

# Production of Woody Plants as Cut Flowers

## Introduction

Woody cut flowers have a strong potential for sales at local farm markets and wholesale markets. Currently a number of mid-Atlantic growers cannot meet the demand for cut woody stems. Growing woody plants is a long-term commitment. Many species will need to grow for two or more years before saleable stems can be harvested. Be sure to assess your local markets for demand and pricing before growing any crop.

We have developed this fact sheet based on our experience with different plant species and the experiences of Maryland growers to help you get started in woody cut flower production. Thanks to each of the contributing cut flower growers for their comments on growing and harvesting techniques.

## Obtaining Plant Material

The Internet has made it easy to search for suppliers of woody plants. Suppliers that sell plants for nursery production carry many of the varieties needed for a woody cut flower operation. To keep costs down, bare root or small potted plants are purchased for transplanting. Small plants placed out in the nursery row can easily be overrun by weeds; consider growing them in pots for a year until they increase in size.

## Site Selection

Before beginning cultivation, choose a site that is best suited to the plants you have selected based on its soil type, drainage, and exposure. Most woody cuts need to be planted in full sun locations. Certain species, hydrangeas (*Hydrangea* spp.) for example, will benefit from being grown in partial shade. Some woody cuts such as winterberry (*Ilex verticillata*), pussy willow (*Salix* spp.), and dogwoods such as *Cornus stolonifera* (grown for their bright colored stems), perform best in wet areas, but all will grow in drier upland areas as well. Others, such as lilac (*Syringa* spp.) and cherry (*Prunus* spp.) will perform best in well-drained sites. Be sure the species you select are hardy in your zone (generally Zone 6 for central Maryland). You may be able to grow some plants on the Eastern Shore or in southern Maryland that you would not be able to grow in western Maryland where the winters are significantly colder.

## Soil Fertility and pH

Establishing woody cut flower beds is a long-term investment. First, send soil samples to a commercial testing lab. You will need to adjust the pH to 6.0–6.5 for most woody plants and bring the phosphorus and potassium up to optimum levels before the plants are installed. In clay loam soils it is difficult to adjust pH or correct low

phosphorus levels once the plants are established and growing.

## Basic Tools Needed

There is a minimal amount of equipment needed to produce woody plants for cut stems. You will need equipment to plow and rototill the soil in preparation for planting. You can transplant by hand, or use a transplanter hooked to a tractor for larger areas. Some growers use an auger attached to a tractor to create holes for transplanting.

Pruners are needed for harvesting and gas-powered trimmers are very useful for pruning back a crop after cutting. A mower is needed for maintaining grass strips between production rows. A cooler, or at least a cool barn or garage, is necessary for storing cut stems if they will not be sold the next day. Trickle irrigation is important for getting plants started in the field and maintaining plant vigor, especially during periods of drought.

## Weed Control

It is well worth the time and effort to control all invasive weeds, especially woody weeds, such as multiflora rose (*Rosa multiflora*) and

## Pre-Emergent Herbicides

Trade Name	Common Name
Barricade	Prodiamine
Broadstar/SureGuard	Flumioxazin
Casoron, Barrier	Dichlobenil
Devrinol	Napropamide
Dimension	Dithiopyr
Goal 2XL	Oxyfluorfen
Kansel+	Oxadiazon + pendimethalin
OH2	Oxyfluorfen + pendimethalin
Pendulum, Corral	Pendimethalin
Pennant Magnum	s-metholachor
Princep	Simazine
Ronstar	Oxadiazon
Rout	Oxyfluorfen + oryzalin
Surflan	Oryzalin

Japanese bittersweet (*Celastrus orbiculatus*), before installing your plants. This may require at least a season eliminating perennial weeds before planting a crop.

Most woody cut flower operations maintain grass strips between their production rows. An alternative method would be to plant two to three rows of cuts with a grass strip on either side of the planting bed and maintain a bare area between plants. The grass strips help to prevent dust and erosion. Also, stems that touch the ground will stay clean and remain marketable when it rains. The bare area around the plants prevents competition from weeds for water and nutrients.

Weed competition is a fact of life that growers have to contend with, especially when trying to get plants established. One method of nonchemical control that works well for some woody plant species is to lay weed barrier cloth on the prepared ground and cut small holes for planting. However, for plants that are susceptible to vole injury weed barrier provides harborage for populations that can injure the roots and crowns of the plants. We have used weed barrier cloth with hydrangeas, cherries, willows, flowering quince (*Chaenomeles speciosa*), forsythia (*Forsythia* spp.), seven son plants (*Heptacodium miconioides*), and bayberry (*Myrica pensylvanica*). For suckering plants,

## Post-Emergent Herbicides

Trade Name	Common Name
Acclaim Extra	Fenoxaprop
Asulox	Sodium Salt of Asulam
Basagran T/O	Bentazon
Casoron, Barrier	Dichlobenil
Envoy, Envoy Plus	Clethodim
Finale	Glufosinate-ammonium
Fusilade II, Ornamec	Fluazifop-P-butyl
Goal 2XL	Oxyfluorfen
Gramoxone Max	Paraquat
Kerb	Pronamide
Lontrel	Clopyralid
Sedgehammer	Halosulfuron
Glyphosate	Glyphosate
Vantage	Sethoxydim

such as winterberry, weed barrier cloth may not be a good choice.

Another method of weed control is the application of organic mulches. Mulch has to be re-applied on an annual basis, but this also increases the organic matter content of the soil. Despite the labor required, mulching is an important method of weed control. Another option is cultivating around the plants several times during the growing season.

Some growers are experimenting with fall plantings of forage radish (*Raphanus sativus*) at a rate of 1/3 lb per 1,000 ft<sup>2</sup>. Forage radish germinates quickly and reduces herbaceous weed populations through competition. The forage radish grows throughout the fall and then dies down in the winter, leaving a mat of organic material that suppresses early spring weed growth.

Pre-emergent and post-emergent herbicides can be used around many woody plants. The charts below list products that can be used for woody ornamentals. Some have specific restrictions for weed species to be controlled. See labels for rates and restrictions. 2,4D is not a product that can be used for woody ornamentals.

## Woody Plants That Can be Sold as Cut Stems

### *Caryopteris x clandonensis* (Bluebeard/Blue Mist Spirea)

*X clandonensis* hybrids produce 18–30 inches of growth each year. *Caryopteris* can be cut to the ground in winter when dormant. This species is harvested when flowers open in late summer and through the fall. Some cultivars may suffer from winter damage in very cold winters. This plant does not tolerate wet soils, especially in the winter. Plant in a well-drained, full sun location.

