Some of the more common insects and appropriate methods of control:

- **APHIDS -** small, juicy-looking insects, usually light green, but can be white, black or grey, that suck sap from young leaves and flower buds. Insecticidal soaps, dish soaps, and most houseplant sprays will kill them on contact, but must be repeated 2 to 3 times every four to six days to be effective and will only kill the aphids they come in contact with.
- **SPIDER MITES –** tiny (need magnification to see them), closely related to spiders, having 8 legs as opposed to 6. They look like very small, fine grains of pepper on the underside of a leaf along the mid-vein. May see fine webbing in crotches of branches or petioles. Mites favor hot, dry weather and drought stressed plants and cause tiny chlorotic spots (stippling), general yellowing, and leaf drop. Wash plant with soap and water, rinse and spray with insecticidal soaps, neem oil, malathion, orthene, isotox, or pyrethrins at least 3 times at 7 to 10 day intervals. Make sure commercial product is labeled specifically for mites.
- **MEALY BUGS -** look like little clusters of damp cotton wool, usually in a crack where a leaf joins a stem. Dabbing each insect with rubbing alcohol on a Q-tip will kill that insect but is rather time consuming! Wash plant with soap and water, rinse and spray with insecticidal soaps, neem oil, malathion, orthene, isotox, or pyrethrin based spray at least 3 times at 7 to 10 day intervals.
- **SCALE –** comes in a variety of sizes, shapes and forms. Several varieties look like a drop of brown, dried glue on the stems or undersides of smooth-leaved plants. Others are covered in waxy egg sacs attached to their bodies giving them a cottony appearance similar to mealy bugs. Still others are covered in a hard white wax. Most scale insects can be scraped off with a fingernail. It is possible to kill individual scales by rubbing each one off with rubbing alcohol, but this will not kill them all, and they will be back! Chemicals control: acephate (Orthene systemic), carbaryl (Ortho Liquid Sevin), diazinon, malathion, dormant oil (Volck Oil Spray) alone or combined with carbaryl, acephate, diazinon or malathion. Most are aimed at the crawler stage and most will not penetrate the hard shell of the adult and the eggs underneath. It is often better to eliminate that plant, as it can spread to other plants and is all but impossible to eradicate.
- **FUNGUS GNATS –** are tiny little black insects hovering around plants. The adults do no harm, other than annoyance, but the larvae in the soil can damage fine root hairs if in large numbers. They prefer dying plant roots and are an indication that the soil is being kept too wet (which kills the roots). Sprinkling the top of the soil with Epsom salts will temporarily eliminate the problem but modifying watering habits will be the only way to completely eliminate them.
- **WHITEFLIES -** tiny white flies on the underside of the leaves that fly up into the air when disturbed. Generally come from infested green house plants. Whiteflies have 5 stages of development and each stage has a different tolerance to insecticides. Insecticides easily eliminate whitefly adults and crawling nymphs. However, eggs, feeding nymphs and pupae defy insecticides. You must spray four times at 4 to 6 day intervals to control nymphs as they hatch. Be sure to spray leaf undersides, where whiteflies congregate. A combination of systemic and contact insecticides (malathion or diazinon, acephate (Orthene systemic) must be used at least 4 times at 4 to 6 day intervals.

If you are not sure what the problem is, do not spray to see if it will work! It is very easy to do more damage than the bugs could! Be cautious with chemicals, and **READ LABELS!**

