



Ken Matthews Garden Center

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SPRAY CHART

FEBRUARY

Year Round Oil or Dormant Oil with lime sulfur – one treatment every 30 days. These are the least toxic treatments and best used as a preventative or for minor infestations. Lime sulfur treats overwintering fungus such as rusts, leaf spot and blackspot

MARCH

Repeat application as stated above

APRIL

Insecticidal Soap for leafminer
Bacillus Thuringiensis (B.T.) for bagworms, inchworms and tent caterpillars
Fungicide application as a preventative if you have known problem

MAY

Insecticidal soap for lacebugs, spider mites and aphids
Bare Minor spray for borers
Bacillus Thuringiensis (B.T.) second application for bagworms, inchworms and tent caterpillars
Milkey Spore for beetle grubs

JUNE

Insecticidal Soap for lacebugs

JULY

Insecticidal Soap and Capt. Jacks (used alternately) to control spider mites

AUGUST

Tanglefoot on trees

SEPTEMBER

Insecticidal Soap for lacebugs

IPM PEST MONITORING CALENDAR

Dormant Season

February-March- early April

aphids (eggs of several species)
adelgids (eggs, nymphs, and adults of several species)
bagworm (cases containing eggs)
boxwood leafminer (larvae)
gypsy moth (egg masses)
juniper webworm (larvae)
mites (eggs and adults of several species)
Nantucket pine tip moth (pupae in dead tips)
scale insects (all stages of several species)
tent caterpillar (egg masses)
white pine weevil

Camellia petal blight
anthracnose diseases
leaf spots
spot anthracnose (dogwood)
phomopsis twig blight (juniper)
stem cankers

April

arborvitae leafminer
balsam twig aphid
boxwood leafminer (adults)
cankerworms (two species)
dusky birch sawfly
eastern tent caterpillar
elm bark beetle
hackberry psyllid
hemlock woolly adelgid
juniper webworm
lilac borer
Nantucket pine tip moth
northern pine weevil
Pales weevil
pine bark adelgid
spruce spider mite
white pine aphid
white pine weevil

woolly apple aphid

azalea leaf gall
azalea petal blight
anthracnose diseases
leaf spots
entomosporium (photinia)
fire blight
spot anthracnose (dogwood)
phomopsis twig blight (juniper)
botrytis
stem cankers

May

aphids and adelgids (several species)
armored scales (crawlers of several species)
azalea lacebug
azalea leafminer (adults)
azalea whitefly
banded ash borer (larvae)
bark beetles (several species)
birch leafminer
boxwood mite
boxwood psyllid (nymphs)
bronze birch borer (adults)
blackheaded ash sawfly
calico scale (adults)
cankerworms (two species)
cottonwood leaf beetle
cottony camellia scale (adults)
cottony maple scale
dogwood borer
dusky birch sawfly
eastern tent caterpillar
elm case bearer
elm leaf beetle
euonymus scale (crawlers)
European elm scale (crawlers)
European fruit lecanium (adults)
European red mite
fall webworm
Fletcher scale (adults)

soft scales (crawlers of several species)
southern pine beetle
taxus mealybug
terrapin scale (crawlers)
twobanded Japanese weevil
wax scale (crawlers)
white peach scale (crawlers)
white prunicola scale (crawlers)

phytophthora root rot
phytophthora die back
entomosporium
powdery mildew
fire blight
black spot (roses)
botrytis
hollyhock rust
cedar-apple rust

July

aphids (several species)
azalea lacebug
azalea leafminer
bagworm
banded ash borer (larvae)
bark beetles (several species)
black vine weevil
boxelder bug
bronze birch borer
dogwood borer
fall webworm
gloomy scale (crawlers)
Japanese beetle
lacebugs (several species)
leafhopper
leopard moth
locust leafminer (adults)
mimosa webworm
obscure scale (crawlers)
oystershell scale (crawlers)
Peachtree borer
pine needle scale (crawlers)
pine sawflies (several species)
pine tube moth

plantbugs (several species)
rhododendron borer
roundheaded appletree borer
San Jose scale (crawlers)
southern pine beetle
twobanded Japanese weevil
twospotted spider mite
wax scale (crawlers)
whiteflies (several species)

