Critter Control

Protecting your Fruit and Trees from "Those Pesky Varmints"

Critter Control

Mammals:

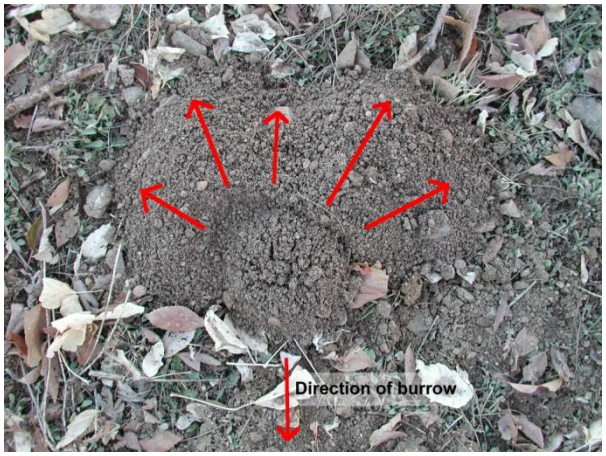
- Gophers – Rats – Squirrels – Raccoons – Rabbits
- Birds
- Snails
- Ants
- Some common insects and bugs
- Some common diseases

Pocket Gophers

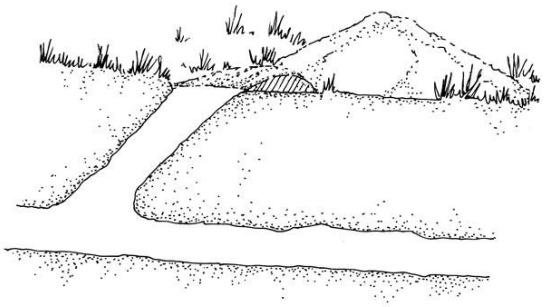
- Five species of pocket gophers are found in California
- Although they are sometimes seen feeding at the edge of an open burrow, pushing dirt out of a burrow, or moving to a new area, gophers for the most part remain underground in the burrow system.
- Gophers usually live alone within their burrow system, except for females with young or when breeding, and may occur in densities of up to 16 to 20 per acre.
- Favorite fruit trees that are frequently attacked by gophers include figs and bananas. They will, however, attack almost any fruit tree.

Pocket Gophers

- Mounds of fresh soil are the best sign of gopher presence.
- Mounds are formed as the gopher digs its tunnel and pushes the loose dirt to the surface. Typically mounds are crescent- or horseshoe-shaped when viewed from above. The hole, which is off to one side of the mound, is usually plugged.
- One gopher may create several mounds in a day.
- Most commonly they feed on roots and fleshy portions of plants they encounter while digging. Sometimes they feed aboveground, venturing only a body length or so from their tunnel opening. Burrow openings used in this manner are called "feed holes." They are identified by the absence of a dirt mound and a circular band of clipped vegetation around the hole.



Gopher mound showing direction of burrow and where soil was pushed out of the hole (arrows in a "fan" pattern).

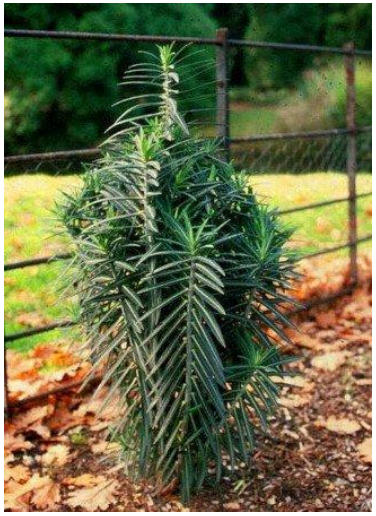


Gopher Control - Repellants

- There are a few repellents registered by EPA for gopher control that contain castor oil. Some predator odors have been tested as gopher repellents, but cannot be currently recommended.

- Commercially-available sonic devises are claimed to repel pocket gophers. There is, however, no scientific supporting evidence.

- The plants known as caper spurge, gopher purge, or mole plant (*Euphorbia lathyrus*) and the castor-oil plant (*Ricinus communis*) have been promoted as gopher repellents, but there is no evidence of their effectiveness. In addition, these are not recommended as they are both poisonous to humans and pets.



Critter Repellants

- There is an ever increasing number of both sonic and “scent” repellants that are being advertised to keep away everything from gophers to rats and mice, squirrels, rabbits, deer, dogs and cats, snakes and bugs.

- There is no independent, scientific evidence that <u>ANY</u> of these are effective.

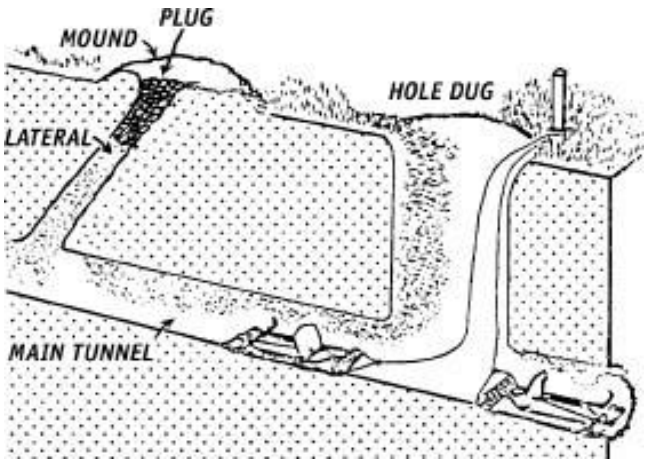
Gopher Control

The Rodenator

Gopher Control Products

Traps, Baits and Gases

- Traps are often the most effective.



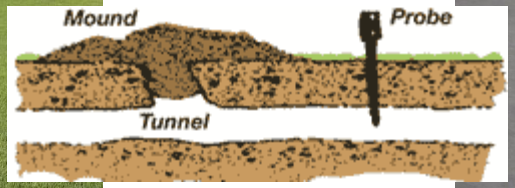
- Use in snap traps in pairs and place back to back.

- Place box traps in each tunnel

Gopher Control Products

Baits and Gases

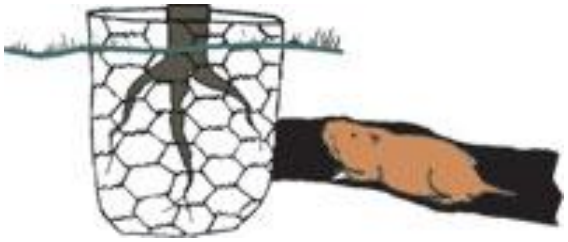
- Baits work well if used properly and are often the most “convenient”. A bait injector tool is a useful tool.



- Gases are most effective when the soil is moist. Gases are often the least effective of these options.