#### Outstanding Cultivars

‘Arthur Simmonds’—light blue flowers, hardier than other cultivars

‘Azure’

‘Blue Mist’—2–3 feet

‘Dark Knight’—deep blue-purple flowers and dark colored foliage

‘First Choice’—dark purple flowers

‘Grand Bleu’—upright growth habit and deep blue flowers

‘Heavenly Blue’—dark blue flowers

‘Kew Blue’—dark blue flowers

‘Longwood Blue’—up to 4 feet tall, violet-blue flowers

‘Sunshine Blue’—bright yellow foliage with blue flowers

‘Worcester Gold’—light lavender-blue flowers, golden foliage

### *Chaenomeles speciosa* (Flowering Quince)

The demand for this crop is high, but flowering quince is difficult to grow and harvest because of the thorny stems. Some cultivars have fewer spines, making it easier to pick and for the customer to handle. Flowering quince prefers a pH level between 6.0–6.4. Flowers are borne on old wood and appear before the plant leafs out in the spring. If killed by cold in winter, it can still produce new buds for cutting in April. Harvest the stems when the plant is dormant and force the blooms for early spring sales. Stems are sold with 2/3 of the flowers open. Stems are as long as 60 inches, but it is often difficult to get such long stems that are not also heavily branched.

#### Outstanding cultivars

‘Toyo Nishiki’—white, pink and red flowers on the same branch

‘Cameo’—double flowering variety with apricot and pink blooms, nearly thornless

*C. x superba*—‘Crimson and Gold’—red flowers with gold stamens

### *Cornus* (Red Twig Dogwood)

Several species of *Cornus* have outstanding stem colors varying from red to yellow to gold. Species that have colored stems suitable for cut woody stems include: *C. stolonifera*, *C. sanguinea*, *C. alba*, and *C. alternifolia*. The stems start to develop color in the late fall and the color tends to intensify as the weather gets colder in the winter.

## ***Cornus alba***

Outstanding cultivars

'Argenteo-marginata'—blood red stems, harvest in December-March, prefers moist areas

'Cream Cracker'—purplish-red stems in winter

## ***Cornus sanguinea***

Outstanding cultivars

'Arctic Sun'—yellow stems tipped with blood red color

'Winter Flame'—bright stems of yellow, red, and orange

## ***Cornus sericea* (Red Osier Dogwood)**

*Cornus sericea* is a multi-stemmed stoloniferous shrub native to North America that is grown for its red stems that develop color in late summer and darken in winter. The stems return to green in early spring. *Cornus sericea* is a vigorous plant hardy in zones 2–8. It is adaptable to a variety of soil conditions, but prefers moist locations. The red color of the stems intensifies after the first frost, so wait for the colder weather before harvesting. Cut stems when dormant in fall or winter and store them dry.

Outstanding cultivars

'Baileyi'—bright red twigs in winter. The color occurs more on younger stems, so regular cutting for production works well with this plant. Unlike the species, this cultivar is not stoloniferous.

## ***Cornus stolonifera***

Outstanding cultivars

'Cardinal'—starts with coral red color in early winter changing to bright cherry red

'Bud's Yellow'—bright yellow stems

## ***Cotinus coggygria* (Smokebush or Smoketree)**

Smokebush is grown for its attractive foliage, which varies from bluish green to dark purple depending on the cultivar. Cut plants back to

1 foot annually to achieve a multi-branching habit for more stems. This is especially important for good foliage color on the purple-leaf types. Some growers harvest the flowers and use the 6-8 inch long panicles in unusual displays. The inflorescences persist from June through August or September (not as long in warmer zones 7 and 8). The flowers themselves are insignificant—the ornamental value comes from the pubescence on the 6–8 inch long panicles. This native plant thrives in dry, full sun locations. Plants tolerate a wide range of soil types including dry, rocky soils. Mature height of the original species is 10–15 feet. Some deer resistance is reported.

Outstanding cultivars

'Young Lady'—bluish green foliage and smoky pink inflorescences

'Velvet Cloak' and 'Royal Purple'—dark purple foliage, reddish-purple inflorescences

## ***Forsythia x intermedia***

*Forsythia* is a common cut woody that is easy to grow and force into bloom out of season. Select cultivars with large blooms for more showy displays. Some of the cultivars have attractive foliage that can be marketed during the spring, summer, and fall months.

Outstanding cultivars

'Citrus Swizzle'—yellow flowers and burgundy foliage that can be cut after flowering

'Lynwood'—more open flowers that are better distributed along the stem

## ***Forsythia viridissima korena***

Outstanding cultivars

'Kumson'—nice display of yellow flowers, dark green variegated foliage has an attractive network of silver veins

## ***Heptacodium miconioides* (Seven-son Flower)**

*Heptacodium* is an interesting woody plant from China. It has small, fragrant white flowers in mid-August to September. The flowers are in clusters of seven, giving it the name Seven-son. However, the real ornamental value comes in mid-September

after it has finished blooming when the flower-like sepals enclosing the fruit capsules turn an attractive rosy-purple color. These sepals will persist for 2–3 more weeks into October (until frost). The plants' sepals are attractive and sell well in markets looking for unusual flower displays. Handle stems carefully as the sepals tend to shatter easily. Local growers transporting in buckets have an advantage because the fragile sepals would be easily crushed in boxes during shipping.

The plant can be grown as a large shrub or trained as a tree; mature height is 15–20 feet. Most growers cut the stems down to 3–4 feet annually to achieve a multi-branching habit for more cut stems. Seven-son does best in full sun, but can handle some partial shade. It will tolerate a wide range of soil types including poorly drained clay, but prefers moist, well-drained locations. *Heptacodium* is sometimes called the crepe myrtle of the North because it has exfoliating grayish-brown bark similar to a crepe myrtle and is hardy in zones 5–8.

### ***Hydrangea arborescens* (Smooth Hydrangea)**

*Hydrangea arborescens* blooms on the current season's wood. The blooms are harvested in the spring. *H. arborescens* grows in zones 4 to 9 and prefers a dry to moist location. The plants will benefit if watered with trickle irrigation during periods of drought.

#### **Outstanding cultivars**

'White Dome'—has strong stems that hold the large flowers upright

'Annabelle'—pure white flowers up to 1 foot across, earliest bloomer in Maryland (June) They are often cut in the immature green stage or after the flowers have gone from white back to green again. The blooms can burn in full sun, so plant it in a location where it will get at least a half day of shade.

