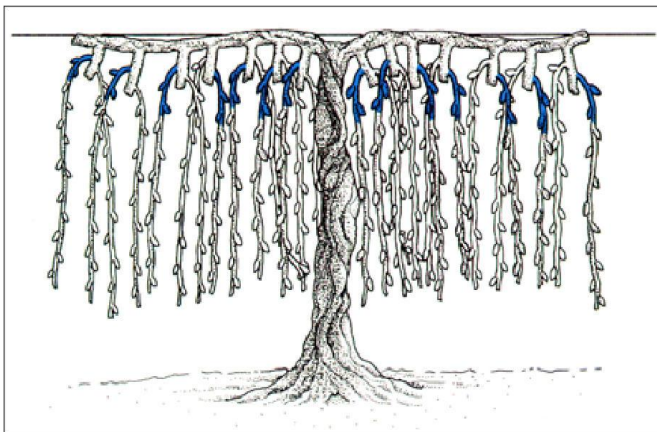


Figure 6C. Spur pruning, fourth winter before pruning (shading indicates fruiting spurs that will be retained for next season).

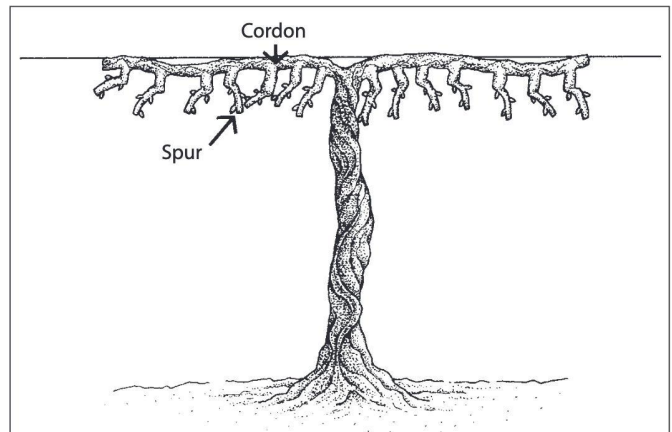


Figure 6D. Spur pruning, fourth winter after pruning.

If you're not sure whether a cultivar's basal buds are fruitful and it's suited for spur pruning, it's best to cane prune the vine. It's easy to convert from one system of pruning to the other, though. So, if you're interested in spur pruning, try both methods on a particular cultivar and compare results.

Training

You can train grapevines in many ways. The training systems described below are well suited to all production regions in Oregon, unless otherwise noted.

Single downward hanging canopy

This system requires a simple trellis consisting of posts and a single wire at about 6 feet high. The trunk is trained to about 6 feet tall, and two canes are trained in opposite directions down the wire to meet the cane from the adjacent plant. Shoots are not trained between any wires during the growing season, but are left to “hang” downward. This system can be cane or spur pruned (figures 5D, 6C, 7, 8, and 9).

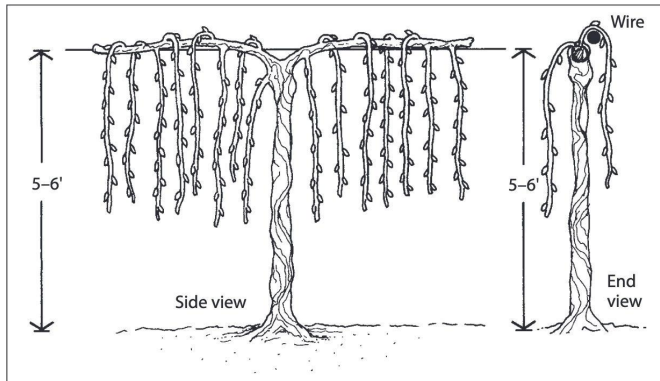


Figure 7. Single-wire trellis for single curtain training.



Figure 8. Single downward hanging canopy, spur pruned, dormant.



Figure 9. Single downward hanging canopy, near harvest.

Credit: Patty Skinkis, © Oregon State University

Geneva double curtain (GDC)

This system, developed in Geneva, New York, is well suited to vigorous American-type grapes that can be pruned to a relatively high number of buds. Vines are pruned to four fruiting canes or four cordons. It is generally best to use this training system on vigorous sites.



Figure 10. Dormant GDC-trained vine, cane pruned.



Figure 11. GDC-trained vine, spring, center of row.

The trellis must be of sturdy construction to support the weight of vine growth and fruit production. The trunk must be trained to a high head height, about 5½ feet tall. A center wire at this height serves as the trunk's training wire. The GDC requires cross-arms about 3 to 4 feet wide. Run a wire down the row on each side of the cross-arm or “T.” These become the cane training wires (figures 10 and 11).

Train the shoot (the future trunk) to head height in the first growing season. If growth is vigorous, train the shoot toward one side of the “T” and down a wire if needed. For these instructions, we will assume only a trunk, to head height, grew the first year.

