Grapes are one of the most ancient crops known to humans. They can be eaten fresh as table grapes or enjoyed in a variety of products such as juice, jelly, raisins, and the ultimate processed grape product, wine—created from the controlled fermentation of grape juice. (For information on home winemaking, refer to Winemaking as a Hobby [AGRS-049], available through Penn State county extension offices.) Grapes are a wonderful crop to grow in the backyard. Many species are native to North America and are extremely easy to grow, whereas others (primarily wine grapes) are natives of Europe and can present a true horticultural challenge to the backyard grower. Because grapes are vines, the form to which they are trained is limited only by the grower’s imagination—from arbors to fences to more standard trellis systems, grapes can be trained to conform to many shapes and sizes.

**Site and Cultivar Selection**

Site selection is extremely important for growing the more cold-tender grape cultivars, although American types such as Concord and Niagara thrive in most places in Pennsylvania. An ideal site for the cold-tender cultivars should have 160 or more frost-free days. The USDA cold-hardiness zones are a good measure of climate suitability. Minimum low winter temperature for vinifera grapes is 0°F and -5°F for hybrids. A slight degree of slope will assist in air drainage, and east-to-south exposures are desirable. Well-drained soils like a clay loam are most preferred, as they assist in removing excess moisture from the root zone.

After choosing an appropriate site, the most important decision a prospective grape producer must make is the selection of appropriate cultivars. Cultivar selection is determined by at least two primary factors. The first is the purpose of the grapes. Although Concord makes a wonderful juice and jelly, it makes a wine of limited appeal; in addition, many people dislike seeds in their fresh-eating grapes. On the other hand, Concord is wonderfully adapted to our climate in Pennsylvania, having good pest resistance and cold hardiness. European grapes (Vitis vinifera) such as Chardonnay or Cabernet Franc have excellent wine-making characteristics but are susceptible to a whole host of diseases and are more cold-tender than native grapes. In many cases, French-American hybrid grapes such as Vidal and Chambourcin offer a good compromise for wine production because they have good winemaking characteristics as well as better horticultural traits than their European cousins.

**Purchasing and Planting**

Grapes are sold as rooted cuttings (referred to as “own-rooted” plants) or grafted plants. Both are usually sold as bare-root dormant plants, which should be planted in the spring as soon as the soil can be worked. Only the European grapes require grafting since they are susceptible to the root louse phylloxera, which is ubiquitous in Pennsylvania’s soils. Grafting onto a resistant rootstock takes care of this problem.

Most grape plants will be rooted cuttings, but note that grapes are also propagated easily from dormant cane cuttings. Collect dormant wood (pencil thickness, exposed to full sun) in the winter and store it in a cool and damp place until spring, making sure to note which end of the cuttings is “up” (apical end). The plants will not root if put in the soil upside down. In the spring, put two nodes of the cutting into friable, moist, well-drained soil, and keep the cuttings watered. Rooting generally will occur in 4 weeks or so. Transplant the following spring to the desired site. Commercial grapevine nurseries in New York sell wine and table grape varieties and will ship them as bare-rooted plants for planting in the spring.

Prepare your vineyard site carefully. If you are planting more than just a few vines, this will help greatly in the establishment of the vineyard. The year before you plant, mark off the area for the vines and begin preparing the soil. Cultivate the soil and kill any weeds, and then add any amendments suggested by your soil tests. Weeds compete
with young vines for nutrients and water—the fewer weeds you have in your new vineyard, the better your new vines will perform. To the extent possible, plant rows in a north-south orientation to capture the most sunlight. Mark the rows carefully and evenly using wires and marking sticks. Straight rows look much better than crooked ones and are easier to maintain. Tie your shoots loosely to a training stake to create a straight trunk. You only have one chance to train your vine correctly. You should have a clear idea of how you want to permanently train your vine so you can create a correct, strong, and permanent vine structure.