### ***Hydrangea macrophylla* (Bigleaf Hydrangea)**

*H. macrophylla* should be planted in an area that receives afternoon shade. Grow this plant at low pH (less than 5.5) for blue flowers.

Use aluminum sulfate to lower the pH. The lower pH and aluminum help develop the blue flower color. A pH that is no lower than 6.0 is maintained for pink flowers. When harvesting in the field, place the cut flowers in water with solution. Then hold them in cold storage overnight to harden off.

#### **Outstanding cultivars**

'Endless Summer'—blue blooms start in early summer and continue until fall. This plant blooms on old and new wood. 'Endless Summer' performs best in partial shade to avoid scorching of leaves and sepals. It can have some blue and pink color on the same flower—a desired combination by many growers.

'Nikko Blue'—small blue flowers

### ***Hydrangea paniculata* (Hardy Hydrangea)**

*H. paniculata* is a fast-growing and productive woody plant that is excellent as a cut flower stem during the summer and early fall. Hardy hydrangeas need moisture—a trickle irrigation system is a worthwhile investment when growing this plant species. *H. paniculata* is tolerant of a wide range of soil pH. Some growers cut the plants back to 3–4 feet before it leafs out and then let it grow 1–1.5 feet of green growth (mid-May to June 1). Before flower initiation, growers cut it again leaving 1/3 of new growth on the plant. By cutting back only part of the plants, growers can get two crops with stems between 50–70 cm. *H. paniculata* flowers through to the first frost. If flowers are harvested too early when they are still green, they tend to wilt more readily. The flower heads and stems curve, especially when on their sides.

#### **Outstanding cultivars**

'Pink Diamond'—color is more temperature dependent and not based on pH

'Unique'—flowers early

'Limelight'—one of the leading white cultivars grown in Maryland, very productive

'Quick Fire'—best of the pink-red flowering hydrangeas, blooms early in May and June

'Tardiva'—flowers late in the season

'PeeGee'—vigorous cultivar, does not have conical flower heads

### ***Ilex verticillata*** (Winterberry holly)

Winterberry prefers moist to wet soils with a high organic content. This native holly is hardy in zones 3–9 and is usually found growing near streams and in swampy areas. Winterberry requires an acidic soil and can become chlorotic in alkaline soils. It does not perform well in rocky or dry soils. The growth is influenced by the availability of water and can be slow to moderate growth rate when first planted. Growers may want to start out with larger plants. Plants have a mature height of 6–10 feet. The fruit set is best in full sun locations, but they can handle some light shade.

The fruit is a bright red berry-like drupe that ripens in fall and persists through February. Marketable stems can be cut in late November after cool weather causes coloration of the berries. This deciduous holly is harvested after frost when the foliage has turned brown and dropped. Growers start selling the yellow-berried varieties the week before Thanksgiving, and the reds the week after Thanksgiving. Most growers plant more reds, since there is a shorter marketing window for the gold berries. Because there is an earlier demand for 'Winter Gold', you may have to sell it with up to 50 percent of the leaves still on—especially in years where there is a late frost. Berries harvested in full color persist very well in floral arrangements during the winter months. Local growers who transport stems in buckets have an advantage because the berries are easily knocked off in boxes during shipping.

Winterberries are dioecious plants, some have male flowers and some have female flowers. Both male and female plants are required for good fruit set, but only the females will produce fruit. There is no magic ratio of male to female plants, but one recommendation is to plant 1 male pollinator for every 20–30 female plants. Male pollinators are divided into northern and southern geographic groups. The northern group will bloom 2–3 weeks later than the southern group, so be sure to plant a compatible pollinator. Many growers will plant three different male

cultivars to insure good pollination of several female cultivars that bloom over the season.

### Outstanding male pollinators

*Ilex verticillata* 'Jim Dandy'—compact, early bloomer

*Ilex serrata* x *I. verticillata* 'Apollo'—late blooming hybrid

*Ilex verticillata* 'Southern Gentleman'—very late blooming

### Outstanding female cultivars

Berry Heavy™ (*Ilex verticillata* 'Spravy')—large, bright-red berries, heavy fruiting; use 'Jim Dandy' as the pollinator

Berry Nice™ (*Ilex verticillata* 'Spriber')—dark red berries; use 'Jim Dandy' as the pollinator  
'Maryland Beauty'—large fruit, colors early, heavy fruiting; use 'Jim Dandy' or 'Apollo' as pollinator

'Oosterwijk'—large, bright-red berries are very persistent; use 'Southern Gentleman' or 'Jim Dandy' as pollinator

Winter Red®—brilliant red berries, heavy fruiting, long persistence; use 'Southern Gentleman' as the pollinator

'Winter Gold'—pinkish orange fruit; use 'Southern Gentleman' as the pollinator

### ***Ilex serrata* x *I. Verticillata*** Hybrids

The growth of these hybrids is more vigorous than *Ilex verticillata*, and the fruit will ripen earlier. However, the fruit is slightly smaller and usually less persistent than that of *Ilex verticillata*. The berries of some hybrids may also bleach in the sun on the southwestern facing side.

### Outstanding cultivars

'Sparkleberry'—heavy fruiting, long persistence; use 'Apollo' or 'Southern Gentleman' as the pollinator

### ***Myrica pensylvanica*** (Northern Bayberry)

This coastal plant is hardy in zones 3–6 and can handle dry, salty locations. Bayberries are tough plants that adapt well to poor soil types, including sterile sandy soils.

However, they prefer acidic soils and can become chlorotic under alkaline conditions. Bayberry is a fast-growing shrub with a mature height of 5–12 feet. It performs best when grown in full sun to partial shade. The leathery, aromatic foliage is deciduous to semi-evergreen. The fruit is small and round with a waxy coating that gives it a silvery gray appearance. The wax is used to make bayberry candles and soaps. The fruit ripens in early fall and persists throughout the winter. Harvest in September and hang to dry. Sell from Thanksgiving until Christmas after the leaves have dropped. Bayberries are dioecious plants, some have male flowers and some have female flowers. Both male and female plants are required for good fruit set, but only the females will produce fruit. It is recommended that you plant 20 percent males.

#### Outstanding cultivars

‘Morton’—female

‘Myda’—female

‘Myriman’—male

#### *Nandina domestica* (Heavenly Bamboo)

*Nandina* prefers moist fertile soil, but it is adaptable to a range of growing conditions. It can be grown in full sun but will perform best in partial shade locations. The flowers are attractive, but not generally used as a cut stem. The berries color up in fall and this is when the stems are harvested. There are both red-berried and yellow-berried cultivars available.

