GROWING CITRUS IN THE SIERRA NEVADA FOOTHILLS

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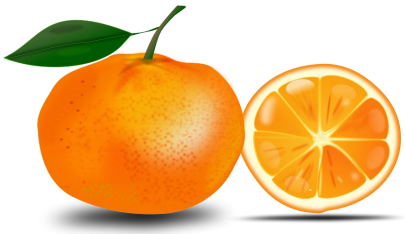
Mandarins are the signature fruit of the Sierra Nevada foothills. Warm days and cool nights during the growing season provide near-perfect conditions for production of high-quality, flavorful fruit, the Mountain Mandarin®. Research has shown that Satsuma mandarins contain significant amounts of synephrine, a natural antihistamine, which can alleviate the symptoms of colds and allergies. Mandarins are good for your health!

Commercial mandarin production flourishes in the foothills at elevations from 400 to 1,000 feet. Most of the production is Owari Satsuma mandarins: sweet, seedless, easy-peeling fruit. Early Satsuma varieties and some common or Clementine-type mandarins are also grown.

Mandarins dominate commercial citrus production in the foothills, but many other citrus species can also be grown. Navel, blood, and Valencia oranges, lemons, limes, grapefruit, and kumquats are all produced commercially in the foothills. Microclimates created by foothill topography also allow production of more exotic citrus species such as pommelo, shaddock, limequat, finger limes, calamondin, and yuzu. Not all varieties can be grown in all microclimates, however.



Eco-requirements for citrus production

Citrus are subtropical in origin, thus the cold temperatures which occur occasionally in the foothills can pose significant risk of frost or freeze damage. Tolerance to cold temperatures varies among the citrus species. Generally, kumquat (18° F) is hardier than Satsuma mandarin (20°F) > Meyer lemon (22°F) > oranges: navel, blood, etc. (24°F) > grapefruit (26°F)> true lemons (Eureka, Lisbon) (28°F)>lime (30°F).

These temperatures are guidelines to assist in selecting appropriate species. Low temperature tolerance depends on many factors: tree age, nutritional status, soil water status, acclimatization, and fruit maturity, among others. All the species cited can successfully be grown in the right microclimate of the lower foothills.

Site Selection

The best sites for citrus are ridgetops or south-southwest facing upper slopes, with good cold air drainage. Impediments to cold air drainage such as vegetated fence lines, brush, blackberries, or hills may cause cold air to back up and damage the orchard. Mandarin is among the most cold-hardy commercial citrus, however, elevation does limit production. The upper limit for commercial citrus orchards is 1,200 feet in elevation.

In some areas, foothill topography creates locations where temperatures are much more moderate than one would expect for a given elevation. These so-called “banana belts” or warm microclimates are where citrus production may be possible above 1,200 feet. Growing citrus may also be possible at higher elevations where frost risk is moderated by a large body of water, pavement, or warm upwinds from a canyon. It is, however, extremely risky for commercial production.

Citrus require full sun for flowering and fruit production. A citrus orchard should be sheltered as much as possible from strong winds. Mandarins and other thin-skinned fruits such as limes and Meyer lemons, should be protected from winds, without impeding cold air drainage. The thin rind is susceptible to damage from wind and wind-driven rain from winter storms. Damage is exacerbated by cold weather. Sites offering protection from wind will also increase the available heat for the trees in frost/freeze events.

For home-use trees, planting next to south-facing cement or stone walls or a patio can mitigate frost/freeze risk. The stone or cement absorbs heat during the day, and reradiates it back at night, protecting the trees. In marginal zones, containerized trees in wine barrels or tubs can be moved next to south facing walls, or indoors for protection in cold weather.

If you are interested in planting mandarins in the foothills, but are unsure of the suitability of your property, it is best to collect temperature data for your site for at least a year. Purchase several maximum/ minimum thermometers and place them around your property, especially up and down slopes, to gauge where cold air backs up the slope. Record minimum temperatures throughout winter and spring, at least on a weekly basis.

Soil Conditions

Citrus are shallow-rooted trees. Feeder roots are in the top two feet of soil, with most activity occurring in the top 12 inches. Citrus do not require deep soils, but they do need well-drained soils. They will grow well on most foothill soils, as long as they are on slopes or soils that drain well.