Regardless of whether you buy or propagate your own plants, plant them in a hole a few inches deeper than the longest roots. Trim roots to 6 to 12 inches and soak the vines in water before planting. In the hole, roots should be pointed down and spread out evenly. While the vine is still dormant, prune back to one or two canes and leave only two to three nodes on each cane. After shoot growth begins and the danger of spring frost has passed, remove all but the two strongest shoots. Be sure to keep the new vines watered and weeded, and remove all flower clusters in this first year. A small amount of fertilizer may benefit the young vine. Remember that your first goal is to establish the plant. A well-established grapevine that is well adapted to its climate will produce fruit for many decades! Vines can be staked as needed, and the desired trellis system can be erected during the summer or the fall. How the plants are supported is up to the individual, of course; the grape plant adapts graciously to most forms. A standard trellis used in commercial vineyards is about 6 feet tall with wires to support the grapes. Be sure to monitor and control insect and disease pests (see pest descriptions and recommendations on the following pages). The trellis system can be installed in the first or second year. Deer, rabbits, and other animals like to eat tender shoots, so efforts should be taken to keep them away from new vines.

**Nutritional Requirements**

Test and amend the soil according to the soil test directions a year before planting. Two to three weeks after planting, apply 2 ounces of 33-0-0 to the plants, taking care to keep the fertilizer 1 foot away from the vine. In subsequent years, apply 4, 6, or 8 ounces of 33-0-0 per plant or 1 to 2 pounds of 10-10-10 per plant before the buds start to swell in the spring. If vines are too vigorous, omit nitrogen for 1 to 2 years—you do not want to grow a monster vine. Test the soil and leaf petioles periodically (every 3 to 5 years) to monitor nutritional needs and maintain soil pH between 5.5 and 7.0. Many nutrient deficiencies can be detected by visual leaf and fruit symptoms, so take the time to learn these.

**Pruning**

Pruning occurs in winter months when vines are dormant, usually between December and March. Pruning sets the bud number and crop for the upcoming season and is a very important viticulture practice. Learn how to prune properly. A vine that is too big will have more disease and lower-quality fruit. A small vine will not be productive. Grapes can be grown to conform to numerous shapes; arbors, fences, and decorative trellises are only a few of the possibilities. The grower’s imagination is the only limit to how the vines can be trained. Since many home gardeners opt to use a less traditional training system, they should remember a few pruning and training principles:

- The structure to which you are training the grapevine should be reasonably filled but not overgrown. This is easier said than done because although the vine initially grows fairly slowly, it can become a jungle of vegetation as it matures. One to two layers of leaves for any area on the canopy are best for flower-bud and fruit development.

- Mature grapevines, by their very nature, produce much more wood than they can support. Think of the wild grapevine growing in the woods—it produces a huge amount of wood just to climb to the sunlight. Your grapevines won’t need to produce that much wood since you’re cultivating them, but nevertheless they will produce much more wood than is necessary or desirable. Typically, 90 percent of the new growth of a mature grapevine is removed during dormant pruning. Plan on leaving about three to four buds per foot of cordon (the horizontal trunk on a grapevine).

- Grapes bear their fruit on one-year-old wood.

- Different grape cultivars have different growth habits. American grape canes tend to grow in a willowy, downward direction, while European and many French-American hybrid grapes tend to grow directly up. Choose your training system with this in mind.

In order to help guide you, some traditional training systems employed by commercial and backyard viticulturists (grape growers) are described below.
Training Systems

Single-Curtain Cordon or Hudson River Umbrella Systems
These “cascading” systems are traditional for native and hybrid grape varieties. The top wire in this system should be galvanized crinkle wire or brite basic number 8 wire that has the property of low stretchability. This is because once this system is established, the wire cannot be retightened. In training a vine to this system, select two strong canes or arms and place them bilaterally along the top wire. Arms from one vine should not overlap with arms from adjacent vines. For first-year pruning, leave several branches (spurs) that are five to seven buds long. These spurs should be spaced 4 to 8 inches apart. For each two- to four-bud spur, also leave a one-bud renewal spur. In selecting arms, be careful to avoid scored wood where canes cross over the top wire. The fruiting shoots will hang like a curtain in groups from the spurs that originate from the arms along the top wire.

The arms should be wrapped loosely around the wire and tied at each end. One and one-half turns should be sufficient for each arm. Using a bottom wire is necessary only for young vines or for trunk position control.