In the second growing season, choose two shoots, one per side, to grow toward the cane training wires of the “T.” These become the arms, or permanent part of the vine that extends from the trunk to the cane training wires. Train these shoots down the wire as they grow (for example, toward the south). Remove all other shoots early in development.

In the third growing season, prune the existing canes (one per side on the south end of the vine) to limit fruit production. Choose one shoot on each cane, near the arm, to train down the wire toward the north. The following winter, select a new 1-year-old cane from the south side to become that side’s new fruiting cane. Prune it back to limit fruit production. On the north side, prune back the 1-year-old cane to limit the crop. Repeat this on the other side of the trellis.

The next winter, choose a new fruiting cane on each of the four sections of the vine (on each side of the arm). After pruning, the vine will have four fruiting canes (figure 10). This training system can also be spur pruned to four cordons.

During the growing and fruiting season, thin shoots to one shoot per node, if necessary (see “Shoot thinning”). Look at your vine frequently to make sure that shoots are hanging down in distinct curtains on each side of the trunk. It’s important for light to reach both sides of the curtain. If you do not manage shoots well, they intertwine, creating a 4-foot thick canopy. Fruit will not get enough light, which delays ripening and increases risk of disease.

Vertical hedgerow (also called 2-cane Guyot, VSP, or two-cane Kniffen)



Figure 12. Vertical hedgerow training, cane pruned, dormant.

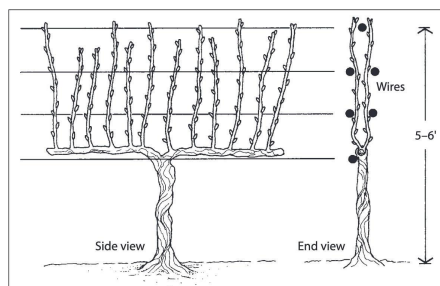


Figure 13. Two-cane Kniffen.



Figure 14. Vertical hedgerow, cane pruned, growing season.

Credit: Patty Skinkis, © Oregon State University

In this system, the head height of the trunk varies from very short in cooler areas (1½ to 2 feet) to 3 feet in warmer regions. Vines are pruned to two canes or cordons (figure 12). The trellis requires a training wire at head height and two to three sets of training wires above head height to about 6 feet. Shoots produced from canes or spurs are trained upward between the sets of training wires on the trellis (figures 13 and 14). Keeping the shoots upright in a narrow canopy improves the fruit’s exposure to light. Many wine grapes are grown in Oregon using this method. Table grapes are more often grown using downward hanging systems.

Head training

In areas with limited space, it’s possible to train vines to a self-supporting trunk with no trellis. Young vine trunks are tied to a stake and become self-supporting as they grow (figures 15 and 16). Prune vines to long spurs that originate

at the head of the vine (figure 17A). This method is inexpensive and requires less space, but yields are lower. A common mistake made in the home garden is to “hedge prune” these head-trained vines (figure 17B). This produces too many spurs, which leaves too many buds and—in American types—many spurs that are too short for good fruit production.

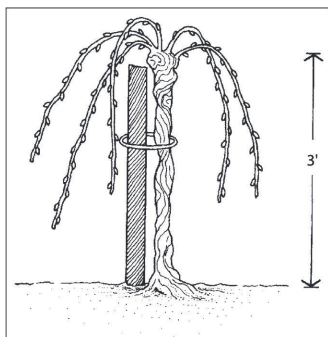


Figure 15. A head-trained vine.



Figure 16. Head-trained vine.



Figure 17A. Correctly pruned, head-trained vineyard.



Figure 17B. Incorrectly “hedged” vine.

Arbors

Grapes are well suited to training on an arbor. The plants make attractive ornamentals and provide shade (figure 18). Depending on how the arbor is constructed, fruit hangs down through the arbor to see and harvest underneath.

You can choose a red-, blue-, and green-fruited grape to grow on each side of a large, three-sided arbor. If you grow one vine per side, plant each in the center of its arbor “wall” and train each trunk to grow up the side and along the top to the middle of the arbor. It may take more than 2 years to grow a trunk to that length.



Figure 18. Grapes trained to an arbor.

Credit: Neil Bell, © Oregon State University

After the first growing season (when the goal is to grow the trunk as tall as possible), select shoots along each trunk to distribute fruiting canes along the trunk’s length. If a trunk is not tall enough yet, use the topmost shoot to extend the trunk in the current season. Repeat this process until the framework of the vine has been established (each vine’s trunk goes up the side and along the top to the middle of the arbor). Have short fruiting canes alternate on the left and right sides of each trunk, so that shoots (leaves and shade) and fruit are well distributed along the trunk and arbor.

Scott Henry

This system of pruning vines to four canes and dividing the canopy was invented by Scott Henry, owner of a vineyard and winery near Roseburg, Oregon. The system is suited to European table grapes grown on a vigorous soil and can be spur pruned.