Clay soils have smaller pore spaces and absorb more water than granitic soils, so the danger of waterlogging is greater. Citrus do not tolerate waterlogged roots for very long. They are very susceptible to *Phytophthora* root disease when they are over-irrigated. Do not plant citrus in lawns or in areas that are saturated by winter rain. Plant in raised beds or mounds if waterlogging is a risk.

Most foothill soils have low native fertility and organic matter. Foothill soils are either clay or decomposed granite and quite acidic (pH <7). At lower elevations, there are more neutral soils.

Citrus grow well in slightly acidic soils, but very acidic soils (below pH 5.5) may need to be amended with lime to raise the pH. High organic matter content in these soils mitigates impacts of low pH. Cover crops and annual additions of organic matter allow the production of high quality citrus despite a low pH.

A soil analysis by a professional laboratory is recommended before planting trees. Your amendment and fertilizer program will depend on the results of your soil tests. In order to avoid costly errors, it is best to use a commercial lab rather than home soil test kits. See UCCE publication **74C *Soil Analysis*** (http://ucanr.edu/u.cfm?id=250) for information on area soil laboratories and analyses.

You will need several soil tests to provide a baseline for a soil management program. Most labs have a basic package, which provides a good baseline. You should have your soil analyzed for:

- pH: acidity or alkalinity
- Soil nutrient status: N, P, K at a minimum; Ca S, Zn, B and Fe are recommended.
- CEC (Cation Exchange Capacity), a measure of native fertility
- Organic matter
- Base saturation % of Ca, Mg, K, and Na in ppm (parts per million)

The Ohio State University

Use a California lab to get accurate information. If you inform the lab that you will be planting citrus, they can provide general recommendations on the nutrients and/or amendments needed. Most labs will give guidance for organic production, if you specify that. For more information on organic amendments, see UCCE publication **72C *Organic Amendments*** http://ucanr.edu/u.cfm?id=251.

Planting Stock

Citrus are very long-lived trees, often producing for 50 years or more. Placer County has century-old producing mandarin trees, and several major orchards are more than 60 years old. Planting a citrus tree is a long-term investment for the future, so it is best to start with high quality planting stock.

Citrus grown for fruit production are almost exclusively budded trees. Very few citrus are grown on their own roots because they are not as productive as those grown on rootstocks. Budded trees will consistently produce the same true-to-type fruit. Very few citrus fruit produce seed that will come true to type. Planting a seed from a citrus fruit rarely gives you a tree that produces the same fruit, and without a rootstock, it will probably be a weak tree.

Rootstocks

Each citrus tree has two parts: the rootstock and the scion. The scion is the fruit-bearing part of the tree. The rootstock is a species selected for specific characteristics, such as disease resistance or tolerance of certain soils. Rootstocks for the foothills are selected for cold tolerance and size control.

Two Trifoliate rootstocks, *Poncirus trifoliata,* are well adapted to foothill conditions. These are Rich 16-6 and Rubidoux, both of which are semi-dwarfing and provide cold hardiness. Another Trifoliate rootstock, Flying Dragon, has a greater dwarfing effect (~75%) and is well suited for home-use or container citrus, but not for production orchards.

Carrizo rootstock is sometimes used in the foothills, producing high quality fruit later in the season. Carrizo does not impart quite as much cold tolerance as Trifoliate, however. Older trees are often on Cleopatra rootstock. However, Cleopatra has no dwarfing characteristics. Trees become very large, so that rootstock has fallen out of use. However, they do produce excellent quality fruit.

The citrus industry standard is C-35 rootstock. It is preferred in valley production because it bears earlier than trees on Trifoliate rootstocks. Some foothill orchards are on C-35. However, it has a number of drawbacks for the foothills. C-35 does not provide as much cold resistance, and young trees are often severely damaged by frost. The C-35 rootstock is vigorous and overgrows the slow-growing Satsuma scion, reducing the longevity of the orchard. In addition, blind taste tests of Mountain Mandarins® over many years have shown that the flavor profile of Trifoliate fruit is more desirable.