#### *Physocarpus opulifolius* (Ninebark)

*Physocarpus opulifolius* has white or pinkish flowers that are 3 inches across. It is grown for both its flowers and its deep burgundy foliage. The foliage of purple or bronze colored cultivars makes a good filler and holds well in the vase. Plant ninebark in full sun to partial shade. It prefers well-drained soils, and can tolerate drought conditions and a wide range of soil pH. The flowers tend to shatter easily. Often the stems are cut for the seed capsules that hold a very long time and are very attractive.

#### Outstanding cultivars

‘Diablo’—has purple foliage with pink-white flowers in mid-summer

‘Coppertinia’—foliage starts out copper color and matures to a dark red by mid-summer

#### *Prunus* spp. (Cherry, Almond, and Apricot)

Plant in a full sun location. You can force these 4–6 weeks before their natural bloom time for season-extending sales. Cut the branches in late winter when it is above freezing and after they have met their dormancy requirements (usually by February). Harvest stems with numerous buds that are slightly swollen. Place them in buckets of warm (110°F) water with preservative. At that point you have several options. You can hold them at 35°F and slowly force at 50°F, or you can force them faster by starting out at 50°F and moving up to 75°F a couple of weeks later.

#### *Prunus* ‘Hally Jolivette’ (Cherry)

The double, pinkish-white flowers open over a 2–3 week period in April–May. Can reach a mature height of 15–20 feet. Pruning the plants back to 6–10 feet makes harvesting much more efficient. Hardy in zones 5–7.

#### *Prunus glandulosa* (Dwarf Flowering Almond)

The flowers may be pink or white and both single and double forms are available. Harvest when the buds have swollen and there are 1 or 2 flowers open. At this stage they can be held for 2–3 weeks if stored at 33–40°F. When they are moved into a vase the other blooms will open. In most years there is a two-week window when these can be harvested before the peony season begins. Hardy in zones 4–8. Grow to 3–5 feet tall.

#### Outstanding cultivars

‘Rosea Plena’—double pink flowers. Blooms in late April or early May.

## ***Prunus mume*** (Japanese Apricot)

This species has a long blooming period that can start as early as January. The single or double flowers have a spicy fragrance and can be white through pink or red. Blooms on the previous year's wood, so be careful when pruning not to remove all of the flower buds. After flowering cut half of the long shoots back by one-half to two-thirds. Reaches a mature height of 20 feet. Hardy to zone 6. Prefers well-drained soils.

### Outstanding cultivars

'Peggy Clarke'—blooms very early, frost sensitive

## ***Salix* spp.** (Pussy Willow)

Several willow species are suitable for use as cut woody stems. The flowers (catkins) provide a beautiful display for use in arrangements. Willows will perform best if grown in a moist or wet area on your farm, but can grow in drier upland areas as well. Most stems can be harvested in winter and stored at freezing temperatures and then forced into bloom by bring them to room temperature.

## ***Salix alba*** (White Willow)

### Outstanding cultivars

*Salix caprea* (French Pussy Willow)

Has silver-pink catkins. Cut back to less than 1 foot from the ground after harvest to keep vigorous thin stems in production.

## ***Salix chaenomeloides*** (Giant Pussy Willow)

Has large attractive flowers with a pink to rosy color. Flowers can be the size of a small rabbit's foot.

## ***Salix* spp.** (grown for stems)

Many willows are grown for their colored or twisting stems. They are harvested in late fall and winter, after leaves drop and stem color has intensified.

## ***Salix alba*** (White Willow)

### Outstanding cultivars

'Britzensis'—has fiery orange-red stems. The strong color only occurs on new growth. Very fast growing.

## ***Salix matsudana***—tends to be more drought tolerant than other willows.

### Outstanding cultivars

'Tortuosa' is a female clone. The vigorous shoots on the plant tend to be more contorted.

## ***Salix sachalinensis*** (Japanese Fantail Willow)

Has fasciated, distorted branches that are very appealing in floral arrangements. Many stems will not be contorted.

### Outstanding cultivars

'Sekka'—male clone with twisted branches

## ***Salix x scaruczam*** (Scarlet Stem Hybrid Willow)

### Outstanding cultivars

'Scarlet Curls'—vigorous plant with scarlet stems. Color most intense after the first frost.

## ***Syringa* spp.** (Lilac)

Lilacs should be grown in well-drained, full sun locations. They are adaptable to different pHs, but will do best in slightly acidic soils with some organic matter added. Hardy in zones 3–7. The flowers of many species are very fragrant. The buds on early flowering cultivars can be damaged by frost injury in the early spring. It usually takes at least three years to produce a marketable crop, so you may want to start out with larger plants. The blooms occur on the previous year's growth, so be sure to prune after flowering. Many lilac species have purple or lavender colored flowers, but in some locations there is a high market demand for white while in other markets there is a strong market for dark purple colors. The major disease problem with lilacs is powdery mildew—try to select cultivars that are less susceptible. A good

fragrant white hybrid that shows resistance to powdery mildew is 'Mt. Baker'.

### ***Syringa x chinensis* (Chinese Lilac)**

This is a hybrid between Persian lilac (*S. x persika*) and common lilac (*S. vulgaris*). The flowering is more profuse than that of *S. vulgaris*. Has fragrant, purple flowers in mid-May on 4–6 inch long panicles. Grows to 8–15 feet.

### ***Syringa x hycinthiflora***

Has pure white flowers that are very fragrant. Is resistant to powdery mildew.

### ***Syringa reticulate* (Japanese Tree Lilac)**

Has creamy white flowers with a fragrance similar to privet in early to mid-June on 6–12 inch long terminal panicles. Mature height of 20–30 feet. Hardy in zones 3–7.

#### **Outstanding Cultivars**

'Ivory Silk'—flowers at a young age, heavy flowering

'Lilac Sunday'—pale purple flowers are very fragrant

### ***Syringa vulgaris* (Common Lilac)**

Blooms in early to mid-May on 4–8 inch long terminal panicles. Grows to 8–15 feet. Hardy in zones 3–7, but growth can be weak in warmer parts of zone 7. Lilac-colored blooms are the most fragrant of the species (flowers start to lose fragrance with hybridization). Unfortunately, common lilac is highly susceptible to powdery mildew and lilac borers.