powdery mildew
black spot (roses)
southern wilt
phytophthora
hollyhock rust

August

aphids (several species)
azalea caterpillar
azalea lacebug
azalea leafminer
banded ash borer (larvae and pupae)
bark beetles (several species)
black vine weevil
Cooley spruce gall
adelgid
euonymus scale (crawlers)
fall webworm
greenstriped mapleworm
leafhoppers (several species)
leopard moth
mimosa webworm
pine sawflies (several species)
plantbugs (several species)
twospotted spider mite
whiteflies (several species)
white prunicola scale (crawlers)
yellownecked caterpillar

powdery mildew
southern wilt
phytophthora
black spot (roses)

Applying the Correct Amount in the Right Place

Applying the correct amount of pesticide on target is critical for proper pest control. Using the right equipment for the job is the first important step towards achieving this task. Your choice of equipment can be as simple as using an aerosol or granular applicator supplied with the product, or as complex as using an estate sprayer for a large area. In each situation, the application equipment must be in good working order and calibrated to put down the correct amount. Ask your Extension agent for publications and assistance with calibration of larger pieces of equipment and backpack sprayers.

Proper Measuring and Mixing

To mix a concentrated formulation of a pesticide, you must first determine (according to label directions) how much concentrate to dilute with water or some other diluent. You can use the conversion charts and other pieces of information in the Reference Tables (to follow) to help you with some measurements. Determining the correct amount to mix is usually just a combination of simple math and knowing the units of measurement.

For example, the product label says, "For the control of aphids on tomatoes, mix 8 fluid ounces of pesticide concentrate into 1 gallon of water and spray the foliage until wet." By filling your sprayer with water and testing the output on your garden, you know that your six tomato plants require only one quart of dilute pesticide to cover their foliage. So you need only 2 fluid ounces of pesticide concentrate mixed in one quart of water to do the job. Why? Because a quart is one-fourth of a gallon, and 2 fluid ounces mixed into a quart make the same strength spray recommended by the label, but in a quantity that can be used all at once.

Consumers can solve similar problems by using careful math, good measurements, and use of the reference information here and in the tables at the end of this section of the guide.

Helpful Hints

If you need to determine the size of a square or rectangular area, such as a lawn for herbicide application, measure and multiply the length times the width. For example, an area 10 feet long by 8 feet wide contains 80 square feet of area. Common area measurements may involve square yards (1 square yard = 9 square feet) or square feet (1 square foot = 144 square inches).

If you need to determine the volume of a space such as a room, measure and multiply the room's length, width, and height. For example, a space 10 feet long, 8 feet wide, and 8 feet high contains a volume of 640 cubic feet. You would use this procedure for instance, for an aerosol release to control cockroaches.

Pesticide Calibration Tables

Table 1.4 - Travel Speed Chart

Time Required in Seconds to Travel

Miles per Hour	100 ft	200 ft	300 ft
1	68	136	205
2	34	68	102
3	23	46	68
4	17	34	51
5	14	27	41
6	11	23	34
7	10	20	29
8	9	17	26
9	8	15	23
10	7	14	21

1 mph = 88 feet per minute

1 mph = 1.466 feet per second

Speed in mph = Number of 35-inch steps
per minute/30

Table 1.5 - Equivalent Quantities of Dry Materials (Wettable Powders) For Various Quantities of Water

Water	Quantity of Material					
100 gal ¹	1.0 lb	2.0 lb	3.0 lb	4.0 lb ¹	5.0 lb	6.0 lb
50 gal	8.0 oz	1.0 lb	1.50 lb	2.0 lb	2.50 lb	3.0 lb
5 gal ¹	0.80 oz (3 tsp) ²	1.60 oz	2.40 oz	3.20 oz ¹	4.00 oz	4.8 oz
1 gal	0.16 oz (2 tsp) ²	0.32 oz (3 tsp) ²	0.48 oz (1 1/2 tsp) ²	0.64 oz (2 tsp) ²	0.80 oz (3 tsp) ²	0.96 oz (3 tsp) ²

¹Example: If a recommendation calls for a mixture of 4 pounds of wettable powder to 100 gallons of water, it would take 3-1/4 ounces to 5 gallons of water to give 5 gallons of spray mixture of approximately the same strength.