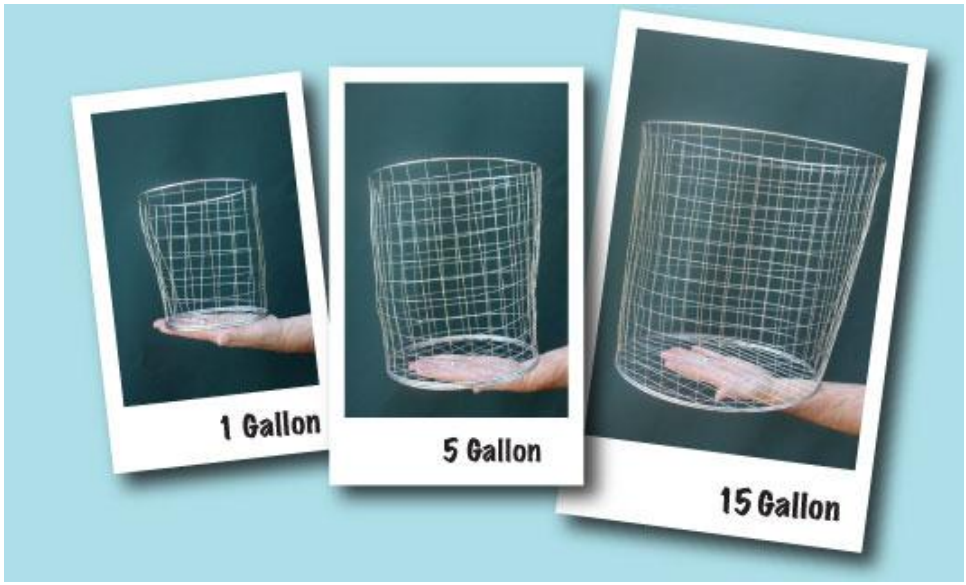
- Blow the gas into the gopher tunnel with a blower or a Shop Vac to increase the effectiveness of the smoke.

Gophers Baskets



- Young trees can be protected from gopher damage by planting the tree in a large aviary wire basket.

- The wire should have openings no larger than ½” and the top edge of the basket should extend at least 2”-3” above the surface of the soil or mulch.



Tree Rats

- Tree rats are especially fond of avocados and citrus and often eat fruit that is still on the tree. When feeding on a mature orange, they make a small hole through which they completely remove the contents of the fruit, leaving only the hollowed out rind hanging on the tree. The rind of a lemon is often eaten, leaving the flesh of the sour fruit still hanging.

Tree Rats / Roof Rats

- Roof rats are very agile climbers and usually live and nest above ground in shrubs, trees, and dense vegetation such as ivy.

- Roof rats eat a wide variety of foods, but their food preferences are primarily fruits, nuts, berries, slugs, and snails.

- Roof rats routinely travel up to 300 feet for food. They may live in the landscaping of one residence and feed at another. They can often be seen at night running along overhead utility lines or fence tops.

Traps

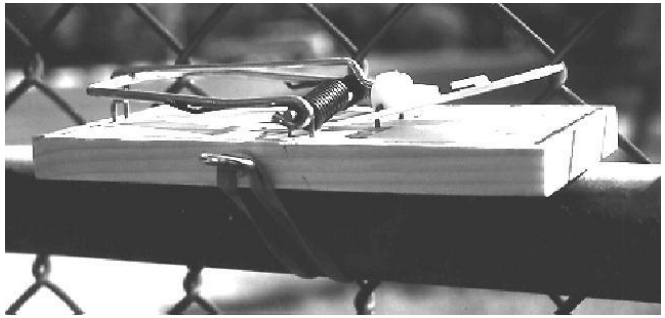
- Since rats prefer to stay off the ground, they like to run along the stringer boards of fences and the horizontal support poles of chain link fences. Traps can be nailed directly to the horizontal stringer board of wooden fences.

- To secure rat traps to horizontal poles of chain link fences, put an eye screw on each side of the trap and use several heavy rubber bands or zip tie to hold the trap to the pole.

- Traps should be set only from dusk until dawn to avoid killing non-target animals active during the day.

- Roof rats are nervous and cautious of new objects in their environment, so leave traps in the same location for at least a week before moving them.

- It is a good idea to bait the trap, but not set the trap for several days. After baiting the trap for 3-5 days, set the trap. This will increase the success rate for trapping.



Rat Baits

Anticoagulant Rodenticides

- Rodents poisoned with anticoagulants die from internal bleeding. Because anticoagulant baits are slow in action (several days following the ingestion of a lethal dose), the target animal is unable to associate its illness with the bait eaten. Therefore, bait shyness does not occur.

- This delayed action also has a safety advantage because it provides time to administer the antidote (vitamin K1) to save pets, livestock, and people who may have accidentally ingested the bait.

- Grain-based baits in a loose meal or pelleted form are available in bulk or packaged in small, plastic, cellophane, or paper "place packs". These packets keep bait fresh and make it easy to place baits into burrows, walls, or other locations. Rodents will gnaw into these bags to feed on acceptable baits.

- Pelleted baits can more easily be carried by rats to other locations. Such hoarding of food by rats is not uncommon and may result in bait being moved to places where it is undetected or difficult to recover. In some cases these baits may then become hazardous to nontarget species.

- Anticoagulant baits have also been formulated into wax and extruded blocks. These are generally less readily accepted by rodents.

Rat Baits

Non-anticoagulant Rodenticides

Zinc phosphide has been used extensively in the control of rodents. When zinc phosphide comes into contact with dilute acids in the stomach, phosphine (PH_3) is released.

- Rats and mice that ingest lethal amounts of bait usually succumb overnight.
- Because zinc phosphide is not stored in muscle or other tissues of poisoned animals, there is **no secondary poisoning** with this rodenticide.
- **The bait, however, remains toxic up to several days in the gut of a dead rodent. Other animals can be poisoned if they eat enough of the gut content of rodents recently killed with zinc phosphide.**
- Bait shyness can be a problem; so prebaiting is recommended or necessary for achieving good bait acceptance.