### ***Tamarix ramosissima* (Tamarisk)**

This coastal plant can handle dry, salty locations. It is a tough plant that adapts well to poor soil types, including sterile sandy soils. The root system is shallow, so use caution when planting. Tamarix is grown for both its flowers and its foliage texture. Has rosy-pink flowers in June–July that have been described as resembling an ostrich plume. The scale-like foliage is similar to a juniper, but is

soft and feathery. Has a fast growth rate, and a mature height of 10–15 feet. Plant in a full sun location. Hardy to zone 2. Flowers on new growth—cut back to the ground in late winter and allow the new shoots to grow up each year. Note: Asiatic species have become invasive in the West where they replace the native vegetation.

#### **Outstanding cultivars**

'Pink Cascade'—vigorous growth, deep pink flowers

'Rubra'—pink to rose-colored flowers

'Summer Glory'—starts blooming in spring and continues into summer

### ***Viburnum* spp.**

Plant in full sun to partial shade locations. They can tolerate very cold winter temperatures and windy conditions. Most viburnums have a slow growth rate, so may want to start out with larger plants. Cut back to 1 foot in the fall.

### ***Viburnum x carlcephalum* (Fragrant Viburnum)**

Cross between Koreanspice viburnum (*V. carlesii*) and Chinese snowball viburnum (*V. macrocephalum*). The fragrant flowers are 5–6 inches across. They start out pink and then turn white. Blooms in late-April to early-May—this is the latest of the semi-snowball types to bloom. Grows 6–10 feet tall. Sensitive to frost; hardy in zones 5–8. Has attractive burgundy fall color.

### ***Viburnum opulus* (European Cranberrybush Viburnum)**

Grows 8–12 feet tall. Very cold-hardy plant, grows in zones 3–8. It has a multi-stemmed, spreading growth habit. Grows white flowers in May–June. The flat-topped cymes are 2–3 inches across. There are two distinct markets for these flowers. They can be sold either at the "small green ball" stage in May or as the white snowball flowers in May–June. Stem lengths may be on the shorter side, but there are multiple flowers on a stem.

	<b>Exposure</b>	<b>Irrigation</b>	<b>Soils</b>	<b>Pruning</b>	<b>Harvest</b>
Abeliophyllum distichum	Full sun to part shade		Needs well-drained soil	Renewal pruning is done every 3–4 years	Cut when dormant
Caryopteris x clandonensis	Full sun		Needs well-drained soil; does not tolerate wet soils	Cut back to ground in early spring as temperatures start to increase; plants bloom on new growth	Cut stems when blooms appear
Chaenomeles	Full sun to part shade		pH 6.0–6.4		Cut when dormant and force blooms for early sales; sell when 2/3 of flowers are open
Cornus sericea	Sun to partial shade		Prefers moist soils, but will tolerate dry soils	Cut when dormant in fall or winter and store dry	Cut stems in winter months
Cornus sanguinea	Sun to partial shade		Prefers moist areas, but is adaptable to a variety of soil conditions		Cut stems in winter months
Cotinus coggygria	Full sun	Drought tolerant	Adaptable to a wide range	Cut to 1 ft in winter	June–September
Forsythia x intermedia	Full sun to part shade, but more flowers in sun		Average, well-drained soils	Blooms on previous season's wood	Cut when in tight bud
Heptacodium miconioides	Full sun to partial shade	Drought tolerant	Acidic soils with a high organic content	Cut to 3–4 ft in winter	September–November
Hydrangea arborescens		Needs irrigation during drought periods	Tolerates dry to moist conditions		Cut stems when flowers appear
Hydrangea macrophylla	Full sun to part shade		pH 5.5 or below for blue flowers; pH 6.0 or above for pink blooms		Cut stems when flowers appear
Hydrangea paniculata		Prefers moist soils: tolerates a range of pH levels		Hold in water with solution in the field when cutting and put in cold storage to harden off overnight	
Ilex verticillata	Full sun/partial shade. Note the best flowering and berry production is on plants grown in full sun.	Not drought tolerant. Prefers moist to wet soils	Acidic soils with high organic content	Cut to 1 ft in winter	Cut stems from November through February
Nandina domestica	Full sun to part shade (better foliage in full sun)		Average, well-drained soil; tolerates drought conditions		Cut stems in winter months

	Exposure	Irrigation	Soils	Pruning	Harvest
<i>Myrica pensylvanica</i>	Full sun/partial shade	Extremely drought tolerant	Acidic soils, salty soils, poor or sterile sandy soils	Prune in early spring	Harvest in September
<i>Physocarpus opulifolius</i>	Full sun to part shade		Average, well-drained soil; tolerates drought conditions	Note that several growers have found that green leaf varieties do not sell well	Cut from spring through fall
<i>Prunus</i> spp.	Full sun	Not drought tolerant	Adaptable to a wide range of soils	Prune after flowering. Cherry: 10 ft, Almond: 1 ft	April–May
<i>Salix</i> spp.	Sun to part shade		Prefers wet soils		
<i>Syringa</i> spp.	Full sun	Drought tolerant	Slightly acidic soils—close to neutral with some organic matter	Prune after flowering	May–June
<i>Tamarix ramosissima</i>	Full sun	Extremely drought tolerant	Acidic soils, salty soils, poor or sterile sandy soils	Cut back to the ground	June–July
<i>Viburnum</i> spp.	Full sun/partial shade	Drought tolerant	Adaptable to a wide range	Pruning varies with cultivar. See notes under viburnum section	April–June
<i>Weigela florida</i>	Full sun	Drought tolerant	Adaptable to a wide range	For flowers: prune in early summer after flowering For foliage: cut down to the ground	For flowers: harvest in May–June For foliage: season-long harvesting

proper chemical choices. Proper timing and thorough coverage are essential for successful disease control. Avoid continuous use of the same fungicide (or even the same class of fungicides) for a disease problem, as fungi can develop resistance to certain chemical classes. ALWAYS use fungicides in accordance with label instructions.

## Diseases Caused by Fungi

### Leaf Diseases

Several fungi can cause leaf spots, blotches, or blights on woody plants. These diseases usually affect only one or a few host plant species. Symptoms include small brown (necrotic) spots, which may coalesce to form larger blotches. Leaf spots due to fungi usually occur in random (scattered) patterns on leaves, and tend to progress from lower

leaves upward in the canopy. Leaf spot diseases can be greatly reduced by minimizing leaf wetness periods (avoid overhead irrigation and space plants adequately to encourage air flow around leaves). In most instances, leaf spot diseases have little impact on overall plant health, and may not warrant control measures at all if the plant is not harvested for its foliage. Protectant fungicides effective against fungal leaf spot diseases include thiophanate methyl, chlorothalonil, mancozeb, myclobutanil, propiconazole, triadimefon, and the strobilurins. Refer to product label for specific hosts and fungal diseases controlled by each product.