The trellis should have two cane-training wires, one at about 2½ feet from the ground and another at 3½ feet (figure 19). Train the trunk to a 2½-foot head height. Prune the vine to four canes. Allow the shoots from the two lower canes to grow downward; they are not “trained.” Train the shoots from the two upper canes upward and between catch wires (see “Vertical hedgerow,” 5; figure 20). Train four shoots near the head of the vine upward. These become the fruiting canes for next year.

It’s important not to let the upper shoots shade the lower ones, or quality will be relatively poor.



Figure 19. Scott-Henry training system, after cane-pruning. (Left side of vine)



Figure 20. Scott Henry training system, during fruiting season, showing gap between upward- and downward-trained shoots.



Figure 21. Four-cane Kniffen, early spring.

Credit: Patty Skinkis, © Oregon State University

Four-cane Kniffen

Home garden grape books often refer to this system. It is similar to the Scott Henry, but shoots are not trained. The top shoots are allowed to shade the lower ones (figure 21). This system is not generally recommended for cool regions in Oregon. Also, it is best not to spur prune this system in western Oregon to avoid too much shading.

Trellis

A trellis is required for most training systems. Building a trellis is like building a fence: take care to make the trellis strong and brace it well. It needs to bear the weight of vigorously growing vines and a heavy crop.

It’s best to build the trellis in the first growing season, so that you can start training vines to the trellis early (rather than to a stake).

The type of trellis you need varies with the training system you use (see “Training”). However, all trellises have certain characteristics in common.



Figure 22. Trellis for GDC.



Figure 23. Trellis for VSP-trained vineyard.

Credit: Patty Skinkis, © Oregon State University

End posts should be strong, about 8 to 9 feet long, and have a diameter of at least 6 inches. Treated wooden posts are best, though you can use concrete or large steel posts. Set end posts about 2 to 3 feet deep and leaning slightly away from the center of the row. For most training systems, 6 feet of post should be above ground. To brace the end posts, use large screw anchors or an “H” brace (figures 22 and 23).

Line posts are those in the row between the end posts. Space them 18 to 21 feet apart (or every three plants) and set them 2 feet deep. Wooden line posts should have a minimum diameter of 3 inches. An option for some training systems (like the single downward hanging canopy) is to place a steel fence post at each plant.

Use high-tensile, 12-gauge or heavier wire. Insert a wire tightener (e.g., figure 24) in each head- or cane-training wire. Wires must be tightened each winter after pruning.

To make moveable training wires, add chain-link to the end of wires at the row ends (figure 23) and put nails or hooks in the post. This allows you to move wires as you train the shoots. The number of wires you need depends on the training system you use.



Figure 24. Example of a wire tightener.

Summer pruning

There are several pruning techniques you can use in spring and summer to manage the vine for good fruit quality.

Shoot thinning

In spring, a grapevine can produce up to three shoots per bud at a node. When you prune to a certain number of buds per vine, you are estimating yield by assuming there will be only one fruitful shoot per node. **Shoot thinning** is removing extra shoots to leave just one shoot per node. Thin shoots once in spring when the main shoot is about 6 inches long. You can usually determine the shoot to keep because it's longer than the secondary or tertiary shoots (shorter shoots at the same node). Remove the extra shoot(s) by carefully snapping them off (figure 25 A–D). Avoid

shoot thinning when shoots are too long, so you won't accidentally remove the main (primary) shoot.



Figure 25A. Two shoots per node, before thinning.



Figure 25B. Ready to remove the least productive shoot.



Figure 25C. Snapping off the shoot.



Figure 25D. One shoot is left per node.

Fruit thinning

It's best to limit young vines to one cluster per shoot (see "Pruning"). This is called **fruit thinning**. Thin fruit right before bloom to improve fruit set on the remaining clusters.

Fruit thinning can also be done later in the season, if you feel you haven't pruned the vine severely enough and there's too much fruit for the crop to ripen well. If you remove fruit clusters before veraison, berry size increases, yield is less affected, and the grape clusters ripen sooner. If you thin fruit soon after veraison, there is little effect on berry size, but yield is reduced, and the remaining fruit ripens sooner.

In general, shoots need to be at least 3 feet long to support a fruit crop. Remove clusters from shorter shoots.

Hedging

Usually, 3 to 4 feet of growth per shoot is enough to ripen a crop. If plants become too vigorous, you can top or trim shoots. Be sure not to shorten too much the shoots that are to become next year's new fruiting canes. Hedged or tipped shoots produce lateral branches. Trim these also to prevent too much shading of the fruiting zone.

Leaf pulling

Good exposure to sun improves fruit quality. In cooler climates, you can remove two to four leaves per shoot in the fruiting zone so that clusters are less shaded. Remove leaves only on the side of the row that gets morning sun (figure 26). Do not remove leaves on the side that gets afternoon sun, or clusters may get sunburned. If you pull leaves off when fruit are pea-size (about late June) or earlier, the clusters won't get sunburned.