Rootstocks are usually grown from true-to-type seed (available from some nurseries). After a year or so, a bud from a certified mother tree of the cultivar (named variety) of desirable fruit is attached to the rootstock and the top of the rootstock plant is cut off. The two plants are allowed to grow together and they become the citrus tree.

It is important to buy certified citrus trees from a reputable nursery, even if you only intend to plant a couple of citrus trees for home use. A reputable nursery will sell trees that are certified disease-free and true-to-type.

If you are intending to plant an orchard, it is best to use a specialty citrus nursery which sells to the industry. A commercial citrus nursery will not only guarantee certified, true-to-type plants, but the quality and longevity of the trees will be much better. For many of the varieties used in commercial production in the foothills, trees need to be budded to order. That may require ordering one year or more ahead.

If you buy citrus trees outside of your home county, your County Ag Department must inspect them before you plant. Citrus can carry many pests, and you could unwittingly be bringing in a new insect or disease.

There are USDA quarantines between California counties, most notably to reduce the spread of Huanglongbing, a disease that kills citrus trees. County Ag Commissioners have the authority to destroy trees that do not meet local quarantines. Violating quarantines may also result in fines.

Citrus cannot legally be brought into California from other states without going through quarantine procedures because of the danger to California's citrus industry. Even if it is only one tree or one budstick, **please do not bring in citrus from another state or country**. The health of the California citrus industry depends on abiding by quarantine laws.

Preparing the Soil and Cover Cropping

If you are planting more than a couple trees, you need to know how deep your soil is and whether or not there is a hard pan. Dig a few 6-foot deep holes with a backhoe to find out. Many foothill soils are layered. You will be able to see the layers and whether you have a hard pan. The Soil Survey, which has basic soil information for all locations, is online at http://websoilsurvey.nrcs.usda.gov or at Natural Resources Conservation Service (NRCS) county offices.

Land should be prepared by ripping before laying out and planting the orchard. Ripping the soil is essential in clay soils or if there is a hard pan. It opens up the soil, allowing roots to penetrate and water to drain

through. Ripping is particularly critical for citrus because of their sensitivity to waterlogging. If possible, add amendments such as lime or compost before ripping so as to incorporate them.

While good land preparation can be somewhat costly, your orchard and the quality of your fruit will suffer in the long run from the lack of soil preparation. Poorly prepared ground can result in irrigation issues and tree stress for the life of the orchard. Giving your plants the best possible opportunity to establish themselves will result in a long, productive life.

Once your soil is prepared, establish a cover crop, especially if you are not planting immediately. Typical cover crops for foothill orchards are grass and legume mixes, usually 25-35% legumes and 65-75% grasses. The cover crop is used to stabilize soil, add organic matter, and, in the case of legumes, fix nitrogen.

A cover crop protects your soil from erosion in heavy rains and significantly increases soil organic matter. Organic matter improves water-holding capacity in coarse soils and facilitates drainage in clay soils. Foothill orchards need vegetative cover on the soil. Intense winter rainfall and bare soil result in significant erosion and high soil loss in a very short time. Once lost, soil cannot be replaced. Seed mixes appropriate for the foothills are available from local farm supply stores.

Plant spacing

Citrus tree spacing and layout vary greatly in the foothills. If you are planting an orchard, spacing will depend on several factors:

1. Species and rootstock
2. Degree of slope
3. Tractor turning radius
4. Pruning and training plan

Common spacing in the foothills ranges from 12 to 18 feet. 10 feet between trees in the row and 12 feet between rows is adequate for small trees such as mandarin and Meyer lemon, if they are on a semi-dwarfing rootstock such as Trifoliate and pruned to maintain small size. Oranges and grapefruit need a minimum of 12 feet between trees and wider is better.

Orchards are often laid out in north-south lines to facilitate capturing sunlight. The foothills do not have a shortage of sunlight, but do have slopes. Flat ground sufficient for an orchard is not common, so the direction of the slope is much more critical to row direction than compass directions. It is safer to drive a tractor up and down the slope than across the slope, so it is important to lay out your orchard along the slope.