Powdery mildews are a specialized group of fungal leaf pathogens that can become severe on certain woody plants, such as certain lilac species. These fungi colonize the outer surfaces of leaf and stem tissue, producing a powdery white or gray mold visible to the

## Outstanding cultivars

'Roseum'—European snowball or Guelder-rose. Has showy sterile flowers in mid-May that are 2 ½–3 inches across. The flowers can get a rusted appearance by frost at the green ball stage, but will grow out of it and appear undamaged by the time they reach the snowball stage.

### ***Viburnum x juddii* (Judd Viburnum)**

Cross between *V. carlesii* and *V. bitchiuense*. This plant has very fragrant semi-snowball type flowers in April that are 2 ½–3 ¼ inches across. The blooms will start out pink and then turn to white. Harvest when there is only one flower open. Grows to 6–8 feet. Hardy in zones 4–8.

### ***Weigela florida***

Has 1–2 inch long pink funnel-shaped flowers in May–June. Blooms on the previous year's growth—prune after flowering. When it is being grown only for the foliage, you can cut it all the way back to the ground. Plant in full sun locations. Adaptable to different soil types, but prefers well-drained sites. Mature height of 6–9 feet. Hardy in zones 5–8.

## Outstanding cultivars

'Variegata'—grows 4–6 feet ('Variegata Nana' is the 3-foot dwarf variegated variety). Has deep rose-colored flowers and creamy white edges on the leaves.

Wine and Roses® (*Weigela florida* 'Alexandra')—grows 4–5 feet tall. Has dark purple foliage and hot pink flowers.

## **Diseases of Cut Woody Plants**

Plant diseases caused by fungi, bacteria, and viruses are usually of minor importance in woody plant production. However, there are times when environmental conditions favor rapid disease spread, and there are some plant species that are prone to infectious disease problems. It is always a good idea to regularly scout your plantings for early symptoms of plant disease, so that you can take action before the problem becomes severe.

## **General Disease Management Tactics**

1. **Grow Healthy Plants.** Start with healthy plants—inspect all new nursery stock and do not choose plants showing any disease symptoms. It is always easier to avoid disease problems than to control them once the disease becomes established. Look for cultivars that have resistance to common diseases. Use proper cultural practices to keep plants healthy—healthy plants are able to resist many infectious diseases better than plants with poor vigor.
2. **Water Management.** Fungal and bacterial pathogens can be spread from plant to plant through splashing water, and require wet plant surfaces for infection to occur. Cultural practices that reduce leaf wetness periods will help slow the spread of disease. Avoid overhead irrigation; drip irrigation keeps leaf wetness to a minimum. If overhead irrigation is your only option, apply irrigation in the morning so that foliage can dry out during the day. Make sure plants are not crowded, so that air circulation around the leaves and branches helps to reduce leaf moisture. Some root rot diseases are favored by saturated soils, so improve drainage in wet spots, or avoid planting in poorly drained areas.
3. **Sanitation.** Remove and dispose of dead or infected twigs and branches as soon as symptoms are noticed. Clean pruning tools with alcohol or household disinfectant to avoid spreading stem diseases when pruning. Rake and destroy fallen leaves before they turn dry and crumble to reduce the source of leaf disease infection the following spring.
4. **Chemical Applications.** In some instances, fungicide applications may be necessary to manage common diseases on highly susceptible plants. Most fungicides are protectants and only a few have limited curative properties, so they must be applied before the disease becomes severe. It is critical to know what disease you are targeting with a chemical application—many products are effective against a select group of fungal pathogens, and [AU: "but"?] bacterial diseases will not be controlled by most fungicide products. Contact your University Extension Office or diagnostic laboratory to obtain a diagnosis of any plant disease to ensure

unaided eye. Powdery mildews usually occur in late summer, and therefore have little impact on overall plant health. Spring or early summer infections can occur, and these may warrant chemical control as they have a more significant effect on plant health. Effective fungicides for controlling powdery mildew diseases include thiophanate-methyl, triadimefon, and myclobutanil.

Botrytis blight, caused by *Botrytis cinerea*, can develop on any senescent, aging plant tissue. Flowers, leaves and stems are commonly infected, particularly during wet, cloudy weather. The fungus has a very large host range, and also colonizes plant debris on the soil surface. Symptoms range from small spots to leaf or flower blight and stem cankers. Sanitation (removal of spent flowers and dead foliage), and practices to increase air circulation (increased plant spacing and pruning to allow greater air flow around foliage) will help reduce Botrytis infection. If these steps do not provide adequate disease control, foliar application of fungicides such as chlorothalonil, thiophanate-methyl, iprodione, copper sulfate pentahydrate, potassium bicarbonate, or mancozeb, according to label instructions, will help protect uninfected plant tissue. Note that Botrytis blight can also occur on flowers, such as hydrangea, after harvest and if severe, preharvest sprays may be needed to protect flowers. However, generally postharvest Botrytis can be avoided by keeping the flower tissue dry during harvest, processing, sorting, storage, and shipping. If you need to harvest stems while it is rainy, you may want to allow the flowers of sensitive species to dry before storing and transporting.

## Stem Diseases

Numerous fungi can cause stem cankers on a variety of woody plants. A canker is a dead area on a stem—cankers caused by fungi may be sunken, cracked or swollen, and will have discrete margins at the junction of healthy and diseased stem tissue. Canker fungi are often weak pathogens, infecting plants under stress from adverse environmental or site conditions. Botryosphaeria species are among the most common canker pathogens, affecting dogwood, viburnum, flowering

quince, and smoketree. Canker fungi can infect plants through wounds, such as pruning stubs, injury from string weed trimmers, or insect damage. Management of fungal canker diseases involves maintaining the vigor of plants through proper cultural practices, and removal of cankered branches or stems as soon as symptoms are observed. At present, fungicides have not been shown to effectively control canker diseases on woody plants.

Black knot, caused by the fungus *Apiosporina morbosa*, is a common stem disease of cherry and plum. The pathogen causes elongate, black gall-like swellings on twigs and branches, resulting in significant twig dieback. Prune out diseased twigs when symptoms are first noticed.