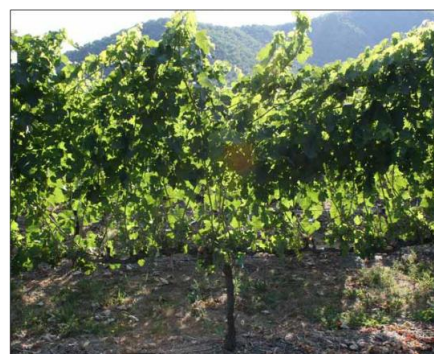


Figure 26. A vine trained to a vertical hedgerow that was summer-pruned by leaf pulling earlier in the season.

Credit: Patty Skinkis, © Oregon State University

Girdling

Girdling is an old practice that, when done correctly, improves size and appearance of seedless table grapes. Seeded grapes show relatively little response.

Many commercial table grapes available in supermarkets are larger than the fruit of the same cultivars you grow at home. Commercial table grapes are often girdled (or may be treated with a naturally occurring growth hormone, gibberellic acid) to enhance berry size. The cultivars listed in the table “Characteristics of table grape cultivars grown in Oregon” don’t need girdling or gibberellic acid for home table grape production.

If you want to try girdling, here is the technique: Girdle each fruiting cane at the third internode. This allows the two basal shoots to support the root system and weakens the plant less. Remove a narrow ring of bark about 3/16 to 1/4 inch wide about 2 weeks before bloom. The girdle will heal by the end of the growing season.

If you are interested in using girdling, you can buy girdling tools that remove the right amount of bark. If you’re uncertain about the effects of girdling, practice this technique on one cane of a vine.

Pruning an old, neglected vine

A common question home gardeners ask is whether they can “save” an old, neglected vine. Usually, they refer to a vine that wasn’t pruned or trained well to begin with, or one that hasn’t been pruned for many years. First of all, if the vine has sentimental value or you really like the variety and want to “save” it, it’s best to take some cuttings just in case the pruning methods described here don’t work (see “Propagation”).

A vine that hasn’t been managed well will have many small (short and thin) shoots. Often, these are at the growing ends of the plant—perhaps high up in a tree or on the roof of an old shed! This growth produces low-quality fruit, isn’t good material for cane or spur pruning, and isn’t in a place where you can harvest the fruit easily.

If the vine has a decent trunk and looks like it had a good framework in the past, you might be able to save it. Prune it heavily by removing most of the wood, leaving only about 40 buds on 1-year-old wood. This wood might still be high up in a tree, but it’s needed to support new shoot growth.

With such a severe pruning, the vine may produce new suckers at the head of the vine or at the base of the trunk. If this happens, you will have new shoots that will become your fruiting canes next winter. You can use a sucker to replace the trunk. In that case, you would remove the older wood (up in the tree, in this example) the winter following the severe pruning.

For a vine that has too many trunks to count and you don’t know where to begin pruning, try cutting the vine back to near ground level. Often, the vine will produce new suckers. (This method doesn’t work on grafted vines, but grafted vines are rare in table grapes.) Choose one of the new suckers to be your new trunk, and train it. The following winter, pile soil around this new trunk so that it will form its own roots (the old stump will rot out).

Remember: to be safe, be sure to take cuttings to propagate the vine in case the severe pruning doesn’t work.

Harvest

There are several signs that can help you judge the ripeness of your grapes.

- The color of ripe grapes varies with cultivar. Once you become familiar with a particular variety, color can help you judge when the grapes are getting close to maturity.
- The stem that supports the cluster changes from green to brown as the cluster reaches maturity.
- The seeds of seeded grapes darken as the berry matures.

The best way to judge whether table grapes are ripe is to taste them. Taste berries at the tip of the cluster. These are the last to ripen.

Grapes become sweeter and less acid as they mature. The characteristic aroma and flavor of a cultivar develops relatively late in the ripening process, with intensity increasing as the grapes “hang.” But, grapes also start to soften if they are left to hang too long, which decreases storage life. Also, the longer you let fruit hang on the vine in the fall, the greater the risk of damage from birds, bees, and fruit rot.

If you are an avid grower, you might buy a hand-held refractometer, a device that measures the percentage of soluble solids or sugar content (also known as “Brix”). These cost a little over \$150.

As you decide when to harvest, you must consider the weather and its potential effects on fruit. Rain on mature fruit may cause shattering (falling from the cluster), cracking or splitting, and an increase in fruit rot.

The average temperature must be above 50°F for grapes to continue to mature on the vine. Grapes do not ripen further after they’ve been picked.

Use pruning shears to harvest clusters. Store clusters in the refrigerator in vented plastic bags.