Shoots should be separated carefully and placed vertically downward from the top wire for a distance of 18 to 24 inches. Positioning should be carried out as soon as the shoots have toughened, usually 2 to 3 weeks after peak bloom. Peak bloom is when 50 percent of the fused petals (calyptras) have fallen, exposing the rest of the flower parts. Extreme care must be exercised during shoot positioning since the loss of any shoot at this time can result in a poorly filled trellis.

During the second year and thereafter, leave at least five buds on each spur along the arms of the vine for fruiting purposes. The total number of buds should be adjusted in accordance with the capacity of the vine, as explained for other systems.

Umbrella Kniffin System
This system is established by bringing the trunk up to the top wire and leaving four or more canes, bearing a final total of 50 to 60 buds, near the top of the trunk (head). Remove all other wood except two renewal spurs (short canes of two buds) near the head. After adjusting the number of buds, retie the trunk. Then bend the canes rather sharply over the top wire so the outer bark cracks, and tie the tips to the bottom wire. The renewal buds will develop into shoots that probably will not be fruitful but should be allowed to grow. They are there to be used, if necessary, for retaining canes the next year. The buds on the four or more canes will form fruiting shoots that do not need to be tied because the vine already has been trained. Some of those shoots will probably be well located and can replace the original canes the following season, in which case the renewal shoots will not be needed.

Vertical Shoot Position System
This is the standard trellis system for vinifera and high-quality hybrid grapes. It creates a hedge-like wall of foliage with a fruit zone at the base of the wall. It is head trained/cane pruned or cordon trained/spur pruned. Fruiting wire is set between 30 and 36 inches. Green shoots are trained vertically and held in place with catch wires. Vines are often trimmed on their tops and sides. A balances vertical shoot position canopy has about one to two layers of leaves.

Building a Stout Trellis for Your Vines
Vines will need support for many years. Replacing a trellis holding an old vine is very difficult, so use the best materials possible that will stand the test of time when building a trellis. Secure all posts firmly in the ground to keep the trellis from being blown or pushed over.

Insect and Nematode Pests
The use of integrated pest management (IPM) practices for disease, insect, and weed control is strongly encouraged. Scouting and identification are important skills to learn. Minimizing the use of pesticides is good for your health and the environment. The following descriptions of insect damage are general guidelines that can vary in severity depending on a number of factors. Provisional action thresholds prescribe treatment when 15 percent or more of the leaves are destroyed by defoliating insects, or when 4 percent or more of the clusters are destroyed by cluster-feeding insects.

Climbing cutworms are known to feed on grapes. The larvae hide in the soil litter below the grape trellis and climb onto vines on warm nights to feed on developing primary grape buds. Cutworms are only able to inflict serious damage to a vineyard during budswell. To examine for cutworms, search under the bark and in the soil litter beneath a vine with damaged buds, or search the vine with a flashlight after dark.

European red mites are spider mites. They are especially severe in vineyards adjacent to apple orchards. Adult mites are small, dark red, and eight legged. Both adults and nymphs pierce the cells on the leaf undersides and extract plant juices. Heavily infested leaves take on a characteristic bronze coloration. Several generations occur in a season. You should use a 10x hand lens to find them.
Grape berry moths are one of the more serious insect pests affecting grapes in Pennsylvania. Two and occasionally three generations of moths hatch per season. Overwintered pupae emerge as adult moths in late May and lay eggs among the grape clusters. The larvae are small (up to 0.38 inch long) and feed internally in grape berries. External signs of moth feeding are the silk webs that tie several berries together. The larvae cut flaps in grape leaves and pupate inside, emerging as adult moths with half-inch wingspans. Time sprays to eliminate grape berry moths with a combination of pheromone traps and visual scouting for “stung” berries.

Grape leafhoppers overwinter under leaves and litter and enter vineyards in the spring. These overwintered adults do not cause serious damage. Depending on the length of the growing season, several generations can occur, with rapid population increases. Both the 1/8-inch adults and the nymphs feed on the underside of grape leaves by piercing the tissue and sucking out the plant juices. Damaged leaves become blotchy and yellow. A moderate infestation of grape leafhopper does not significantly affect yield and quality.