Planting

The best time to plant citrus is in spring, after danger of frost has passed, but well before hot weather. Planting citrus in March and April, when the soil is moist, gives the trees an opportunity to establish roots before the heat of summer. Planting citrus in the fall is not recommended in the foothills. It is best to wait until spring as it is easier to protect trees in containers from frost damage.

Dig each tree hole no deeper than the container and twice the width. Auguring holes in clay soils is not recommended, because the augur creates a smooth surface that makes it hard for roots to grow out of the hole. If you do augur the holes, make sure the surfaces of the hole are roughed up before planting the tree.

Plant on a mound or in raised beds if soil drains slowly or contains heavy clay. Keep the rootball as intact as possible when planting the tree. If the trees have been in containers a long time, they may have circled or kinked roots. If that is the case, make a small mound in the bottom of the hole. Unwind the roots and spread them over the mound, ensuring that tips point downward. Do not amend the soil in the planting hole with fertilizers or manures.

After planting, trees should not settle deeper than the level they were in the nursery containers. Check and make sure the crown (limit between the trunk and roots) is not below the soil line. Trees planted too low or in a depression will not thrive. After planting, spread 2-4 inches of compost or mulch on the surface of the soil around the tree. Keep the mulch 4 inches away from the trunk.

Using compost or mulch on the surface of the root zone creates healthy soil conditions for the trees. It helps maintain soil moisture, reduces weed growth, and keeps roots cooler in the summer, reducing tree stress. It also adds organic matter, beneficial microbes,

and nutrients to the soil. Compost or mulch should be renewed on an annual basis.

Protect young trees from sunburn by whitewashing the trunk with a 1:1 solution of white interior latex paint and water. Paper trunk bands can also protect young trunks, but plastic sleeves are not recommended because of the potential for rodent damage.

Frost and Freeze Protection

Damage to citrus from cold temperatures often occurs in early winter (December) before the tree has acclimatized. Mature mandarin trees can withstand temperatures below 20°F; although leaves and green wood will die if temperatures remain at that level for any length of time. Other species are less cold-hardy (see page 1). Fruit are much less cold hardy than the woody parts of the trees and are often damaged at 26°F or higher, if it remains cold for a long period. Trees with fruit are less cold-hardy than trees without fruit.

Young trees (1-3 years old) are much more susceptible to frost and freeze damage than older trees. They may be killed to the bud union in a cold year, if left unprotected. Leaves and green wood may be lost in a single incident, but trees usually come back after a minor freeze. In general, flowers are the most sensitive to cold, followed by fruit, leaves, and wood.

Planting in an area with frost hazard requires a plan for frost protection. Overhead sprinklers were used for frost and freeze protection in the past. However, they require a lot of available water for the duration of the freeze. More damage can occur if the sprinklers are shut off prematurely than if the trees are left unprotected. In the foothills, the weight of the ice is often more damaging than frost or freeze damage.

With increasing prices and less available water, most orchards have replaced overheads with micro-sprinklers (microjet, fanjet, microspray), which use a much lower volume of water. Microsprinklers can offer several degrees of frost protection, but need to run for the duration of the freeze. If running irrigation for such long periods is not feasible, saturating the soil before the freeze event will offer the best protection.

For small trees, covering them with burlap, rowcover, or plastic may be feasible. The cover should entirely cover the tree, but not touch the foliage. Plastic that touches the foliage may cause damage because of condensation and subsequent freezing that can occur. Remove the cover after temperatures rise each morning. Strings of small incandescent lights can also be used to protect individual trees.

Irrigation

Monitor the soil around newly-planted trees to determine when to water. When soil begins to dry in the top 6 inches, trees need to be watered. Young trees have a limited root volume, so it is important to irrigate often with small amounts of water. Frequency of irrigation is determined by soil type and by weather conditions, but generally will be several times a week for young trees. In time, roots will expand and have a greater area from which to extract water and nutrients, and intervals between irrigations will increase.

Learn about water use by digging shallow holes (4-6”) on the edge of the tree root zone and see how long it takes the soil to dry after an irrigation. There are many useful tools for monitoring soil moisture, including matrix blocks and tensiometers, but they need to be backed up by firsthand knowledge of the soil conditions in different sections of the orchard.