Pests and problems

Environment

Winter cold injury

American grapes are the most cold hardy, while European grapes are the least. In the Willamette Valley and coastal areas of Oregon, cold damage to buds and canes of European grapes occurs rarely, and then only on the coolest sites (such as at high elevation). Cold injury to European table grapes and hybrids is more common in eastern-Oregon growing regions. There, these types of grapes may be grown using certain methods to train vines or protect them with soil or mulch during cold winter months. Refer to the publication *Protecting Grapevines from Winter Injury* (“For further reading”).

Frost

After bud break in spring, grapevine shoots are sensitive to frost damage. If frost injury occurs, there may be a less developed shoot or bud at that node that will grow and produce a partial crop.

To reduce risk of frost injury on cooler sites:

- Grow vines near compacted bare soil rather than near weeds or grass.
- Leave long canes when pruning, which delays bud break on the more basal part of the canes. Remove the extra cane length after risk of frost has passed.
- Keep other canes as “spare parts” to delay bud break. Remove the extra canes or buds after risk of frost has passed.
- Train to a high head height. Higher from the ground tends to be warmer during frost season.

Risk of frost injury varies a great deal among sites and even among locations on the same property. Cultivars may also differ in timing of bud break, which can make some cultivars more susceptible to frost.

Stunted spring growth

In spring, affected shoots have zig-zag internodes and are generally stunted. This can be caused by nutrient deficiencies (particularly zinc and boron), herbicide injury, spring frost damage, or mites. Refer to the publication *Grapevine Growth Distortions* (“For further reading”) for more information and suggested control measures.

Herbicide injury

Grapes are very sensitive to herbicide injury. Distorted leaves (figure 27) and shoot tips are common symptoms in areas where herbicide drift (particularly of a 2,4-D product) has occurred. Avoid using these herbicide products near grapes or on days when drift may occur (hot or windy conditions).



Figure 27. Symptoms of 2, 4-D injury on a grape leaf.



Figure 28. Grape erineum mite symptoms on top and underside of leaf in late season.

Credit: Patty Skinkis, © Oregon State University

Pests

Phylloxera

This aphid-like insect feeds on roots, weakening the plant. Many American or hybrid table grape cultivars are tolerant of this pest, but European cultivars are susceptible. European wine grapes are available from nurseries as vines grafted to a resistant rootstock, but most European table grapes available in the Pacific Northwest are not grafted.

Phylloxera can kill a susceptible grapevine. There are no control measures for this pest if susceptible, non-grafted vines become infested.

Grape erineum mite

Mites feeding on leaves cause characteristic fuzzy spots on the underside of leaves (figure 28). There is no need to control this pest, as it doesn’t really harm the vine or the fruit.

Wasps and hornets

These insects feed on fruit before it’s considered fully ripe or ready for harvest. They use their mandibles to tear a hole in the berry skin and then eat out the fruit contents, leaving a hard shell. Use traps in the row to minimize these pests.

Birds

Birds can be major pests. Scare devices, such as aluminum plates or flagging, offer little control. The only sure method of protection is to place netting over the vines or along the fruiting zone.

Deer

Unfortunately, deer like eating grapevines. Adequate fencing is the only sure way to protect the vines.

Rodents

Voles and field mice damage vines by chewing on the cambium layer just under the bark. If vines are girdled, they die. Avoid tall grass or mulch around vine trunks. These encourage rodents.

Weeds

Mature vines may be able to compete with most weeds on fertile soil. In shallower soil or around young vines, use shallow cultivation to control weeds. You can use mulch, but mulch may become a home for mice or voles in winter, and they can girdle and kill the trunk.

Disease

Crown gall

This is a bacterial disease that causes a gall or enlarged area at a wound site, often the base of the vine. The bacterium is systemic in the plant, so cleaning your pruners between vines may help limit its spread.

Botrytis fruit rot

This disease is also called **gray mold**. Fruit rot is aggravated in cool, wet autumns, especially in dense canopies where fruit clusters stay moist longer. To minimize this disease, use cultural methods of canopy management (shoot thinning, leaf pulling, shoot positioning) to increase cluster exposure to sun and wind.

Powdery mildew

This disease affects both leaves and fruit. Leaves show yellow to brown patches on the leaf upper surface (figure 29A). Fruit shows a gray “netting” on the berry’s surface and splitting in severe infections (figure 29B). Fruit affected by powdery mildew has a bad off-flavor.

Cultivars differ considerably in their sensitivity to powdery mildew. In general, European cultivars are most susceptible and may require several applications of sulfur or other fungicides for control. Good canopy exposure and air circulation also help manage this disease.

For more information on pests, see the following publications (in “For further reading,” below).

- Pest Management Guide for Wine Grapes in Oregon
- Pacific Northwest Insect Management Handbook
- Pacific Northwest Plant Disease Management Handbook
- Pacific Northwest Weed Management Handbook

Also, check with your local OSU Extension Service office for management recommendations.