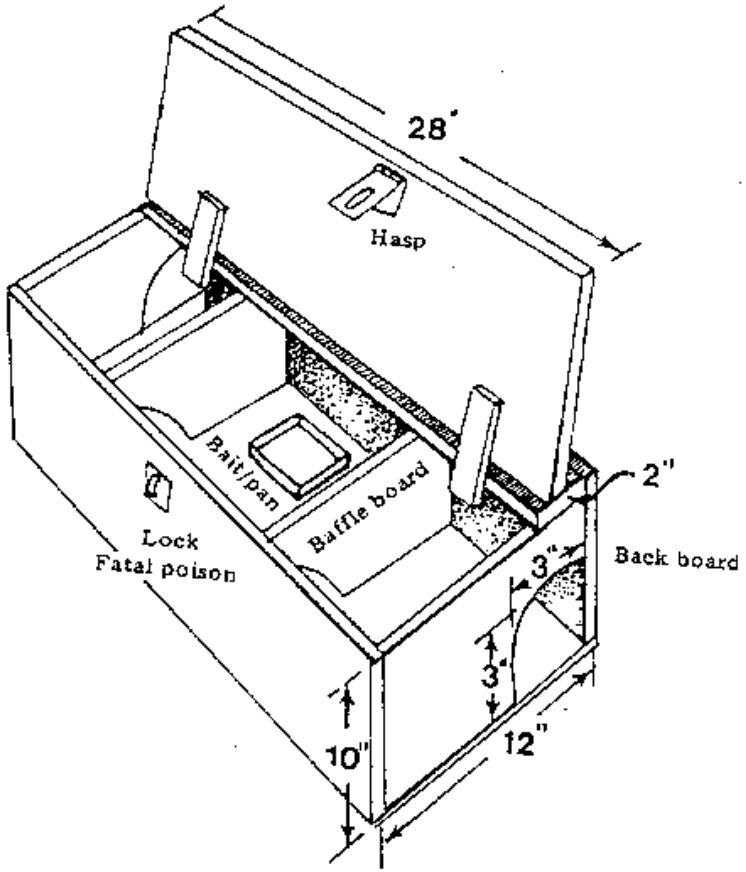
Cholecalciferol (Vitamin D3) is a single-dose or multiple-dose rodenticide that causes mobilization of calcium from the bone matrix to plasma and death from hypercalcemia.

- Time to death is 3 to 4 days after ingestion of a lethal dose. As the toxicant is slow-acting, bait shyness apparently does not occur.
- **No secondary poisoning for birds of prey.**
- **Dogs are very susceptible to poisoning by vitamin D3**

Use of Poisons

- If poison baits are used outdoors, they **must** be placed in a tamper-resistant bait station. All rodenticide labels state that it is illegal to place any poison rodenticide baits where they are accessible to children, pets, livestock, or wildlife, unless the bait is contained in a secured, tamper-resistant bait station.

- The practice of wiring poison bait blocks to branches of trees is illegal and has caused thousands of cases of accidental poisoning of dogs and wildlife each year.



Ground Squirrels

- Ground squirrels damage many fruit trees and ornamental plants by gnawing bark, girdling trunks, eating twigs and leaves, and burrowing around roots.

- Poison bait is commonly used to control ground squirrels.

Squirrel bait can be quite toxic to pets and non-target animals and **must** be used with a bait station to reduce the risk of accidental poisoning.

Make a PVC Bait Station

Put a lip or elbow piece on the end of the bait station to prevent squirrels from tracking bait outside the station.

PVC Inverted-T
anticoagulant bait station

1. Make the bait station from PVC pipe no smaller than 4" in diameter for ground squirrels.
2. The long, upright end, 24" to 30", of the "T" is a bait reservoir. Keep this end upright by attaching it to a fence post, building, tree, stake, etc. After filling with bait, place a plastic cap on the end to keep moisture from reaching bait.
3. Keep bait in the station at all times during the control program.

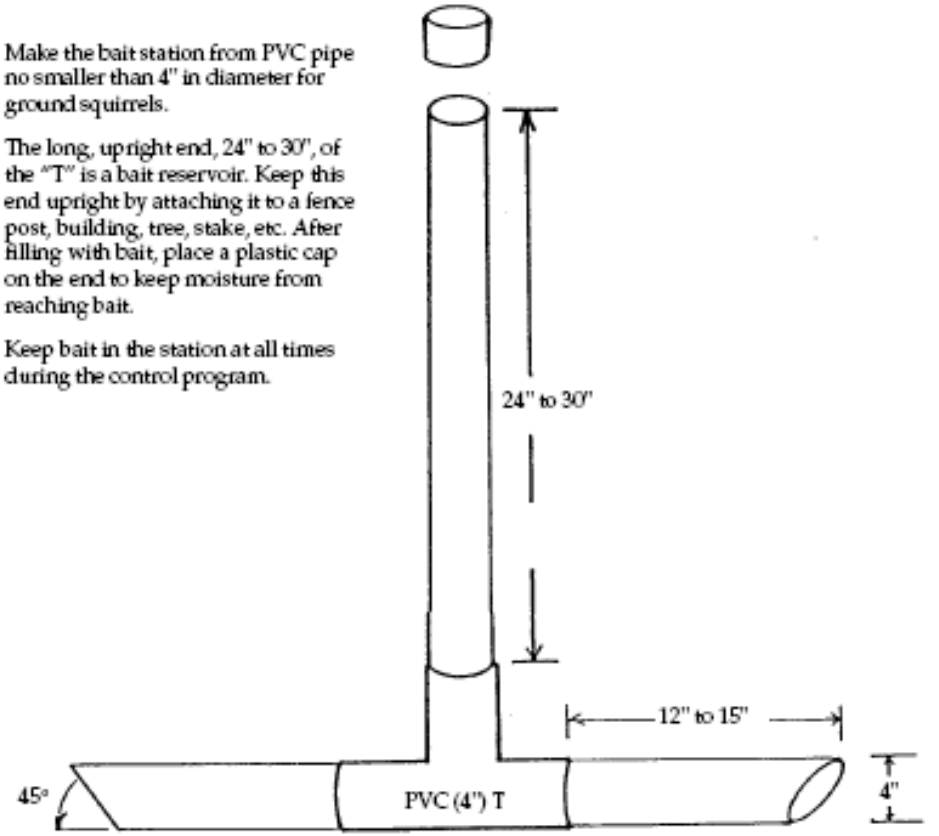
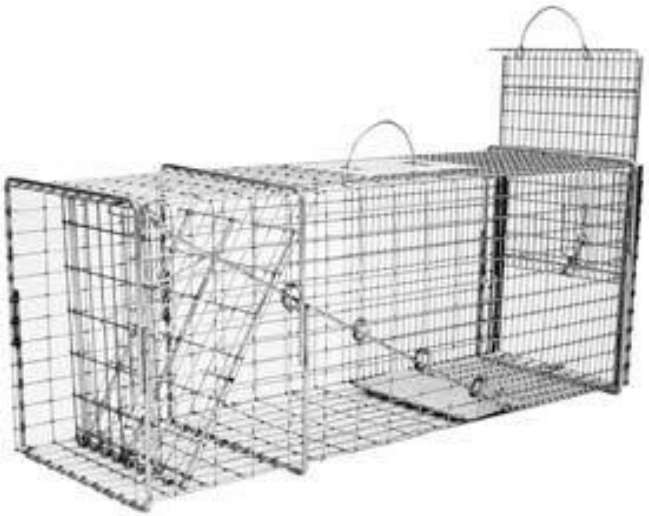


Fig. 5. Commonly used inverted "T" ground squirrel bait station made of 4-inch (10-cm) PVC pipe. Stake secures station in upright position.