COMMON DISEASES OF BONSAI TREES

PLANT	PATHOGEN	SYMPTOMS	CONDITIONS FAVORING INFECTION	TREATMENT
APPLE & CRABAPPLE	*Venturia inaequalis* (apple scab - fungus)	Metallic black circular lesions on leaf surface or fruit	Avoid overhead watering	Fungicide such as captan
AZALEA	*Exobasidium vaccinii* (leaf gall – fungus)	Developing leaves are fleshy, thickened, distorted; enlarging to become white or pink.	Poor air circulation, insufficient light, overhead watering in spring.	Remove galls when first noticed. Fungicide containing tribasic copper sulfate or zineb.
COTONEASTER, PYRACANTHA, HAWTHORNE, CRABAPPLE, QUINCE	*Erwinia amylovara* (fireblight – bacteria)	Blossoms & leaves suddenly wilt and turn black as if scorched by fire; bark at base of twigs becomes water soaked, then dark sunken and dry; cracks may develop with drops of brown ooze	Spread by insects (bees), rain, wind and contaminated tools.	Purchase resistant varieties. Bordeaux mix (copper sulfate) or Streptomycin.
HAWTHORNE, CRABAPPLE, QUINCE	*Gymnosporangium spp.* (cedar-apple rust - fungus)	Circular orange, red or gray spots on leaf surface *alternate hosts: CEDAR & JUNIPER	Avoid collected specimens, eliminate alternate hosts.	Spray with maneb, zineb, or furbam as flower buds open 2 – 3 times at 7 to 10 day intervals.
BOXWOOD	*Phytophthora cinnamoni* (root rot – fungus)	Young leaves are yellowish & wilting, dead leaves remain attached. Bark close to ground level shows dark discoloration when peeled back	Poorly drained, heavy soil, overwatering.	Soil pathogen, no chemical treatment. Maintain good cultural practices.
HORNBEAM, BEECH	CANKERS (many fungal spp)	Leaves on affected twigs are stunted & lighter green in color; sunken, water soaked area on branch or trunk	Wound induced, improper pruning	Remove effected areas. Sometimes tree will "cure" itself by producing callus tissue and branch will survive.
CRAPE MYRTLE *Lagerstromia*	*Erysiphe lagerstromiae* (powdery mildew - fungus)	White to grayish powdery splotches on leaves and flowers. Stunted growth, leaf and bud drop	Spread by wind. Thrives in both humid and dry weather.	Almost any broad spectrum fungicide.
LILAC	Microsphaeria alni (powdery mildew - fungus)	Thin white coating on leaves in late summer or fall.	Insufficient light, overcrowding, insufficient air circulation	Unnecessary since it occurs late in the season and is not particularly injurious since leaves drop off in fall.

SPRUCE	*Cytospora kunzei* (spruce canker & dieback – fungus)	Needles nearest base of tree turn brown and dry. Amber colored pitch oozes from infected area.	Attacks older, weak or injured trees; drought stress	Prune off and destroy dead or dying branches, keep trees vigorous by watering and fertilizing regularly. Benlate, 3 times, 10 day day intervals.
PINE (MUGO, SCOTCH WHITE)	*Diplodia pinea* (*Diplodia* tip blight - fungus)	New growth is stunted and brown. *Dead buds and needles remain place "glued in" by resin formation.	Poor growing conditions, wet spring; spread by wind & rain.	Prune off and destroy dead or dying branches, keep trees vigorous by watering and fertilizing regularly. Benlate, 3 times, 10 day intervals.
JUNIPER, CHAMAECYPARIS, CRYPTOMERIA, ARBOVITAE	Phomopsis juniperovora (Twig blight – fungus)	Needles, twigs, & branches turn light brown to reddish brown, then gray gradually dying from the tips back. Border between healthy and dead tissue sharp as opposed to the gradual transition in drought stressed plants.	Overhead watering, wet weather, shady moist locations, insects and infected tools. *Watch out for old, end of season nursery stock!	Prune out and destroy infected branches (clean pruners with alcohol between cuts). Provide good air circulation & full sun.
ANY TREE INFESTED WITH SCALE, MEALY BUGS, OR APHIDS	Sooty mold (fungus)	Leaves are covered with a black coating "stuck" on the honeydew (sticky, sugary fluid excreted by insect pests).	Secondary infection caused by honeydew excretion.	Wash plant with soap and water and prevent further infection by controlling the insect producing the honeydew.