²Note: Wettable pesticide materials vary considerably in density. Therefore the teaspoonful (tsp) and tablespoonful (tbsp) measurements in this table are approximate but not exact dosages by weight. However, we believe that they are within the bounds of safety and efficacy for mixing small amounts of spray.

Table 1.6 - Equivalent Quantities of Liquid Materials (Emulsifiable Concentrates, etc.) for Various Quantities of Water

Water	Quantity of Material					
100 gal ¹	1/2 pt	1.0 pt	2.0 pt	3.0 pt	4.0 pt ¹	5.0 pt
50 gal	4.0 fl oz	8.0 fl oz	1.0 pt	24.0 fl oz	1.0 qt	2 1/2 pt
5 gal	0.40 fl oz (1 tbsp) ²	0.80 fl oz	1.60 fl oz	2.40 fl oz	3.20 fl oz	4.0 fl oz
1 gal ¹	0.08 fl oz (1/2 tsp) ²	0.16 fl oz (1 tsp) ²	0.32 fl oz (2 tsp) ²	0.48 fl oz (3 tsp) ²	0.64 fl oz (4 tsp) ²	0.80 fl oz (5 tsp) ²

¹Example: If 4 pints of a liquid concentrate is recommended to 100 gallons of water, 4 teaspoons of the chemical in 1 gallon of water will give a mixture of approximately the same strength.

²Approximate figure.

IDENTIFICATION OF PLANT PROBLEMS: DIAGNOSIS

Determining the causes of poor plant growth and the associated symptoms, such as leafspot and discolored leaves requires years of experience. However, generalizations can be made that will help you become proficient in diagnosing the ills of plants.

They may be injured by animals such as insects and rabbits; by other plants such as fungi and bacteria; by natural causes such as drought and nutritional disorders; and by chemical injury such as phytotoxic symptoms from sprays and air pollution.

Careful observation often reveals the cause. For example, a canker disease may have girdled a twig or limb. The symptoms might include wilted or dead leaves, but one must look carefully along the twig or limb to find the cause. Or an insect may be eating the roots of a plant – the symptoms appear first on the leaves, but until one examines the roots the cause cannot be established.

Two or more causes might produce the same kind of symptom, and there are hundreds of causes. With careful observation, knowledge of the plant's history, and a general knowledge of possible causes, plant ills can often be diagnosed without the aid of a plant pathologist or entomologist.

Ways in Which Insects Injure Plants

1. **Chewing:** devouring or notching leaves, eating wood, bark, roots, stems, fruit, seeds, mining in leaves. Symptoms: ragged leaves, holes in wood and bark or in fruit and seed, serpentine mines or blotches, wilted or dead plants, or presence of larvae.
2. **Sucking:** removing sap and cell contents and injection of toxins into plant. Symptom: usually off-color, misshapen foliage and fruit.
3. **Vectoring Diseases:** by carrying diseases from plant to plant, e.g. elm bark beetle and Dutch elm disease; various aphids and virus diseases. Symptoms: wilt, dwarf, off-color foliage.
4. **Excreting Honeydew:** deposits lead to the growth of sooty mold and leaves cannot perform their manufacturing functions, which results in a weakened plant. Symptoms: sooty black leaves, twigs, branches and fruit.
5. **Forming Galls:** galls may form on leaves, twigs, buds, and roots. They disfigure plants, and twig galls often cause serious injury.
6. **Scarring by Egglaying:** scars formed on stems, twigs, bark, or fruit. Symptoms: scarring, splitting, breaking of stems and twigs, misshapen and sometimes infested fruit.

Ways in Which Diseases Injure Plants

1. Interfere with the supply lines by clogging water-conducting cells. Examples: late blight of tomato and potato. Dutch elm disease. Symptom: wilt.
2. Destroy chlorophyll. Examples and symptoms: blotch, scab, black spots on leaves, brown patch disease of turf.
3. Destroy water- and mineral-collecting tissues. Examples and symptoms: Fusarium wilt, root rot, general stunting of plant.
4. Gall-formation disrupts normal cellular organization. Symptoms: unusual growths on flowers, twigs, and roots.
5. Produce flower and seed rots. Examples: fireblight, bacterial rot of potato.