Live Traps

- Raccoons, opossums, squirrels and other critters can take advantage of your hard work and eat your fruit. These animals can be trapped and relocated or destroyed by using live catch traps.

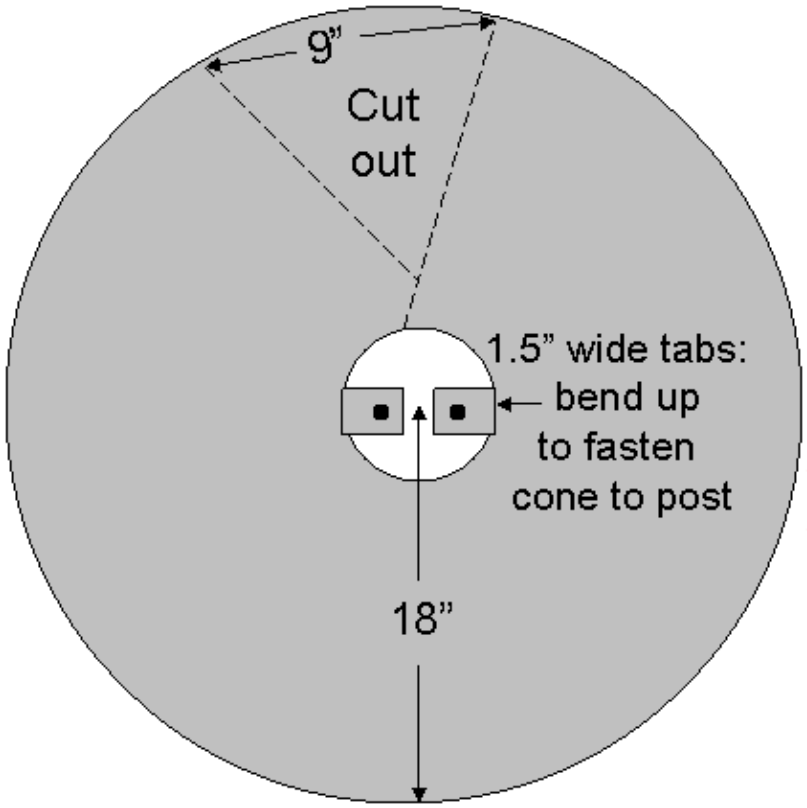
- These traps may be purchased on line or at many feed stores.

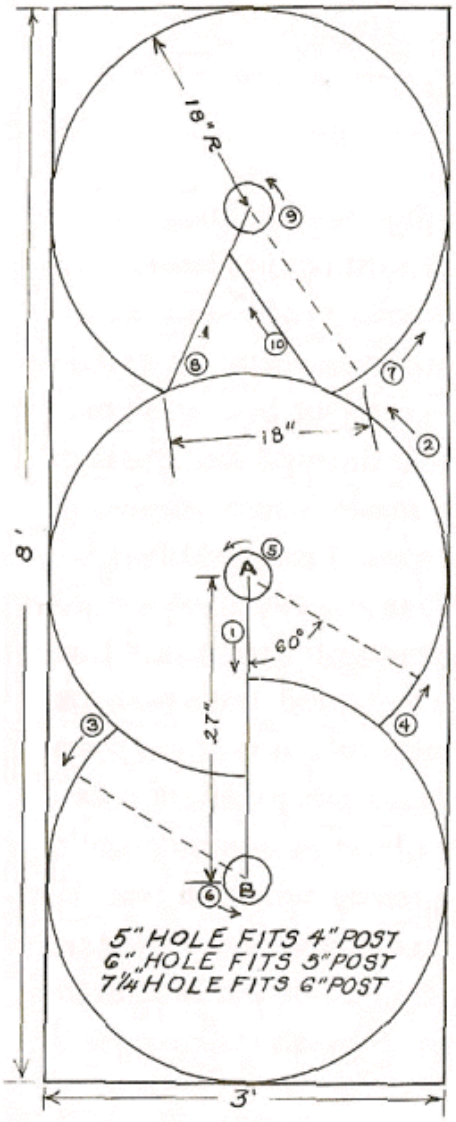


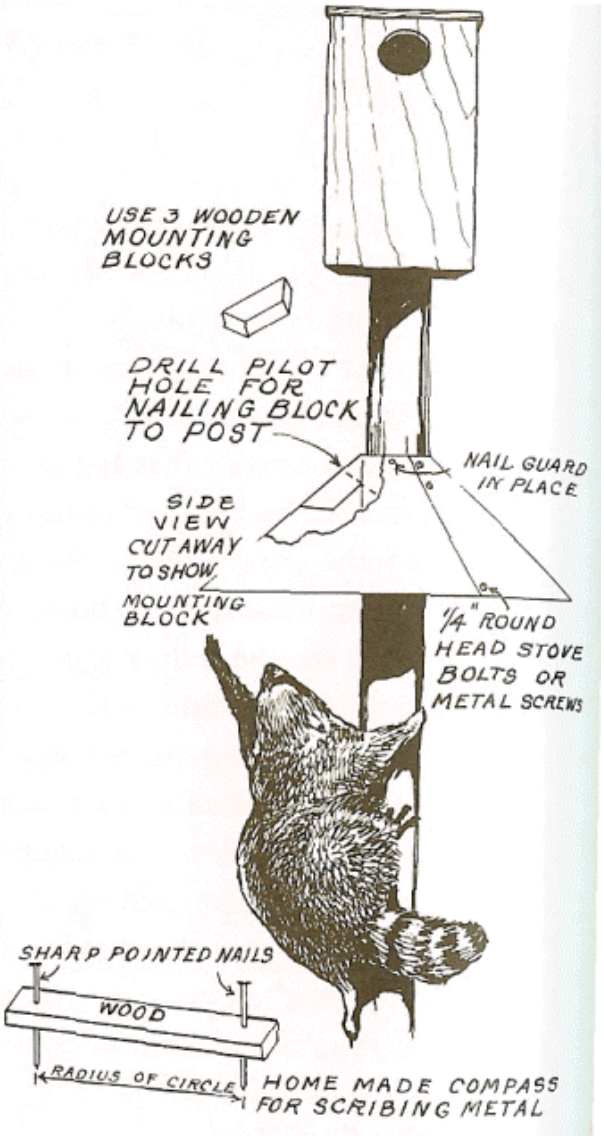
Cone Baffle Guards

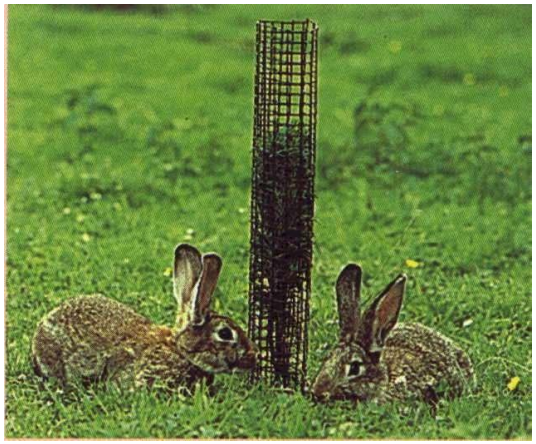
- Cone baffles can exclude rats and other climbing pests from getting into your trees.
- Baffles can be made out of a variety of materials.
- Lower branches must be pruned away and tree must not touch anything that would allow pests to gain access into the tree.