Grape phylloxera are minute insects with a complex life cycle. Two forms of phylloxera occur within the same species, and several generations of each can occur in any given year. The root gall form feeds on the outside of galls or swellings on the roots. Grape loss from this form can be prevented by grafting the variety scion to a phylloxera-resistant rootstock. This grafting will not affect injury caused by the leaf gall form of the phylloxera. The leaf gall form lives inside galls on the underside of grape leaves. Grape varieties vary widely in their susceptibility to both forms of phylloxera. Examine foliage on a weekly basis, before and after bloom. Spray when 15 percent of the shoots become infested. If new growth becomes infested, spray again in 10 to 14 days. All vinifera varieties and some hybrids should be grafted onto phylloxera-resistant rootstocks. Ask your nurseryman for advice on choosing the correct stock for your soil.

Grape root borers are clear-winged moths that strongly resemble paper wasps. At present, they occur only in southern and eastern Pennsylvania. Larvae feed on grape roots for a two-year period. Mature larvae burrow to just below the soil surface, spin a dirty brown silk cocoon, and pupate. Adults emerge in mid- to late summer, mate, and lay eggs beneath the vines. The eggs hatch and reenter the root system. There is no registered method for controlling the subterranean stages of this insect. Trapping male moths is somewhat effective as a control measure. Careful monitoring for pupal cases on the soil surface beneath vines will reveal when pupation is occurring and thereby aid in timing the application of the soil barrier.

Grapecane gallmakers are small (1/8-inch) brown weevils that form scars in shoots, typically beyond the last grape cluster. The 3/4-inch reddish swellings are quite noticeable on green shoots. Berry size and percentage of sugar are not affected, and the scars are easily found and removed during winter pruning. In areas where this insect previously has been a problem, apply control sprays to plantings when shoots are 4 to 6 inches long.

Grapecane girdlers are small (1/8-inch) black weevils that girdle grape canes by chewing two series of holes several inches apart. The girdles are generally beyond the last grape cluster, so there is usually no fruit loss. Control sprays should be applied at the new shoot stage to provide protection through bloom. To culturally control grapecane girdlers, cut off and burn infested parts of the canes before adults emerge from them in late summer.

Grapevine flea beetles are small (1/16-inch) bluish-black beetles that damage vines by feeding on small (1/2-inch) grape buds. In addition, their 1/4-inch larvae feed on the upper surface of the leaves. If adult beetles are present in damaging numbers in the early season, they should be controlled by the bud-swell spray.

Japanese beetles are 1/2 inch long and are distinguished by a metallic-green abdomen and coppery outer wings. Tufts of white hairs are arranged along the side of the body and behind the wing tips. Adults cause damage by feeding on the foliage and occasionally on the berries. One generation hatches each year, with the peak of adult activity occurring in midsummer. Vines with smooth, thin leaves are most susceptible to Japanese beetle attack. Young vines should be monitored closely to prevent excessive damage.

Nematodes are microscopic, multicellular worms. Poor vine growth can be a result of high nematode populations feeding on the roots. Nematode injury can result in increased winter damage. One species (Dagger) present in Pennsylvania soils can transmit viruses such as tomato ringspot virus, which can kill a vine over time. You can have your soils tested for nematode counts. Contact your county extension office.

Disease Description and Management

While many fungal diseases affect grapes, the following are considered to be the “big 5” by wine growers in the region. Strategies to combat them need to be in place well before the growing season begins. As with insect pests, an integrated pest management (IPM) program combining cultural practices with minimal use of chemical pesticides should contain most problems. Leaf plucking around the fruit zone and shoot-thinning and positioning to keep an open canopy help increase aeration, sunlight, and spray penetration. By reducing canopy shade and humidity, you can greatly reduce fungal diseases.
**Black Rot**

Black rot is one of the most serious diseases of grapes in the eastern United States. Crop losses can range from 5 to 80 percent, depending on the amount of disease in the vineyard, the weather, and cultivar susceptibility. The fungus can infect all green parts of the vine, with even greater damage affecting the fruit. Later fruit infections can destroy virtually an entire crop.