Figure 29A. Powdery mildew on leaves.



Figure 29B. Powdery mildew on fruit.

For further reading

- [Establishing a Vineyard in Oregon—A Quick Start Resource Guide](https://catalog.extension.oregonstate.edu/em8973) (catalog.extension.oregonstate.edu/em8973) (EM 8973-E). 2009. Oregon State University Extension Service.
- [Grape Phylloxera—Biology and Management in the Pacific Northwest](https://catalog.extension.oregonstate.edu/ec1463) (<https://catalog.extension.oregonstate.edu/ec1463>) (EC 1463-E). 2009. Oregon State University Extension Service.
- [Grapevine Growth Distortions—A Guide to Identifying Symptoms](https://catalog.extension.oregonstate.edu/em8975) (<https://catalog.extension.oregonstate.edu/em8975>) (EM 8975-E). 2009. Oregon State University Extension Service.
- [Pacific Northwest Pest Management Handbooks](http://pnwhandbooks.org/) ([//pnwhandbooks.org/](http://pnwhandbooks.org/)). Oregon State University Extension Service.
- [Pest Management Guide for Wine Grapes In Oregon](https://catalog.extension.oregonstate.edu/em8413) (<https://catalog.extension.oregonstate.edu/em8413>) (EM 8413). 2011. Oregon State University Extension Service.
- [Preventing Herbicide Drift and Injury to Grapevines](https://catalog.extension.oregonstate.edu/em8860) (<https://catalog.extension.oregonstate.edu/em8860>) (EM 8860). 2004. Oregon State University Extension Service.
- [Preventing Phenoxy Herbicide Damage to Grape Vineyards](https://catalog.extension.oregonstate.edu/em8737) (<https://catalog.extension.oregonstate.edu/em8737>) (EM 8737). 1999. Oregon State University Extension Service.
- [Protecting Grapevines from Winter Injury](https://catalog.extension.oregonstate.edu/pnw603) (<https://catalog.extension.oregonstate.edu/pnw603>) (PNW 603-E). 2008. Oregon State University Extension Service.
- *The Grape Grower—A Guide to Organic Viticulture*. 2002. Chelsea Green Pub. Co., White River Junction, VT. 289 pp.

Photos by Bernadine Strik unless otherwise noted.

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(Retired)

Appendix A: Characteristics of table grape cultivars grown in Oregon

Characteristics of table grape cultivars grown in Oregon, sorted by color and then listed in approximate order of ripening in the Willamette Valley, Oregon.

See Appendix B for photos of cultivars.

Cultivar	Season	Type	Seeds	Cluster form	Berry size	Flavor	Pruning	Comments
Green (includes yellow-green cultivars)								
Interlaken	VE	E	No	Small; compact	Small	Excellent; foxy flavor; sweet; aromatic	Cane	Moderate cold hardiness (some injury at -5°F); tender skin; berries crisp texture; good for raisins; fruit hangs well on vine to sweeten further; reliable high yields; also adapted to cooler coastal areas
Spartan	E	A	No	Large; compact	Small	Mild	Spur	Moderately cold hardy to -10°F; firm fruit
Himrod	E	A	No	Long; loose	Small	Good, honey-like	Cane; cluster-thin to improve compactness of remaining clusters	Moderately cold hardy (-10°F); tender skin; good for raisins; brittle cluster and berry stems; berries fall off cluster when stored; medium yield on very vigorous vines
Ontario	E	A	Yes	Medium; compact	Medium to large	Mild foxy flavor		Cold hardy (-20°F); slip skin; productive on lighter, fertile soil
Seneca	E	A	Yes	Medium; loose	Small; oval	Sweet, spicy, aromatic		Moderately cold hardy (-5 to -10°F); not suited for coldest regions; firm-textured berries; susceptible to powdery mildew; vigorous

Cultivar	Season	Type	Seeds	Cluster form	Berry size	Flavor	Pruning	Comments
Edelweiss	E	A	Yes	Medium; loose	Medium to large	Mild foxy flavor that intensifies as fruit hangs on the vine	Cane	Cold hardy (-30°F); slip skin; nice alternative to Niagara (more disease resistant)
Lakemont	M	A	No	Very large; compact	Small to medium	Mild and acid	Cane; cluster-thin	Moderate cold hardiness (-10°F); susceptible to botrytis; high yield
Remaily Seedless	M-L	A	No	Very large	Large; oval	Sweet when ripe; mildly fruity	Cane; cluster-thin	Vigorous plants; susceptible to powdery mildew; fruit may “bronze” in sun; needs warm fall to develop sweet fruit
Emerald	M-L	A	No	Very large	Medium to large	Mild	Spur; cluster-thin	Cold hardy; well tested in Idaho but not in Oregon; extremely susceptible to powdery mildew and sunburn
Italia	M-L	A	Yes	Large	Large; oval	Great sweet flavor	Spur	Cold hardy; fruit turns yellow in sun; berries hang well on vine; fruit stores well; well-tested in Idaho but not in Oregon
Niagara	M-L	A	Yes	Large; compact	Large	Strong foxy flavor; not very sweet		Cold hardy (-15 to -20°F); slip skin; for fresh or wine; does not consistently ripen in Willamette Valley unless pruned well; susceptible to powdery mildew in wet years; very vigorous