Fungi are organisms having no chlorophyll and therefore are either parasitic (require a living host) or saprophytic (live on dead or decaying tissue). Fungus growth on a bonsai usually starts from spores finding a weak spot on the plant. When a sick bonsai tree is attacked by a fungus, its immune system cannot fight off the disease. Once inside the plant, the spores develop into a mass of interwoven threads called a mycelium which absorbs nutrients from the host plant cells.

OTHER SPRAYS FOR PEST CONTROL

- **Fungicides** - The 2 most commonly used acceptable fungicides are sulfur and copper.
- They are highly toxic to humans and other mammals, fish and aquatic invertebrates.
- Fungicides act as protectants that inhibit the germination and growth of fungal spores.
- Apply prior to periods of wet and humid weather when disease organisms can spread and grow easily
- Since copper is a protectant, cover the entire plant surface to prevent invasion by disease organisms. Spray in the early morning in dry, bright weather so that plants have time to dry. If the solution remains on leaves too long, it may penetrate the cuticle and kill the tissue.
- Commercial Products: Bluestone (copper sulfate) Bonide Liquid Copper, Kocide, Top Cop, Top Cop with Sulfur

*** Never apply oils within 1 month before or after applying sprays containing sulfur.**
SOME OIL SPRAYS AND FUNGICIDES ARE NOT COMPATIBLE *CHECK LABELS*!

- **Oil Sprays** - These products are called superior, summer or supreme oils. They are especially effective at controlling pests because they spread thoroughly over the leaf surface. They work physically to smother and kill pests and their eggs. Superior oils are unique because they control a broad variety of insect pests while going easy on beneficial insects. Oils smother insects and their eggs. Use superior oils to control aphids, mealybugs, mites and scales on a variety of fruit, nut, ornamental and shade trees. Cover both upper and lower leaf surfaces as well as to reach the trunk and small branches. You cannot over apply oil unless you repeat a spraying after the first spray dries. (Label may provide directions for mixing in other pesticides, such as malathion, for even-more-effective growing season control. Also check label to make sure your tree is listed - certain plants & conifers should not be treated with oils).
  Precautions: Do not apply oil when the temperature is lower than 40 degrees or higher than 80 degrees or if the humidity exceeds 90%, because these factors affect the oil's evaporation and plants can be injured. Nor should you spray with oil 30 days before or after applying any type of sulfur spray or certain fungicides.
  Commercial products: SunSpray Ultra-Fine oil, Volck Oil Spray.

- **Neem oil** is a vegetable oil pressed from the fruits and seeds of an evergreen tree (*Azadirachta indica*). It repels a wide variety of pests including mealy bugs, aphids, scale, whiteflies, and spider mites. Neem oil also works as a fungicide and helps control powdery mildew. Some people have also experienced good results with neem oil spray on black spot, anthracnose and rust fungi.
  Pure Neem oil should be diluted at the rate of 1 teaspoon per quart, or 4 teaspoons per gallon of water. Adding a surfactant greatly enhances its effectiveness (1/4 teaspoon liquid dishwashing soap per quart) Neem oil spray like any other oil spray can also burn leaves if sprayed in sun. ***Do not use on Japanese maple!

- **Soap Sprays** - Insecticidal soaps control insect pests by penetrating their cuticles, which causes their cell membranes to collapse and leak, resulting in dehydration. While some insects can overcome the effects of a soap spray, others are immediately affected and die.
  - Protection offered: soft-bodied insects like aphids, mealybugs, and whiteflies. (Non-toxic to humans, but will kill baneficals, so limit their use to problem areas.)
  - Household soaps that can be used: Dawn, Palmolive, Ivory Liquid, or Shaklee's Basic H. (Shaklee Basic H - mix I tablespoon per gallon.)
  - Soaps can be mixed with other insecticides, horticultural oil, pyrethrin and rotenone to boost their toxicity.
  - Commercial Products: Aphid-Mite Attac, Safer Garden Fungicide (soap and sulfur), Safer Insecticidal Soap, Savona