## Vascular Diseases

Some fungal pathogens invade the water-conducting tissue of plants, resulting in wilt and eventual death of infected hosts. Verticillium wilt, caused by *Verticillium albo-atrum* and *V. dahliae*, affects some species used for cut woody stem production, such as *Cotinus* and *Prunus* species. Verticillium wilt is a soil-borne disease; the fungal pathogens can survive in the soil for many years. Infection occurs through the roots, and diseased plants show wilting of individual branches, followed by branch death. Young shrubs may die within one growing season, but infected plants may continue to grow, with progressively more severe branch dieback, for a number of years. When recently wilted branches are cut, dark brown or greenish-black streaks in the normally white xylem tissue may be evident. Infected shrubs cannot be cured. ; If Verticillium has been confirmed in a site, plant species that are known to be not infected by this pathogen. Plants that are resistant to Verticillium wilt include dogwood, willow, holly, and conifers.

## Root Diseases

There are two primary root diseases of woody plants used for cut stem production. Armillaria root rot, also called shoestring root rot, has a very large host range, but usually affects plants under stress from drought or other adverse conditions. The disease is

caused by several species of *Armillaria*, wood-rotting fungi that also colonize cut stumps and fallen logs. Remove stumps and roots of any dead trees in the field, to reduce the food source for these fungi. Maintaining the vigor of woody plants by proper cultural practices will also help reduce losses due to *Armillaria* root rot.

*Phytophthora* species are among the most common and damaging root and crown rot pathogens of woody plants. These pathogens, formerly considered to be fungi, are now placed in their own classification, commonly called water molds. *Phytophthora* species are found in natural field soils as well as in nursery production, primarily in sites that are poorly drained or excessively irrigated. Symptoms include discoloration and decay of fine roots, and discoloration of inner bark tissues of the lower stem. Some species also cause foliar blights. Obtain a confirmed laboratory diagnosis if you suspect *Phytophthora* diseases, because symptoms of other root rot diseases can be similar. *Phytophthora* root diseases can be reduced by improving soil drainage (construction of raised beds, avoiding planting in low areas in a field), and monitoring irrigation to avoid saturated soils. Fungicides labeled for control of *Phytophthora* diseases in field plantings include fosetyl-Al (Aliette), mefenoxam (Subdue Maxx), and potassium salts of phosphorus acid (Alude, Agri-Fos).

### Diseases Caused by Bacteria

Bacterial pathogens can cause leaf spots, shoot blights, stem cankers, and stem galls. Because these symptoms are similar to diseases caused by fungi, it is important to seek a confirmed diagnosis if you suspect a bacterial disease problem.

Bacterial leaf spot and shoot blight diseases are usually of minor importance in cut woody stem production. However, shoot blight caused by *Pseudomonas syringae* can cause significant damage to lilac, and fire blight (caused by *Erwinia amylovora*) can be severe on plants in the Rose family, such as flowering quince. Bacterial leaf spot and shoot blight diseases are favored by long leaf wetness periods, and are spread through splashing water. Management of bacterial

diseases includes cultural practices that minimize leaf wetness, and pruning affected shoots back to healthy stem tissue. Bacterial diseases may be reduced with application of copper compounds (copper hydroxide, copper salts of fatty acids, copper sulfate pentahydrate), but phytotoxicity can occur on some plant species.

Crown gall is an important soil-borne bacterial disease affecting a large number of woody plant species. The bacterial pathogen, *Agrobacterium tumefaciens*, infects through wounds in roots, and causes galls to develop on roots and lower stems. Willows and *Prunus* species are among the cut woody plants susceptible to this disease. There is no cure for infected plants. Management of this disease involves careful screening of new plants to avoid introducing crown gall to the site, and removal of affected plants when symptoms are observed.

### Diseases Caused by Viruses

Viruses are minor pathogens of woody plants. Foliar symptoms of virus infection include yellow (chlorotic) or brown (necrotic) ring spots, mottling, or distortion. Symptom expression can be influenced by environmental conditions, so symptoms may appear to “come and go,” but the plant remains infected. Some viruses are spread through specific insect or nematode vectors. Ring spot symptoms are occasionally observed in *Hydrangea* and *Prunus* species. There is no cure for virus-infected plants. Removal is recommended.

## Major Insect Pests of Cut Woody Plants

### Aphids

Several aphid species attack woody plants. Most species are found on leaves and stems in spring and early summer. Aphids are soft-bodied, small insects with long slender mouthparts. Aphids damage plants by inserting four long threadlike mouthparts, called a stylet, into the vascular tissue of leaves, stems and roots, and sucking out plant juices. Fortunately, most woody plants used

as cut stems can tolerate moderate numbers of aphids without significant damage. In many cases, populations of aphids are kept in check by naturally occurring predators and parasites, if cover sprays of broad-spectrum insecticides are avoided. Some species of aphids can reproduce very rapidly, with populations quickly building to damaging levels.

If you experience damaging aphid populations, chemical control options include contact insecticides and systemic insecticides, which can be either sprayed or applied as soil drenches. Insecticidal soaps or horticultural oils will give a fair level of control of most aphid species but sprays have no residual and must be directed onto the aphids.

Major outbreaks of aphids can be controlled with foliar application of the systemic insecticide Acephate (Orthene). The systemic insecticide acetamiprid (Tristar) can be applied as a foliar spray. The systemic imidacloprid (Marathon) or dinotefuran (Safari) can be applied as a foliar spray or as a soil drench. Soil drenches must be applied 30–60 days before an aphid outbreak but will remain in the plant and provide at least one season of control. Soil drenches of imidacloprid must be applied 30–60 days before an aphid outbreak but will remain in the plant and provide at least one season of control. Dinotefuran applied as a soil drench is untaken [AU: “taken up”?] very rapidly and can be applied when aphids are detected. Dinotefuran works best as a soil drench for aphid control rather than foliar applications.

## Beetles

Leaf feeding beetles are the major pests of cut woody stems. Beetles have chewing mouthparts that cut holes into the foliage of infested plants. A small amount of foliar damage is tolerable. When foliage damage reaches unacceptable levels, then insecticide applications may be necessary. Japanese beetle is one of the pests that feed on the widest range of cut woody plants. Larvae of the insect live in grassy areas and the larval population will increase in wet years resulting in large populations of adults the following season. Adult beetles are the life stage that cause damage to foliage of cut woody plants.

Trap plants are one method of control used by some growers. Roses are a strong attractant plant for Japanese beetles. Roses can be planted 50–100 feet from a planting of susceptible cut woody plants. The rose plants are treated with a soil application of a systemic insecticide such as imidacloprid or dinotefuran. The rose flowers must be removed since the chemicals do not accumulate in the flowers sufficiently to kill the beetles. The chemical in the foliage of the trap plant will kill the visiting Japanese beetles when they feed on the foliage. This method appears to work in seasons where there are low to medium infestations of Japanese adults. Using this method, insecticide is only applied to the trap plants and hopefully kills enough adult beetles so that you do not need to protect the susceptible woody plants being used as cut woody stems. Alternative methods include spraying all infested woody plants with a foliar systemic insecticide as mentioned in the aphid control section.