Cultivar	Season	Type	Seeds	Cluster form	Berry size	Flavor	Pruning	Comments
Neptune	L	A	No	Large; compact	Large; oval	Mild and fruity	Spur	Cold hardy; firm berries with thick skin; milder European-type flavor; low yield; resistant to cracking
Golden Muscat	VL	A	Yes	Large	Medium to large; oval	Muscat type; sweet; aromatic		Moderately cold hardy (-10 to -15°F); slip skin is slightly tough; juicy, soft berries; will not ripen in most locations in Oregon; rain near harvest will cause berries to crack
Red								
Flame Seedless	E	E	No	Large	Medium	Mild, sweet	Cane or spur	Not cold hardy enough for eastern Oregon (injury at 0 to 10°F); crisp texture; vine susceptible to powdery mildew
Reliance	E	A	No	Medium to large	Medium	Sweet, foxy, fruity	Spur	Cold hardy (-20°F); slip skin; fruit may not develop good red color in some years and may crack in wet fall; tender skin; good for raisins, fresh, jellies, and juice
Canadice	E	A	No	Medium; very compact	Small	Medium foxy flavor; sweet	Spur (2-3 buds per spur); cluster-thin if needed to limit yield	Cold hardy (-25°F; only in well-pruned vine); adapted to cooler coastal climates as well as other regions; high yield; tender skin; slip skin; good for raisins

Cultivar	Season	Type	Seeds	Cluster form	Berry size	Flavor	Pruning	Comments
Vanessa	E	A	No	Medium; compact	Medium	Mild; fruity	Cane prune if high vigor; spur if low vigor	Cold hardy (-20°F); may have remnants of undeveloped seeds; stores well; firm berries; a favorite variety of many; a good alternative to Flame Seedless in cool climates
Einset Seedless	E	A	No	Medium; moderately loose	Medium; oval	Flavor mild foxy, fruity, strawberry-like	Cane	Moderately cold hardy (-10°F); skin is slightly tough; small, undeveloped seeds may be noticeable; firm fruit stores fresh very well; overly fertilized or vigorous vines set little fruit
Delaware	M	A	Yes	Small; compact	Small	Almost no foxy flavor; sweet	Cane	Susceptible to powdery mildew; fruit better for juice than fresh eating
Swenson Red	M	A	Yes	Medium; compact	Medium to large	Nice foxy flavor; sweet; aromatic		Cold hardy (to -30°F); berries have firm texture; vine has low vigor when young; not well adapted to coast, as set is reduced in fog
Saturn	M	A	No	Medium to large	Large	Nice, sweet	Cane or spur	Moderate cold hardiness (-15°F); texture and flavor similar to European types; can have small berries in cool season; traces of seed remnants found in warm seasons; well tested in Idaho

Cultivar	Season	Type	Seeds	Cluster form	Berry size	Flavor	Pruning	Comments
Suffolk Red	M	A	No	Medium; loose	Medium	Mild foxy flavor; sweet	Cane or spur	Moderate cold hardiness (to zone 5); berries may be more pink than red; fruit set (berries/cluster) can be poor in some years; low yield
Alborz	M	A	No	Large	Medium	Nice, crispy fruit	Spur	Cold hardy; well tested in Idaho but not in Oregon
Blue								
Van Buren	VE	A	Yes	Medium	Medium	Foxy; juicy; sweet; low acid		Cold hardy; slip skin; juice similar to Concord; berries prone to splitting; fresh fruit doesn't store well; not ideal for juice; vine does best in light, fertile soil
Elizabeth	VE	A	Yes	Medium	Medium	Foxy		Cold hardy; thought by some to be the same cultivar as Van Buren
Price	VE	A	Yes	Small; compact	Large	Nice foxy flavor; very sweet		Cold hardy (-25°F); good disease resistance; slip skin is tender; thinner skin than Concord; makes great juice; most adapted to cool coastal regions as well as warmer areas
Valiant	E	A	Yes	Small; compact	Medium	Nice foxy flavor; sweet	Spur (3-4 buds)	Cold hardy (-35°F); excellent for juice or jelly; do not let vines produce too much fruit when young