**Symptoms:** Reddish-brown, usually circular leaf spots first appear on the upper leaf surface. Soon after, the center of the spot becomes tan to light brown. Small, black, pimple-like bodies appear in the center of the spot, usually arranged in a loose ring just inside the dark border. Infected grapes become dark and shatter, leaving only the stem. Most serious fruit infections occur when the grape is pea sized or larger. The final stage is a black, wrinkled mummy.

**Disease Cycle:** The fungus overwinters in mummified berries on the soil or in old berry clusters that hang in the vines. Spores of the fungus are produced during spring rains. Fruit infections occur from mid-bloom until the berries begin to color. Mature leaves and ripe fruit are not susceptible. Very few berries or leaves are infected after late July, and none are infected after the end of August. Black rot infections depend on the temperature and the length of time the leaves are wet. Light infections can occur under the following conditions:

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<thead>
<tr>
<th>Temperature (F)</th>
<th>Hours of Leaf Wetness</th>
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<tr>
<td>50</td>
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<td>90</td>
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a. Average temperature over the wetting period.
b. Begin counting when the leaves first become wet; stop counting when the leaves have dried off.

**Disease Management:** Infected prunings and mummified berries should be removed and disked into the soil before new growth begins. In vineyards with susceptible cultivars or where black rot was a problem the previous year, early season fungicide sprays should be timed to prevent the earliest infections. Should infections become numerous, protecting against fruit rot later in the growing season will be difficult. It is strongly suggested that resistant cultivars be planted.

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**Botrytis Bunch Rot**

Botrytis bunch rot, or gray mold, is a disease that exists in all vineyards worldwide. The disease is caused by the fungus *Botrytis cinerea* and is commonly associated with the decay of ripe or nearly ripe grapes. Temperature and damp climates favor disease development. The bunch rot phase of the disease causes the greatest economic losses.

**Symptoms:** Buds and young fruit infected in early spring turn brown and dry out. Prior to bloom, large, reddish-brown patches appear on the leaves. By the end of bloom, the fungus develops on aborted berries that are attached to or trapped in the fruit clusters. From ripening onward, the grapes are infected directly through the epidermis or through wounds. Eventually, the entire cluster becomes moldy. When weather is dry, infected berries dry out; in wet weather, they tend to burst and a brownish-gray mold forms on the surface.

**Disease Cycle:** Botrytis bunch rot also infects numerous wild hosts and cultivated plants. The fungus can live on these alternate hosts as a saprophyte on dead tissue. The pathogen overwinters on bark and in dormant buds. In the spring, spores are produced by the fungus and infect leaves and young grape clusters. Spores on decaying and dead vegetation spread mainly by air currents. Water is necessary for germination, but this requires only 1 to 4 hours, depending on the temperature. High relative humidities allow infection to take place after the sporangia has germinated. Any break in the skin of ripening grapes provides an ideal entry point for the *Botrytis* fungus, as well as a moist medium in which the spore can germinate.

**Disease Management:** At least two fungicide sprays of captan are suggested for very susceptible varieties during the bloom period. The sprays will reduce the number of infected flower parts and the incidence of young fruit infection. Cultural practices, such as leaf removal around the fruit after berry set, will help to aerate the fruit zone and reduce the amount of dead vegetation. Water is necessary for germination, but this requires only 1 to 4 hours, depending on the temperature. High relative humidities allow infection to take place after the sporangia has germinated. Any break in the skin of ripening grapes provides an ideal entry point for the *Botrytis* fungus, as well as a moist medium in which the spore can germinate.

**Downy Mildew**

Downy mildew occurs wherever the growing season is warm and wet. There is some cultivar resistance, with *V. vinifera* cultivars being the most susceptible and *V. rotundifolia* being the most resistant.

**Symptoms:** The pathogen attacks all green parts of the vine, especially the leaves. Lesions on leaves are angular, yellowish, sometimes oily, and located between the veins. As the disease progresses, a white, cottony growth can be observed on the lower leaf surface. Severely infected leaves will drop. If enough defoliation occurs, the overwintering...
buds will be more susceptible to winter injury. Infected shoot tips become thick, curl, and eventually turn brown and die. Young berries are highly susceptible, appearing grayish when infected. Berries become less susceptible when mature. Infected berries remain firm compared to healthy berries, which soften as they ripen. Eventually, infected berries will drop.