In cold, wet springs, citrus leaves may turn yellow. This occurs because roots do not function well in cold, wet soils. The tree is not able to take up nutrients, especially nitrogen, so it uses up internal reserves, causing chlorotic (yellow) leaves. The problem usually resolves itself as the soil warms and dries. If it does not, consider installing drains in the orchard or moving the tree to a location with better drainage.

As subtropical plants, citrus trees can be stressed by hot, dry foothill summers, thus, it is important to keep trees adequately watered. When temperatures above 95ºF are predicted for several days, trees should be irrigated in advance of the heat. Keep root systems moist, but not saturated, during the heat. A saturated soil has all its pore spaces filled with water, which deprives the roots of oxygen.

Nutrient and Soil Management

Citrus are not heavy nutrient users, but need adequate nutrition for quality fruit production. An effective fertilizer program is initially based on soil analysis, and as the tree grows, on leaf tissue analysis. For more information on nutrient management, see UCCE publication ***11C Fertilizing Citrus in the Foothills.***

Leaf tissue analysis is the best tool for determining tree nutrient status. It provides an accurate assessment of nutrients in the tree, rather than what is in the soil. Tissue analysis may indicate nutrient levels above or below optimal levels, when symptoms are not yet visible. Starting in the fourth year, leaf petiole samples should be taken every other year in August or early September and analyzed for nitrogen, phosphorus, potassium, zinc, manganese, and boron.

Nutrient management for foothill citrus typically combines the use of compost or composted manure with soil or foliar applications of specific nutrients. Applying compost or mulch provides some nutrients, but also helps keep applied nutrients in the root zone to be released as the trees deplete the soil solution.

Most orchards need annual applications of nitrogen and zinc, and many need micronutrients such as boron, manganese, or iron. In acid foothill soils, phosphorus (P) may occasionally be needed. However, many orchards have excess phosphorus in the soil, so P should not be applied without laboratory analysis. Potassium is sometimes needed. Soil and tissue analysis should be used to match the nutrient management program to the trees' needs.

Nitrogen is a critical nutrient for citrus, but overuse adversely affects fruit quality and may contribute to susceptibility to frost and insect damage to the tree. Matching N applications from all sources to actual tree needs is critical. Composted manures and legume cover crops contribute nitrogen. Winter rains deposit 10 to 25 lbs. of N per acre in the northern foothill citrus-growing area. This non-fertilizer nitrogen needs to be included in the estimates of fertilizer needs.

The majority of nitrogen applications should occur in spring, as the highest plant needs for N occur from bloom through June. Start applications after heavy rains have tapered off. Nitrogen is mobile in the soil, so much of it will be lost to runoff and leaching if applied during winter/spring rains. Slow release forms are more expensive, but may be more convenient for small orchards.

Nitrogen applications should be completed by late June or early July. Later applications may affect fruit quality and delay maturity. Late summer or fall applications promote fall growth flushes which are more susceptible to frost and freeze damage.

Nitrate forms of nitrogen are recommended for use on acid soils in the foothills. Ammonium fertilizers reduce the pH, further acidifying the soil. For the first year, about two ounces of actual nitrogen per tree are needed. In the second and third years, ¼ pound actual N is needed per tree. Young trees do not have well-developed root systems, so split N into several applications from March through June. A slow-release form may also be used.

From the fourth year on, citrus are treated as mature trees, requiring ½ to ¾ pound of actual nitrogen per tree per year. Use the lower recommended amounts for trees on trifoliate rootstocks, which grow slowly.

Actual N can be found by multiplying the percent N in the material by the weight of the material. For example: calcium nitrate (15.5-0-0) contains 15.5% N. Thus, a 20-pound bag (.155 x 20 = 3.1) contains 3.1 pounds of actual N. For young trees, each tree needs a total of 4 ounces (oz.) N. They may get 1 oz. from compost or other sources, so 3 oz. of fertilizer nitrogen are needed. You will need to apply 19 ounces of the calcium nitrate fertilizer to each tree to obtain 3 oz. actual N. (3 oz. N ÷ 0.155 [15.5% N] = 19 oz. The 20-pound bag will feed about 16 young trees.