How to Make a Conical Baffle









Rabbits

- Rabbits can damage or kill young trees by girdling the bark around the trunk of the tree. They will often eat the lower foliage or gnaw on lower branches.

- Trunk protectors made of wire mesh or plastic are often used to protect young trees from rabbit damage.

Birds

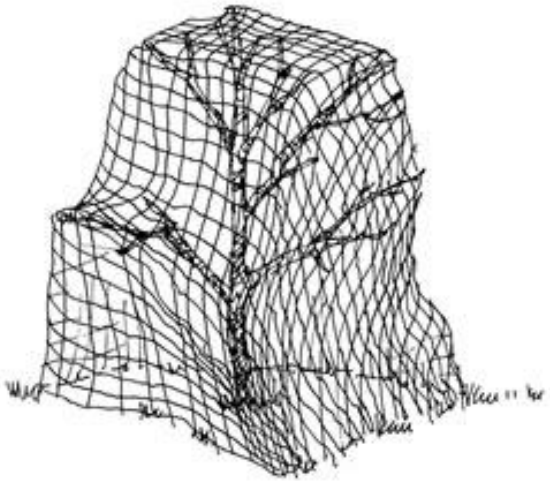
- Many birds eat insects in the garden, however, some also eat ripening fruit.
- Birds should be discouraged from you fruit, but never harmed or killed. There are several products available to protect your crop from birds.
- These products vary in their effectiveness.

Owl and hawk decoys should be moved around frequently.

Scare Tape

Birds

- Bird Netting is the most effective way to protect your fruit from bird damage.
- The net must be staked to the ground or closed around the tree trunk or tree limbs to keep the birds away from your fruit.
- Be sure to remove the netting as soon as the fruit is harvested. This prevents the tree from growing through the netting and being damaged when the net is finally removed.



Motion Activated Sprinkler Animal Repellent

- Motion-activated scarecrow sprinklers automatically detect animals as they approach.

- Repels animals with short bursts of water.

Snails

- The brown garden snail *(Helix aspersa)* is the most common snail causing problems in California gardens; it was introduced from France during the 1850s for use as food.

- The white garden snail, *Theba pisana,* is the worst potential agricultural pest of the helicid snails introduced to North America. The snails were found and identified in August 1985 in San Diego, California, at several localities in about a 10 square mile area

- Snails are excellent climbers and often will also feed on foliage and fruit of some trees; citrus are especially susceptible to damage.

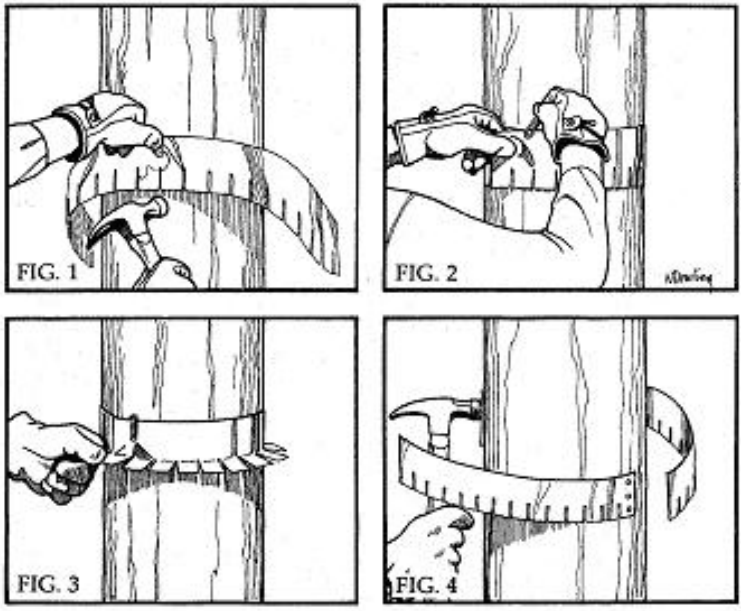
Snail Control

- Most snail and slug baits have mateldehyde as the main active ingredient.
- Mateldehyde is very toxic to mollusks as well as dogs, cats, wildlife, fish and people.

- Baits containing Iron Phosphate kill snails and slugs but are of very low risk to dogs, cats, wildlife and people. They are also less toxic to fish than conventional snail baits.
- As these baits break down they become plant nutrients in the form of iron and phosphorous.

Snail and Slug Control

- Snails and slugs cannot crawl over copper.



Decollate Snails

- These predatory snails eat the eggs and young of the brown garden snail. They are not effective against large snails or slugs.
- They may attack young seedlings or fallen fruit.
- The do not climb trees. Used together with copper banding on trees, decollate snails can be effective in reducing pest snail populations.

Snail Baits will kill Decollate snails!

Ants

- Some species of ants "farm" aphids, mealybug, soft scale, whitefly or other honeydew producing insects. The ants eat the honeydew that these insects secrete.

- At the same time, they protect these insects from natural enemies.

- Controlling the ants in your fruit orchard will go a long way in reducing other insect pest problems on your fruit trees.

Pest Control - Ants

- Ants can be kept out of trees by banding tree trunks with sticky substances such as Tanglefoot.
- Trim branches to keep them from touching structures or plants so that ants are forced to climb up the trunk to reach the foliage.
- Protect young or sensitive trees from possible injury by wrapping the trunk with a collar of heavy paper, duct tape, or fabric tree wrap and coating this with the sticky material.
- Check the sticky material every few days and stir it with a stick to prevent the material from getting clogged with debris and dead ants, which will allow ants to cross.


Applying tanglefoot to trees

Ants

- When properly used, baits are more effective and safer than sprays or granules to control ants.

- Bait products must be slow-acting so that the foraging ants have time to make their way back to the nest and feed other members of the colony before they are killed.

- Different attractants are more effective against different species of ants and at different times of the year.

- In the case of Argentine ants, sweet baits are attractive year-round.