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Praying Mantids

Use: Praying Mantids eat a wide variety of garden pests. In their younger stages they eat aphids, thrips, flies & maggots, small caterpillars, leafhoppers, white grubs and other soft-bodied insects. Mature Mantids feed on larger caterpillars, earwigs, chich bugs, sow bugs, beetles, grasshoppers and other large insects.

Release: Put the egg case in a bush, hedge, limb, or anything more than two feet above the ground. The egg case may be inserted in the form of brach or hung with a piece of string or needle and thread run through the outside edge of the case. Hanging will help keep birds and rodents from eating the eggs in the case. If ants are in the area, oiling the string will help keep them away.

Life Cycle: Praying Mantids hatch out of their egg case along the seam. They hatch in the spring when the weather warms; the warmer the temperature, the sooner they hatch. Unlike most insects, the Mantids do not hatch as larvae; they emerge as miniature adults, about half an inch long. They will grow through the spring and summer until they reach a length of 5 to 6 inches, shedding their skins several times. Although Mantids have wings, they do not use them until the fall when the female's wings develop and she begins flying around looking for males to mate with. After mating, she eats the head off the male, which helps to nourish her eggs. She then attaches brown foam to a branch, lays her eggs inside, and dies shortly afterward. The eggs are protected form the winter cold in the foam and the cycle begins again in the spring.

General Information: When the eggs hatch, the egg case does not change in appearance except for what looks like a little sawdust hanging from the seam. Since the Mantids do not move much and blend easily with their surroundings, it is easy to miss the hatching.

While most insects are constantly searching for food, Mantids are content to stay in one area and wait for their food to walk by and then grab it with their strong forelegs. This is why they are good to use early in the season, before they are pest problems and use other insects after pests arrive.



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Bagworms & Webworms

Bagworms:

The larval stage of the bagworm is one of the most destructive pests of trees and shrubs, including: *arbovitae, cedar, juniper, oak, maple, sycamore, elm, poplar, apple, cypress and MORE.*

The winter is passes as eggs inside the bag of the female that is suspended by silken threads to the plant twigs. The eggs hatch in the spring, usually in early to mid-May, and the young caterpillars ear their way out of the bag and start feeding upon the foliage of the host plant. Shortly, the young caterpillars start constructing the silken bags to which has been added chewed up bits of the host plant. As the caterpillar grows, the bag enlarges and the feeding insect carries the bag around with it. By late summer or early September, pupation occurs within the bag. Only the "winged" male moth emerges from the pupal case. The male then seeks out the bag housing the female, inserts his abdomen into the lower opening of the female bag, mates with the female and shortly thereafter dies. After the wingless female has deposited her eggs in the bag, (as many as 1453), she also moves out of the bag, drops to the ground and dies.

Bagworm cases (cocoon) are usually brown from dried leaves and twigs and the larvae are dark green to brown. They do considerable damage to trees and shrubs by skeletonizing leaves, stripping the foliage, and girdling twigs and small branches.

The younger they are, the easier they are to kill and you will also minimize the destructive damage they do.

Webworms:

One of the most unsightly objects on trees in the summer and late fall are the large, loosely woven, dirty-white webs produced by the caterpillar stage of a white moth which emerges in the spring.

The moth lays her greenish-white eggs in clusters on leaves of the host tree. They hatch shortly into pale yellow caterpillars spotted with black that are covered with long white and black "hairs."

The fully-grown caterpillar is about one inch long. The moth overwinters in a cocoon that is constructed beneath loose tree bark, under ground litter, or in loose soil around the tree base.

The moth emerges in the spring and there are usually 3 generations per year: *in the early part of JUNE, the middle to the latter part of JULY, and the middle to the latter part of AUGUST.*

Webs are usually produced on the terminal ends of tree branches and the worms consume the foliage within the web.