Synthetic forms of nitrogen can be expensive, so growers rely on cover crops, compost, and composted manures in addition to fertilizers. Some legume cover crops in pure stand can fix up to 250 pounds of N per acre, which is more than most citrus orchards need.

If you plan to use cover crops to provide a portion of your nitrogen, the UC SAREP Cover crops database at https://sarep.ucdavis.edu/are/nutrient/cover-crops has excellent information. See UCCE publication ***71C Cover Crops for the Sierra Nevada Foothills*** https://ucanr.edu/sites/placernevadasmallfarms/files/337764.pdf for foothill-specific cover crop information.

Compost nutrient content varies widely and depending on the feedstock that went into the compost. Each batch should be tested for nutrient content. Most suppliers can provide that information.

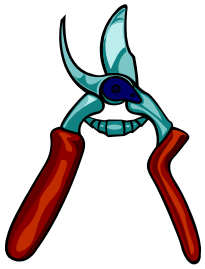
Foothill soils generally contain adequate phosphorus (P), but in some cases, it may not be available to plants, and thus fertilizer may be needed. However, many foothill orchards have excess soil phosphorus, so it should not be applied unless indicated by laboratory analysis. Phosphorus deficiency may reduce marketable yield as deficient trees produce more fruit with thick, coarse rinds and lower juice content.

Potassium deficiencies occasionally occur in the foothills. Potassium helps maintain rind integrity and improves sugar acid balance and flavor in fruit. Some growers apply foliar potassium as fruit are maturing.

Zinc and manganese are usually applied in foliar sprays to new leaves in spring so the nutrients are absorbed quickly. Some soils are deficient in boron, others have excess. Do not apply boron unless soil tests and tissue analysis show that it is deficient. The range between deficiency and excess is very narrow, and excess boron can damage trees.

Some or all of these nutrients may be required in foothill citrus orchards. However, soil depth, nutrient and organic matter content vary greatly, even in the same orchard. Rootstock and soil moisture also influence nutrient uptake, so fertilizer programs should be based on orchard soil and tissue sampling, not on standard recommendations.

Pruning



Citrus are evergreen trees, thus generally require less pruning than deciduous trees. However, pruning is important. Young trees should be topped at planting if they are tall and spindly to promote side shoots which will develop into a lower, fuller canopy. The shorter the tree remains, the easier and more cost effective it is to harvest.

Any shoots below the bud union (suckers) should be removed as they appear. Often, water sprouts or gourmands, which are long, very vigorous branches, will appear in the canopy. These often remain vegetative for a number of years, contributing little to the productive capacity of the tree, so they should be removed.

Mandarins, in particular, tend to have branches that hang to the ground. These are skirt branches, and they impede weeding, fertilizer and compost application, and provide pathways for ant movement into the trees. Trees should be skirted up 2-3 feet every couple of years, as needed.

Fruit needs sunlight to develop flavors and sugars. Dense canopies may not allow enough sunlight to reach fruit, so thinning is needed every few years. A good judge of canopy density is whether you can see dappled sunlight on the ground underneath the tree at midday.

A dense canopy also provides cover for soft-bodied insects such as scale. Scale insects, especially *Citricola*, thrive in dense canopies with high humidity and little air movement. Thinning the canopy, increasing light and air, can reduce scale populations to the point that insecticide sprays are unnecessary.

Pest Management

Foothill citrus generally have fewer insect and disease pests than other areas with high density citrus plantings. However, there are key pests that affect orchard vigor and productivity.

California-specific information on citrus pest management is available at UCIPM online at http://ipm.ucanr.edu/. There are separate recommendations for backyard and commercial orchards. Pest management information from other states is not reliable as we do not have the same pests and California restricts use of many pesticides.

Gophers can be very destructive in young orchards. Citrus roots are not a preferred food, however, gophers can cause serious root damage by tunneling through the orchard. Baiting or trapping can be very effective, if the grower is vigilant and acts every time a new mound is found. UC research has shown that the “Gophinator” trap is the most effective. Some dogs and cats can be very effective gopher hunters, but it is difficult to predict. Most other popular methods are not effective, including propane guns.