**Disease Cycle:** The disease is caused by a fungus *Plasmopara viticola*, which overwinters as spores in fallen leaves. This fungus has two types of spores, both germinating to give rise to swimming spores. These spores swim to the stomates (breathing pores) of plants and cause infection. Water is necessary for the spores to swim and to infect the leaves, so outbreaks of the disease coincide with periods of wet weather. Downy mildew is favored by all factors that increase the moisture content of soil, air, and the plant, with rainfall being the principal factor for infection. The frequency of rain and the duration of wet periods correlate with the number of additional infections during the growing season. Downy mildew infection can become a severe problem when a wet winter is followed by a wet spring and a warm summer with considerable rainfall.

**Disease Management:** Some downy mildew control can be achieved by preventative management practices, such as making sure soils are well drained, reducing the sources of overwintering inoculum (fallen leaves), and pruning out the ends of infected shoots. Fungicides with copper, however, are the most important control measure, especially on susceptible cultivars. They should be applied just before bloom, 7 to 10 days later (usually at the end of bloom), 10 to 14 days after that, and, finally, 3 weeks after the third application. For cultivars very susceptible to downy mildew, or where the disease was severe the previous season, an additional application is suggested about 2 weeks before the first blossoms open. In addition, good canopy management practices should be employed throughout the growing season.

**Phomopsis Cane and Leaf Spot**

Phomopsis cane and leaf spot is one of two distinct diseases that used to be referred to as “dead arm” and is widely distributed in vineyards. The disease can weaken vines, reduce yields, and lower fruit quality.

**Symptoms:** This disease is often the first disease of the growing season to appear in the vineyard. Infections on new shoots first appear as reddish spots about \(\frac{1}{8}\) inch in diameter. These are most common on the first 8 inches of new shoots, and they can be seen when the shoots are about 18 inches long. Infected portions of the leaf turn yellow and then brown. When infections on shoots are numerous, they often run together and form dark blotches that crack. Cluster stems can blight and become brittle if infections are high. These clusters usually break and the fruit is lost. This fungus also causes a fruit rot. Infected fruit will turn brown, shrivel, and eventually drop. In winter, cane infections can be observed.

**Disease Cycle:** The fungus overwinters in bark and leaf petioles. In the spring, especially under wet conditions, spores produced by the fungus exude from infected tissue and are splashed onto shoot tips. Only very young tissues are infected. In summer, the fungus becomes inactive, but by fall it resumes activity. Infection in the vineyard is localized because the disease is spread mostly within the vine rather than from vine to vine. If the disease is not controlled, it will become more severe in the vineyard in each subsequent year.

**Disease Management:** Phomopsis cane and leaf spot can be controlled by a combination of sanitation and fungicide application. At pruning, remove dead and diseased wood. Destroy prunings and debris by burning, burying, or plowing them into the soil. The cane and leaf infections can be prevented by one or two early season fungicide sprays with captan. The number of new shoot infections during the previous 2 years and the frequency of prolonged rainy periods during the current year are indicators for performing none, one, or two fungicide applications. Fruit and cluster stem infections occur from bloom until the fruit are pea sized, and regular fungicide applications are necessary to prevent disease.

**Powdery Mildew**

If you have roses, you probably are familiar with powdery mildew. It is one of the major scourges of grape culture around the world. It was first found in North America in 1834 by Schweinitz. If left untreated, it will spread on leaves and fruit and overwinter on the vine.

**Symptoms:** Powdery mildew can infect all green tissues of the vine. It appears as a whitish gray, dusty or powdery material on both upper and lower leaf surfaces. In the sunlight, it shows up as lighter spots against the green leaves. Leaves and shoots can be infected at almost any stage of growth. Cluster infections generally occur before or after bloom and can result in considerable crop loss.