- **Control with baits may take several weeks or more to be complete.**

Sooty Mold

- Many sucking insects produce large quantities of a sticky excrement known as honeydew.
- Honeydew often turns black with the growth of a sooty mold fungus.
- Sooty mold blocks sunlight and reduces photosynthesis.
- Although sooty mold does not directly harm the tree, it can weaken the tree and affect fruit production by blocking sunlight and reducing the trees ability to produce food.

Soaping for Healthy Trees

- Soaps help to clean your trees and remove honeydew, sooty mold, and dirt and dust.

- **To clean trees, use a hose end dial-a-mix type sprayer. Use 2 tsp. soap per gallon of water.**

- Soaps also dry out (desiccate) many soft bodied insects. **Most** soft bodied insects can be controlled by using **<u>insecticidal soaps</u>**.

- Complete coverage is necessary for effectiveness with soaps as well as with all contact pesticides. Thorough and complete coverage can be accomplished with "soaps" without the risks associated with most poisons.

- For control of insects, washing trees once per week for three consecutive weeks is often necessary.

- **Scale insects are <u>not</u> effectively controlled by insecticidal soaps.**

Some common insects and bugs

Aphids

- Aphids affect nearly all fruit trees. They occur primarily on young foliage and shoot tips.

- Large populations of aphids cause curling, yellowing, and distortion of leaves and stunting of shoots. This may affect growth to the point of hampering the development of fruiting wood and tree development.

- Aphids have many generations a year. When the weather is warm, many species of aphids can develop from newborn nymph to reproducing adult in 7 to 8 days. Because each adult aphid can produce up to 80 offspring in a matter of a week, aphid populations can increase with great speed.

- **High levels of nitrogen fertilizer favor aphid reproduction**

Damage caused by Green Peach Aphids

Mealybugs

- Mealybug females feed on plant sap, normally in roots or other crevices. They attach themselves to the plant and secrete a powdery wax layer (therefore the name **mealy**bug) used for protection while they suck the plant juices.

- Some species of mealybug lay their eggs in the same waxy layer used for protection in quantities of 50–100; other species are born directly from the female.

Figure II. Reddish orange fluid excreted by grape mealybug (photo: JKC).

Figure III. Clear fluid excreted by obscure mealybug (photo: Kent M. Daane).

Figure IV. Vine mealybug colony in the axils of the petiole and cane (photo: Mark Battany).

Whitefly

Giant Whitefly

•Whitefly feed on plant sap, normally on the underside of a plants leaves.

• Whiteflies and their waxy deposits may occur on both upper and lower leaf surfaces. Eggs are often laid among the wax deposits.

Woolly Whitefly

- Common on citrus and tropical guava

Asian Citrus Psyllid

- The Asian citrus psyllid, is a tiny (1/8 inch in length) mottled brown insect that is about the size of an aphid.
- It attacks citrus and very closely related ornamental plants in the family Rutaceae (mock orange, Indian curry leaf, orange jasmine and other Murraya species).
- Asian citrus psyllid arrived from Mexico and was detected in San Diego on September 2nd 2008 near the South Bay Terrace area of San Diego.
- Adults feed with their heads down, almost touching the surface of the leaf. Because of the shape of their heads, their bodies are lifted to approximately a 45-degree angle.
- The more serious damage that this insect causes is in carrying and transmitting the bacteria that cause Huanglongbing (HLB or citrus greening) disease. This bacterial disease is transmitted to healthy trees by the psyllid after it feeds on infected plant tissue.
- **Contact your local Dept. of Agriculture if you suspect you have this insect on your fruit trees!**

Avocado Lacebug and Persia Mite

Avocado Lacebug

- Lace bugs suck leaf sap. Leaf stippling and bleaching from feeding on infested leaves can become very obvious by late summer.
- Adults and nymphs also foul leaves with specks of dark, varnishlike excrement.

Persia Mite

- Most damaging to Hass, Gwen, and a few other varieties. Esther, Pinkerton, and Reed are of intermediate susceptibility. The Bacon, Fuerte, Lamb Hass, and Zutano varieties are much less affected.
- Persea mites feed and reproduce mostly beneath webbed patches or silk-covered "nests."

- All life stages of both insects have several generations a year and can be present throughout the year on avocados.
- **High populations of either insect cause premature leaf drop and defoliation. Defoliation leads to sunburned bark and fruit, aborted or dropped fruit, and severely stressed trees, which later reduces yields.**

Pear Sawfly (Pear Slug)

- Host specific. Plants commonly attacked: Pears, plums, cherry.

- Larvae feed on leaves causing a “windowing” effect.

- Damage may cause reduced vigor from loss of leaves.

Pest Control

All of the insects that were just discussed are soft bodied insects and can be controlled using insecticidal soaps as well as a wide variety of organic and non-organic insecticides.

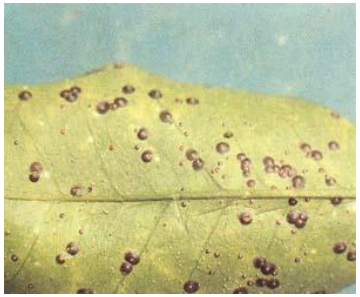
- Most pest control products used on fruit trees are contact killers. They kill what they touch.

- The key to successfully using pest control products are to be complete and thorough with your applications and to be consistent with your follow up applications!

Scale Insects

Red scale

- Red scale has a thin, circular, leathery covering over the soft, flattened, shield shaped, creamy-yellow insect. The reddish-brown scale cover of the adult female is about 2 mm across.
- Red scale is an armored scale and does not produce honeydew.
- **This is a common pest on citrus. It can occur on leaves, fruit and stems.**



Soft Scale

- Soft scales can be smooth, cottony, or waxy and are 1⁄4 inch long or less. They are usually larger and more rounded and convex than armored scales.
- Soft scales feed in the fluid-conducting phloem tissue of the plant and **excrete abundant honeydew,** which is sugary water that drips from their bodies.
- Soft scales infest leaves and twigs but rarely feed on fruit.

Brown Scale

Black Scale

Horticultural Oils

- Oil sprays are used to suffocate insects. They are fairly effective against scale insects.

- **Trees should be washed thoroughly before applying oil sprays. Wash trees once a week for two to three weeks prior to applying oils.**

- **Oil sprays should not be applied when temperatures are over 85 degrees.F. Apply oils no more frequently than once per month as trees can be damaged or defoliated if applied more often!**

Citrus Leafminer

- Citrus leafminer larvae feed by creating shallow tunnels, or mines, in young leaves of citrus trees. It can survive as a larva only in the tender, young, shiny leaf flush of citrus and closely related species. Older leaves that have hardened off are not susceptible unless extremely high populations are present.