Insect Pests

Citrus may be affected by a variety of insect pests: scale, aphid, mite, thrips, and mealybug. However, a well managed orchard with a healthy natural enemy population can keep most of these insects in balance.

Natural enemies are insects which prey on or parasitize insect pests. High populations of a variety if natural enemy species populate the foothills. Flowering cover crops and hedgerows that flower before citrus can provide food and habitat to encourage natural enemy populations. Avoid use of broad spectrum pesticides which adversely affect natural enemies, and may flare pest populations.

Commercial orchards in the foothills rarely have problems with aphids or mealybug. If citrus are over-fertilized with nitrogen, such as trees in lawns, these insects can become problems. Mites are rare in foothill citrus. If they become a problem, it is usually a result of broad spectrum pesticide use or poor irrigation management causing tree stress.

Scale insects are the major insect pest in most orchards. Effective water and nitrogen management, good pruning practices, and ant control can prevent most scale problems. There are two major scale pests, *Citricola* and California red scale; and several minor ones, Black scale and Cottony cushion scale.

Citricola scale is the most common pest issue in the foothills. In most years, populations can be managed with pruning. Periodically, in wet springs, *Citricola* populations get out of control and pesticide applications may be necessary. Horticultural, neem, or stylet oils are adequate for population control.

Ant populations need to be controlled to reduce scale. Ants not only prey on natural enemies but farm and protect honeydew-secreting pests such as scale. Skirt prune lower branches to prevent ant movement into the canopy. If necessary, use sticky bands on trunks.

California red scale is also a major scale pest. It was introduced on nursery stock, and become established in a few orchards. Inspection of planting stock by the County Ag Department, and avoiding importation of infested citrus fruit or leaves from other counties will prevent new introductions. Most growers do not spray for red scale. Natural enemy releases are more effective and environmentally friendly. UCCE works with commercial mandarin growers and a few homeowners to cooperatively release *Aphytis* wasps, a tiny parasitic wasp specific to red scale, each spring and fall in Placer County. Please contact the UCCE Placer County Farm Advisor for more information.

Asian citrus psyllid (ACP) has not yet been found in foothill orchards. However, it is the subject of major eradication and quarantine efforts in Southern California. ACP damages citrus trees by feeding, but the major threat is that it carries Huanglongbing (HLB), a deadly disease for citrus. Most Florida orchards are infected with HLB, and hundreds of thousands of acres have been removed. HLB has been found in residential areas in Southern California nd in Mexico. Huanglongbing, if allowed to spread, will devastate California's citrus industry. There is no cure and it kills trees in just a few years.

Citrus Diseases

ACP, Huanglongbing, and Tristeza disease are the primary reasons not to bring citrus from other areas into the foothills without appropriate documentation and inspection by the County Ag Department. Please respect quarantine regulations.

There are few diseases in foothill citrus orchards. *Phytophthora* is a pathogen that is ubiquitous in the foothills. However, it only becomes a problem when citrus roots are kept too wet. Maintaining good soil drainage, avoiding over-irrigation, and using recommended rootstocks will prevent disease problems. Brown rot occasionally occurs in some orchards. Skirting up usually prevents fruit damage.

Weeds can be a major issue in citrus orchards. Young trees have limited root systems, thus it is critical to keep weeds out of the root zone. Mulch helps diminish weed growth, but some weeding around the base of the trees will be needed.

Weeds can be controlled with string trimmers, mowers, or other equipment. Use caution when weeding close to trunks as citrus bark is thin and easily damaged. Disking is not recommended because of the damage to soil, roots, and subsequent erosion.

Herbicides may be used for strip spraying on orchards, but be careful to choose sprays labeled for citrus and

appropriate to the age of the trees and stage of the weeds. Information on weeds and herbicides is at https://www2.ipm.ucanr.edu/agriculture/citrus/Integrated-Weed-Management/

Foothill citrus production can be a profitable enterprise. However, being a successful grower requires more than production skills, it also involves marketing and business skills. UC Cooperative Extension offers assistance with both. Contact your local UCCE office for more information.

The resources listed were used in preparation of this document and may be helpful in planning and managing your citrus orchard.

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