**Disease Cycle:** Powdery mildew overwinters as hyphae inside dormant buds and bark of the vine, as cleistothecia on the surface of the vine, or both. Developing buds are infected during the growing season. After budbreak, the fungus becomes active again and can cover the emerging shoot with white myceli. Conidia are produced and spread into the wind and water. These heavily infected shoots are called flag shoots. Temperature is important for powdery mildew infection. Optimal temperatures are in the 20–27°C range. Once temperatures exceed 35°C, germination of the fungus is slowed. Above 40°C it ceases.
Free water can be detrimental to germination as well. Low, diffused light appears to favor disease development, so good canopy management can help to control the spread of powdery mildew.

**Disease Management:** A variety of fungicides will control powdery mildew. Sulfur is widely used as a dust or wettable powder because of its efficacy as a curative, as well as its low cost. Copper formulations can also give effective control. Cultural practices, as described below, can offer great benefits to controlling this ubiquitous disease.

**Groundcover Management and Weed Control**

Herbicides currently registered for use in commercial vineyards are not recommended for home gardeners, but small amounts of Roundup prior to fruit set for spot treatments are acceptable. Physical control of weeds under the trellis by mowing, cultivation, hand hoeing, and pulling is suggested. Growth in row middles should be controlled by mowing. Use a lawn grass or commercial cover crop blend to maintain the row middles. Cover crops enhance soil quality by adding “green” fertilizer, reducing soil compaction and erosion, and building soil tilth.

Visit your vines often during the growing season. Scouting will help you detect problems before they get too large to easily control. Whenever possible, use cultural practices instead of chemicals to combat diseases and insect pests. For example, cut off parts of leaves and shoots that are infested or use a shop vacuum to remove insects such as Japanese beetles. Pheromone ties can be used to confuse the mating grape berry moth, and sticky traps can be used to trap leafhoppers and other insects. Low-toxicity insecticidal soaps should be considered for use. Harsh chemicals affect beneficial insect populations as well as the environment and should only be used as a very last defense for your fruit and vine. Remember to follow the label instructions exactly whenever you use chemicals. To lessen fungal pressures, canopies should not be too dense and shoots can be positioned to allow for air and light to penetrate to the interior of the canopy. Shade and humidity are the enemies of fruit quality. Leaves should be pulled from around the fruit zone to expose clusters to light and air. This will help to dry off the clusters and prevent disease. Refer to the *New York and Pennsylvania Pest Management Guidelines for Grapes* for up-to-date information on controlling pests and diseases. It is revised annually and is available at your county extension office.

Other important control practices include:

- Planting varieties and rootstocks resistant to root louse (phylloxera).
- Pruning to keep vines under control and well balanced.
- Pruning off and disposing of all dead, diseased, and broken parts.
- Raking the soil clean under the vine and removing old and shriveled fruit from the vine before spring growth starts.
- Scouting. Identify insects and diseases accurately and treat with the least toxic option.
- Spraying when necessary. If you miss a critical spray, you may lose your crop for the year.

At harvest, birds, bees, deer, and other animals may try to harvest your grapes before you do. Netting will help control the bird feeding. A fence may be necessary to prevent deer browsing.

Harvest ripe and clean grapes for the table or wine. Grapes for wine are usually picked according to their “brix” level, which is a measure of the soluble solids. In the case of grapes, this is mostly sugar. You can use a refractometer or hydrometer to make these measurements. For winemaking, grapes are usually between 18 and 22 percent brix at harvest, depending on the variety and style of wine you are making. A good winemaking guide will give you information about determining maturity for optimal quality. Table grapes are ready when they taste good!

This is a simple and general guide to backyard grape growing. Additional information is available on the Internet and in published form. You can find books on winemaking and grape growing at most bookstores and libraries. A highly recommended guide to home grape growing and winemaking is *Backyard Vintner* by Jim Law (Beverly, Mass.: Quarry Books, 2005). Cooperative extension has a list of information resources that will guide you to materials that will enhance your knowledge about growing grapes.

**Good luck have fun!**
For more information on growing grapes in Pennsylvania, visit extension.psu.edu/enology.

Prepared by Barbara Goulart and Mark Chien.