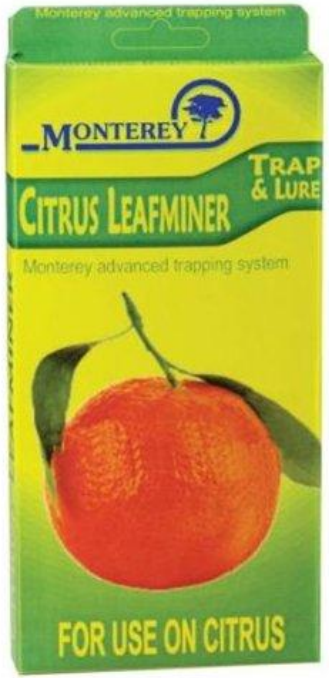
- Mature trees that have a dense canopy of older foliage to sustain them can tolerate damage on new leaves with negligible effect on tree growth and fruit yield.

- The flush growth of citrus trees attacked by leafminer will look unsightly, but often the best course of action is to leave it alone and let the natural enemies of the citrus leafminer feed on and parasitize the larvae in the mines.

- Young trees may experience a reduction in growth. However, even young trees with heavy leafminer populations are unlikely to die.

Citrus Leafminer

- Summer heat in the inland areas of California seems to suppress leafminer populations, but in cooler coastal areas, the insect population may remain high from summer through fall.
- Very young trees do not have much mature foliage and they produce more flush year-round, thereby supporting larger citrus leafminer populations. On very young trees, chemical control may be recommended.



Pheromone traps attracts the male insect where he is caught in the trap. When insects begin to appear, begin spray applications for insect control.

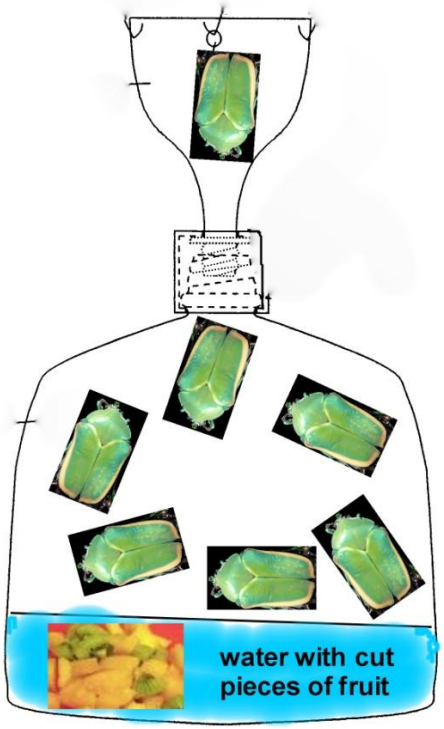
- Azadirachtin (Neem) or spinosad show some efficacy against larvae and are relatively safe for natural enemies. The residues do not last very long, and these insecticides might need to be reapplied every 7 to 14 days. Spinosad products are often limited to 6 times per season.
- Imidacloprid provides the longest period of control, 1 to 3 months. Imidacloprid should only be applied once a year.
- Removing blossoms before they open on young trees will prevent honey bee exposure to imidacloprid in the nectar/pollen.

Green Fig Beetles

- Large grubs (larvae) are frequently found in compost piles and in soil that is rich in organic material.

- Adult fig beetles frequently attack ripening figs and other soft fruit in large numbers and can destroy your crop of fruit.

- Traps hung in trees during the summer can help reduce Fig Beetle populations and can help to reduce damage to the crop.



Codling Moth

- The larvae of the **codling moth** (*Cydia pomonella*) is the common apple worm. It attacks apples, pears, quince, walnuts, and other tree fruits.
- Codling moth adults are about 1/2 to 3/4 inch long with mottled gray wings that are held tentlike over their bodies. Their appearance blends well with most tree bark, making them difficult to detect.
- The larvae pupate inside their cocoons in early spring and emerge as adult moths mid-March to early April.
- After mating each female deposits 30 to 70 tiny, disc-shaped eggs singly on fruit, nuts, leaves, or spurs.
- After the eggs hatch, young larvae seek out and bore into fruit or developing nuts.

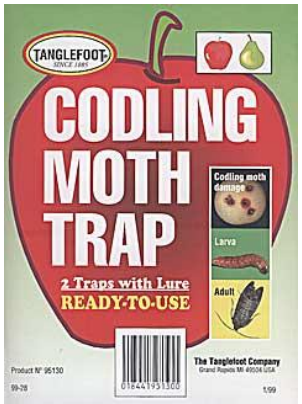
Codling Moth

- After completing development they leave the fruit and drop from the trees to search out pupation sites and continue the life cycle in the soil or on debris under the tree; some crawl back up the tree to pupate in bark crevices.

- The rate of development will vary with temperature, proceeding more rapidly in warmer weather and climates.

- Depending on the climate, codling moth can have two, three, and sometimes four, generations per year.

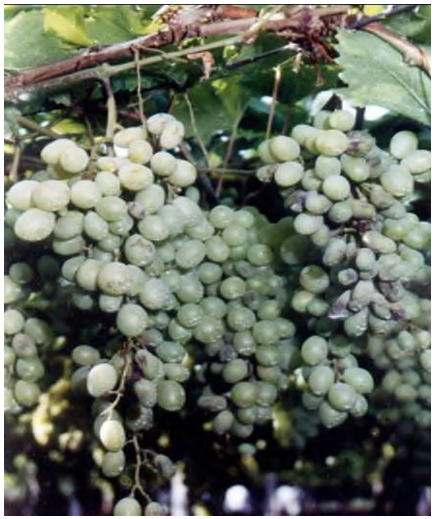
- Trapping the adults can help to control this pest. Traps can also help time pesticide applications. BT and spinosad are somewhat effective if applied before the larvae chews into the fruit.



Some common diseases

Powdery Mildew

- Fruiting plants affected by Powdery Mildew include: Apple, Quince, Stone Fruit, Grape, Caneberries, Strawberry, Mango, Papaya.



- Different powdery mildew fungi cause similar symptoms.
- Does not require moist conditions to establish & grow. Likes warm temperatures.
- Attacks new growth, buds, shoots, flowers, leaves & fruit.

Rust

- Fruiting plants affected by Rust: Nectarine, Peach, Caneberries.
- Cankers appear as blisters or small splits in bark.
- Leaf lesions occur spring, summer & fall. May cause defoliation.
- Lesions may occur on fruit.

- The fungus survives in twig cankers or on other host parts.
- Airborne spores depend on wetness for infection.
- Infections of young twigs and leaves are the most common symptoms, but in California, fruit infections may be a major component of the disease as well.