## Borers

Cut woody plants such as lilac can become infested with clearwing moth borers. The adult moth lays eggs on woody stems and the larvae tunnels into the cambium of the plant causing girdling and death of the stem. The best physical control is to renewal prune the lilac, taking out thick old branches that are highly susceptible to lilac borer damage. Chemical control is rarely needed for this pest if renewal pruning is practiced.

## Scale

Scale are sucking insects that insert a needlelike mouthpart, composed of four slender stylets, into plant tissue to remove plant juices. This feeding results in stunting, reduced vigor, and sometimes dieback of plants. Scale insects and their protective wax are so unusual in appearance that they often look like plant parts or disease symptoms, and most people do not recognize them as insects at first.

Armored scales damage plants by piercing plant tissue and sucking cell contents from stems or leaves, depending on the species. They suck cell contents from conductive tissue in the wood and the chlorophyll-containing cells of leaves. Armored scales do not produce

honeydew. Early damage symptoms of armored scale feeding are chlorosis of the foliage immediately surrounding the feeding site of each scale. If many scale are present, this may be followed by browning and defoliation.

Honeydew deposits are usually the first signs of feeding by soft scale and mealybugs. They do not suck out chlorophyll, so there is no sign of chlorosis around their feeding sites. Soft scale and mealybugs generally feed on the sap in the phloem on stems and along leaf veins.

If you suspect you have a scale insect, get a sample to your University Extension office for identification. Most scale population can be suppressed to tolerable levels with applications of horticultural oil applied in mid-March when temperatures are above 50°F for several days. When the temperatures rise, insect respiration is high enough that the oil application suffocates and kills the insects.

## Spider mites

Spider mites can be a problem on some woody plants in hot dry seasons or if the cut woody stems are grown under high tunnels. Hydrangeas are often grown in high tunnels to help prevent summer burning of foliage. Unfortunately, this creates a dry, warm environment in which spider mites may thrive.

Spider mites feed on the undersides of foliage. They use piercing mouthparts to wound plant cells, causing a stippling of foliage. Heavily damaged foliage will stunt the growth on plants. To monitor for this pest, place a white piece of paper on a clipboard and place under the foliage. Tap the branch over the paper and look for spider mites crawling on the paper. The mites can be controlled with sprays of insecticidal soap or summer rate of horticultural oil directed to the undersides of foliage. Miticides labeled for mite control on woody plants include Avid, Floramite, Akari, Hexygon, and Tetrasan.

## Disease Problems

Plant species	Fungal Leaf Diseases	Fungal Stem Diseases	Fungal Wilt Disease	Bacterial Diseases	Powdery Mildew	Fungal Root Rot	Virus Diseases
<i>Caryopteris x clandonensis</i>							
<i>Chaenomeles speciosa</i>	Entomosporium	Botryosphaeria canker		Fire blight			
<i>Cornus sericea</i>	Septoria	Botryosphaeria canker					
<i>Cornus sanguinea</i>		Botryosphaeria canker			Powdery mildew		
<i>Cotinus coggygria</i>		Botryosphaeria canker	Verticillium				
<i>Forsythia x intermedia</i>		Sclerotinia blight Phomopsis stem gall		Pseudomonas blight		Phytophthora root rot	
<i>Heptacodium miconioides</i>							
<i>Hydrangea arborescens</i>	Cercospora			Xanthomonas leaf spot	Powdery mildew		Tobacco Ringspot Virus
<i>Hydrangea macrophylla</i>	Cercospora Colletotrichum			Xanthomonas leaf spot	Powdery mildew		Tomato Ringspot Virus Hydrangea Ringspot Virus
<i>Hydrangea paniculata</i>	Cercospora				Powdery mildew		Tobacco Ringspot Virus
<i>Ilex verticillata</i>	Phyllosticta Rhytissima				Powdery mildew		
<i>Nandina domestica</i>	Cercospora						
<i>Myrica pensylvanica</i>							
<i>Physocarpus opulifolius</i>	Marsonina						

Plant species	Fungal Leaf Diseases	Fungal Stem Diseases	Fungal Wilt Disease	Bacterial Diseases	Powdery Mildew	Fungal Root Rot	Virus Diseases
Prunus spp.	Taphrina						
Blumeriella	Botryosphaeria and Leucostoma						
cankers, Brown rot , Black knot	Verticillium	Xanthomonas leaf spot, Pseudomonas canker, Crown gall		Armillaria	Prunus Necrotic Ringspot Virus		
Salix spp.	Melapsora rust	Venturia and Cytospora cankers					
Syringa spp.	Phytophthora blight			Pseudomonas blight	Powdery mildew	Phytophthora root/crown rot	
Tamarix ramosissima					Powdery mildew		
Viburnum spp.	Downy mildew	Botryosphaeria canker		Xanthomonas leaf spot	Powdery mildew		
Weigela florida							

## Insect Problems

	Beetles	Borers	Aphids	Mites	Caterpillars	Scales
<i>Abeliophyllum distichum</i>						
<i>Caryopteris x clandonensis</i>						
<i>Chaenomeles speciosa</i>	Japanese beetles					
<i>Cornus sericea</i>					Sawfly	
<i>Cornus sanguinea</i>						
<i>Cotinus coggygria</i>						
<i>Forsythia x intermedia</i>						
<i>Heptacodium miconioides</i>						
<i>Hydrangea arborescens</i>	Japanese beetles		Several species			
<i>Hydrangea macrophylla</i>	Japanese beetles			Mites if grown under high tunnels		
<i>Hydrangea paniculata</i>	Japanese beetles			Mites if grown under high tunnels		
<i>Ilex verticillata</i>						San Jose scale and Japanese maple scale
<i>Nandina domestica</i>						
<i>Myrica pensylvanica</i>						
<i>Physocarpus opulifolius</i>						
<i>Prunus spp.</i>	Japanese beetles		Aphids			Japanese maple scale
<i>Salix spp.</i>	Willow leaf beetles and Japanese beetles		Aphids			
<i>Syringa spp.</i>		Lilac borer; clearwing moth				White prunicola scale
<i>Tamarix ramosissima</i>	Japanese beetles					
<i>Viburnum spp.</i>						
<i>Weigela florida</i>			Aphids			

## Out of state reviewers

John Dole, Lane Greer, Robert McNeil  
Green Industry Advisors for fact sheet  
Mel Heath, Bridge Farm Nursery  
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