Cultivar	Season	Type	Seeds	Cluster form	Berry size	Flavor	Pruning	Comments
Buffalo	E-M	A	Yes	Medium; loose	Medium	Pleasant, sweet flavor	Cane or spur	Moderate hardiness (-10°F); slip skin; tough, astringent skin; pulp can be stringy; best for juice
Venus	M	A	No	Medium; compact	Medium to large	Slight foxy flavor	Cane	Moderate cold hardiness (-15°F); slip skin; skin may be tough and astringent; remnants of undeveloped seeds can be quite noticeable
Jupiter	M	A	No	Large	Large; oval	Mild Muscat flavor	Spur (3-4 buds)	Cold hardy (-20°F); firm reddish-blue fruit; resistant to cracking; sweet, late fruit makes good raisins
Glenora	M	A	No	Large	Medium to large	Slight foxy flavor	Cane	Moderate cold hardiness (-15°F); tip berries may not ripen well; berries do not store well
NY Muscat	M	A	Yes	Medium	Medium	Fruity; rich Muscat flavor	Spur	Cold hardy (-15°F); slip skin; susceptible to powdery mildew; fruit are reddish blue
Campbell Early	M	A	Yes	Large	Large	Sweet; strong foxy flavor	Spur (2-3 buds)	Cold hardy (-20°F); fruit color well before they are ripe—let fruit hang to get better flavor; can have powdery mildew in wet years
Mars	M	A	No	Small to medium	Medium to large	Mild foxy		Moderately cold hardy (-10°F); slip skin; prevent overproduction on young vines; can have powdery mildew in wet years

Cultivar	Season	Type	Seeds	Cluster form	Berry size	Flavor	Pruning	Comments
Black Corinth	M	E	No	Large	Very small	Mild	Cane	Also called “Zante Currant”; used to make dried “currants”; very susceptible to powdery mildew; difficult to grow without disease on a small scale
Concord Seedless	M-L	A	No	Small	Small	Foxy; juicy; sweet		Cold hardy (-20°F); slip skin; berries and clusters are much smaller than Concord; yield is erratic from year to year; may develop seeds in warm years
Alden	M-L	A	Yes	Medium; compact	Large	Mild, European-like, low acid	Spur (2-3 buds)	Moderately cold hardy (-15°F); very productive; berries can crack
Autumn Royal	M-L	A	No	Large; compact	Large	Nice flavor		Cold hardy; firm fruit; susceptible to sunburn; well tested in Idaho but not in Oregon
Steuben	L	A	Yes	Medium; compact	Large	Sweet; spicy	Spur; cluster-thin	Moderately cold hardy (-10°F); slip skin; vigorous
Concord	L	A	Yes	Large	Medium to large	Strong foxy flavor	Cane or to longer spurs (at least 6 buds)	Cold hardy (-20°F); slip skin; susceptible to powdery mildew in wet years; may not ripen in western Oregon if not pruned well

- **Season:** VE = Very Early (~ 6 weeks before Concord); E= Early (about 4-5 weeks before Concord); M = Mid-season; L = Late (~ mid-October; ripens with Concord); VL = Very Late
- **Type:** E = European; A = American or European-American hybrid
- **Pruning:** Recommended number of buds per spur is provided, if known. Otherwise, we suggest trying about five buds per spur.

Sources:

- OSU variety trials in Aurora and Corvallis, Oregon
- [Cornell University, Department of Horticulture](http://www.nysaes.cornell.edu/hort/faculty/reisch/bulletin/table/tableindex2.html)
(<http://www.nysaes.cornell.edu/hort/faculty/reisch/bulletin/table/tableindex2.html>)
- Selecting Grape Cultivars and Planting Sites in Idaho (CIS 1043), University of Idaho
- Variety Selection, University of Idaho publication via [Snake River Table Grape Growers' Association](http://www.srtgga.org/)
(<http://www.srtgga.org/>) (source Esmaeil Fallahi)
- [Table grapes for cool climates](http://viticulture.hort.iastate.edu) (<http://viticulture.hort.iastate.edu>), Iowa State University
- The Grape Grower, [L . Rombough](http://www.bunchgrapes.com/) (<http://www.bunchgrapes.com/>)

Appendix B: Photographs of cultivars, by color

Green



Lakemont



Edelweiss



Himrod



Interlaken



Golden Muscat



Remail Seedless



Neptune



Niagara

Red



Flame Seedless



Suffolk Red



Swenson Red



Vanessa



Reliance



Einsett Seedless

Blue



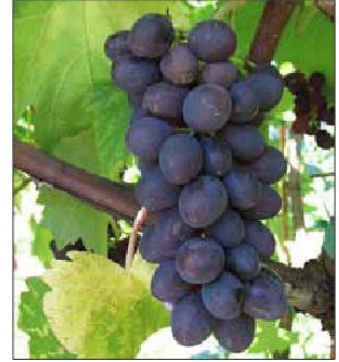
Canadice



Mars



New York Muscat



Saturn



Black Corinth



Campbell Early (good fruit set)



Campbell Early (poor fruit set)



Concord



Glenora



Jupiter



Price



Venus

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