Scab

- Fruiting plants affected by Scab include: Apple, Peach, Pear.
- Favors coastal areas where spring & summers are cool & moist.
- Apple leaves puckered, black circular spots on upper surface, velvety spots on lower.
- Scabby areas on fruit occur when fruit ½ grown & start near stem. Fruit may be stunted, misshapen or crack.
- Cankers occur on stems of peach.

Botrytis (Gray Mold)

- Fruiting plants affected by Botrytis include: Stone Fruit, Caneberries, Grape, Citrus, Guava, Strawberry, many others.
- Infects flower petals, young leaves & especially fleshy fruit. Touching fruit spread disease. Spores are spread in dust-like clouds
- Likes high humidity & moisture. Favors cool – warm spring & summer rainy weather. Occurs at temperatures of 32 –80 degrees.
- **Maintain good air circulation and sanitation! Topping or heading trees can result in poor air circulation and can promote this disease!**

Botrytis bunch rot of grape.

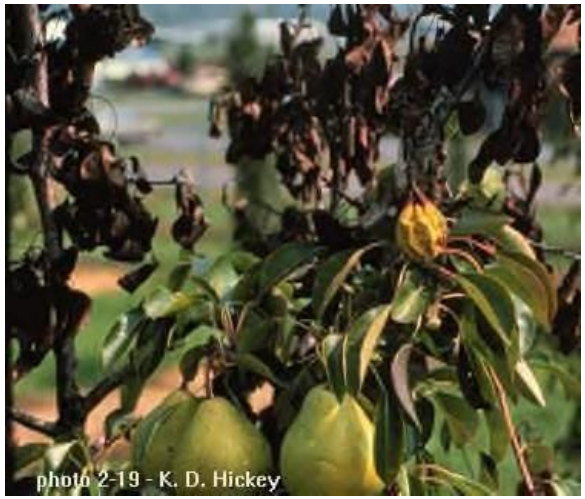
Fungicides

- There are many types of fungicides available for controlling diseases on fruit trees. These can be organic, inorganic, or synthetic and are available in many forms: liquids or powders; concentrates or ready to use.

- ***Bacillus subtilis*** is a bacterium that is used as a fungicide. It is effective against a range of bacterial and fungal diseases.
- Approved for Organic use/OMRI certified.
- Controls common diseases of garden plants including black spot, powdery mildew, anthracnose, bacterial spot, leaf blight, rust, gray mold, scab and more.

Fire Blight

- Fruiting plants affected by Fire Blight are: Apple, Pear, Quince and Loquat



Fire Blight

- Fire blight, caused by the bacterium *Erwinia amylovora,* is a common and frequently destructive bacterial disease of pome fruit trees. Pear and quince trees are extremely susceptible.

- Fire blight infections can destroy limbs and even entire shrubs or trees.

- Disease symptoms can appear as soon as trees begin active growth. The first sign is a watery, light tan bacterial ooze that exudes from branch, twig, or trunk cankers . The ooze turns dark after exposure to air, leaving dark streaks on branches or trunks.

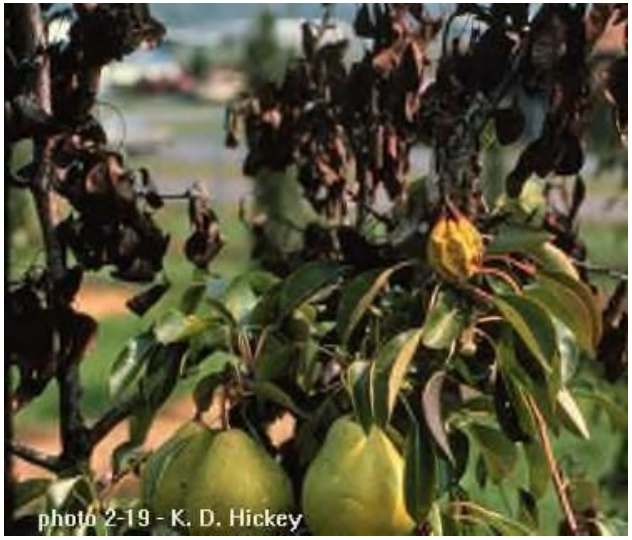
- Cankers may be inconspicuous and infections may not be noticed until later in spring when flowers, shoots, and/or young fruit shrivel and blacken.

Fire Blight

- New infections usually first enter through the flowers. Infected flowers and flower stems wilt and turn black on pear trees, whereas on apple trees they turn brown.

- Blight infections often move into twigs and branches from infected blossom clusters, causing small shoots to wilt, forming a crook at the end of each infected shoot.

- Eventually the infected portion of the shoot turns black. Dead, blackened leaves and fruit cling to branches throughout the season, giving the tree a scorched appearance, hence the name "fire blight."



Fire Blight

- The bacteria can be transmitted to nearby blossoms or succulent growing shoots by splashing rain or insects, especially honey bees. Injuries caused by wind, hail, or insect feeding to succulent tissues are easily invaded by fire blight bacteria.

- **Ideal conditions for infection, disease development, and spread of the pathogen are rainy or humid weather with daytime temperatures in the range of 75° to 85°F, especially when night temperatures stay above 55°F.**

- Once fire blight bacteria enter the blossoms, they may cause only a localized infection and eventually die, or they may move into the twigs and branches.

- Fire blight bacteria that survive generally do not move through the bark uniformly but invade healthy wood by moving in narrow paths up to 1-1/2 inches wide in the outer bark ahead of the main infection. These long, narrow infections may extend 2 to 3 feet beyond the edge of the main infection or canker.

- **Vigorously growing shoots are the most severely affected; therefore, conditions that favor rapid shoot growth, such as high soil fertility and abundant soil moisture, increase the severity of damage to trees.**

Fire Blight Control

- Eliminate fire blight infections by pruning out diseased branches. **Always cut an infected branch at least 8 to 12 inches below the visible injury or canker.**

- If a fire blight infection occurs on a trunk or major limb, the wood can often be saved by scraping off the bark down to the cambium layer in infected areas. When scraping, look for long, narrow infections that may extend beyond the margin of the canker or infection site. If any are detected, remove all discolored tissue plus 6 to 8 inches more beyond the infection. If the limb has been girdled, scraping will not work and the whole limb must be removed.

- To avoid spreading bacteria during pruning, dip or spray the pruning tool before each cut with a 10% solution of bleach (one part bleach to nine parts water).

- **A very weak (about 0.5%) Bordeaux mixture or other copper fungicide applied several times as blossoms open can reduce new infections, but will not eliminate all new infections nor those already existing in wood.** The number of applications needed depends on the blooming period. Once blossoms begin to open, make the first application when the average temperature exceeds 60°F. Apply at 4- to 5-day intervals during periods of high humidity and until late bloom is over. For pear trees, this may mean five to twelve applications per season.

Critter Control

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