

# 8 ANNUAL AND PERENNIAL PLANT PEST MANAGEMENT






Common diseases of annual and perennial plants include damping-off, root and stem rots, leaf spots and blights, rusts, powdery mildew, downy mildew, vascular wilts, and

virus and nematode diseases. Insect pests include aphids, plant bugs, leafhoppers, spittlebugs, mealybugs, scales, thrips, whiteflies, mites, caterpillars, beetles, wasps, leafminers, and borers. Where aphids and other sucking insects are a problem, avoid using excess nitrogen fertilizer.

To keep annual and perennial plants healthy and attractive, you should be able to diagnose common insect and disease problems and formulate an appropriate treatment plan.

This plan should include cultural control measures such as proper site preparation; diversified plantings; sanitation during and after the growing season; disease-free transplants and seed; crop rotation; and scouting. See Chapter 2 for more details. Table 9 contains cultural control guidelines for managing common insect and disease problems. Pesticide guidelines are included in Part II, Table 9.

**Table 8. General descriptions of insect pests that feed on several different annual and perennial plants**

<i>Insect pest</i>	<i>Description/Biology</i>
<b>Aphids</b> 	<p>Small, often pear-shaped, soft-bodied insects that use their long, slender mouthparts to pierce stems, leaves, and other tender plant parts to suck out plant fluids. Sticky appearance is caused by honeydew, a sweet, sticky liquid excreted by aphids and other sucking insects. Sooty mold, a black fungus, may grow on honeydew.</p>
<b>Lacebugs</b>	<p>True bugs with lacy, whitish wing covers. Feed by sucking sap from leaves and are often found on undersides of leaves. Yellow to white spots appear on upper leaf surface, gradually coalesce, and when severe, leaves may turn brown and drop early.</p>
<b>Scales</b> 	<p>Scale insects are so unlike insects that many people do not recognize them as such. Insects are hidden under waxy or hard scale cover. Those under waxy covers are referred to as soft scales; those under hard covers are called armored scales. Long, piercing mouthparts allow them to suck juices from leaves, stems, twigs, branches, and trunks. Entire plant may decline and die. Honeydew may be abundant and sooty mold may grow on it.</p>
<b>Spider mites</b> 	<p>Related to insects but are tiny arthropods with eight legs. Feed by inserting mouthparts into plant and sucking liquid contents, causing yellowish stippling at feeding sites and general plant decline. Webbing is often seen when held up to sunlight. Mites may appear as tiny moving dots on webbing. Several predaceous mites feed on spider mites.</p>
<b>Thrips</b> 	<p>Tiny (less than 1/20 in.), often yellowish insects. Adults have long fringe of hair around wings. Cause damage by rasping leaf surface and drinking fluid that collects in injured areas. Leaves appear silvered or dried out. Brown or black spots (fecal matter and feeding scars) are often seen on plant tissue.</p>
<b>Whiteflies</b> 	<p>Adults are small, yellowish insects with dull white wings. Immature whiteflies are oval and flattened, yellowish scalelike insects. Heavily infested plants send up a cloud of adults when disturbed. Some whiteflies transmit plant diseases that are devastating to some crop plants. Eggs are very small, laid on undersides of leaves. Crawlers hatch from eggs, move to a feeding site, then become more sedentary. Honeydew may be present.</p>

**Table 9. Annual and perennial pest management**

<i>Plant</i>	<i>Pest/Disease*</i>	<i>Pest management practices</i>
<b>Ageratum</b>	Root rot	Rogue plants: remove and destroy or discard entire infected plant and immediately surrounding soil or soil clinging to roots. Improve soil drainage. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil.
<b>Whitefly</b>	Spider mites	Wash off with water occasionally as needed early in the day. A hard stream of water can be used to remove mites from plants. Rogue infested plants.
	Whitefly	Do not purchase infested plants. Rogue heavily infested plants.
<b>Chrysanthemum</b>	Bacterial leaf spot	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Verify diagnosis.
	Brown rust	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Identify alternate host and remove if possible.
	Fungal leaf spot	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Verify diagnosis.
	Powdery mildew	Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible.
	Viral diseases	Rogue plants: remove and destroy or discard entire infected plant and immediately surrounding soil or soil clinging to roots. Manage insect vectors.
	White rust	This disease is under federal quarantine. Contact the NYS Dept. of Ag. and Markets to report; verify diagnosis.
	Aphids	Wash off with water occasionally as needed early in the day. A hard stream of water can be used to remove many aphids from plants.
	Beetles	Remove by hand.
	Borers	Cut and bury large-stemmed weeds nearby. Prune off and destroy affected pests.
	Caterpillars	Remove by hand.





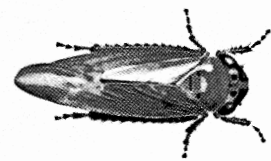
**Powdery mildew on a chrysanthemum leaf**

\*For descriptions of arthropods, see Table 8.

*continued*

**Table 9. Annual and perennial pest management** (*continued*)

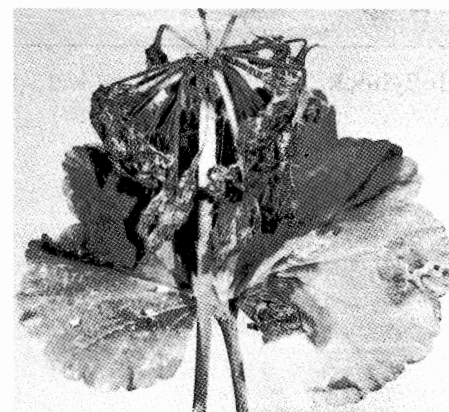
<i>Plant</i>	<i>Pest/Disease</i>	<i>Pest management practices</i>
<b>Cockscomb</b> <i>(Celosia sp.)</i>   <b>Spider mite</b>	Fungal leaf spot	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Verify diagnosis.
	Spider mites	See Ageratum.
<b>Columbine</b>   <b>Aphid</b>	Crown and root rot	Improve soil drainage. Rogue plants: remove and destroy and discard entire infested plant and immediately surrounding soil or soil clinging to roots. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil.
	Fungal leaf spot	See Cockscomb.
	Aphids	See Chrysanthemum.
	Leafminer	These insects create serpentine tunnels or mines in leaves, gradually taking over entire leaf. Practice plant sanitation. Remove or discard affected leaves.
	Sawfly	Remove by hand. Wash off and dispose of young larvae that collect on screening.
<b>Dahlia</b>	Botrytis blight (Gray mold)	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings.
	Powdery mildew	Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible.
	Stem rot and wilt	Improve soil drainage. Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil.
	Viral diseases	See Chrysanthemum.
	Aphids	See Chrysanthemum.
	Beetles	Handpick and destroy.
	Leafhoppers	These insects cause stunting of plants, curling and browning of leaf margins. Grow plants under screening to prevent access by leafhoppers.
	Spider mites	See Ageratum.
	Tarnished plant bug	These bugs cause blackening of buds and new growth. Screen plants to prevent insect access.
	Thrips	These insects cause silvery foliage and flower streaks. No cultural control is available.



**Leafhopper**

**Table 9. Annual and perennial pest management** (*continued*)


<i>Plant</i>	<i>Pest/Disease</i>	<i>Pest management practices</i>
<b>Daylily</b> ( <i>Hemerocallis</i> sp.)	Fungal leaf spot	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings.
	Thrips	These insects cause silvery foliage and flower streaks. No cultural control is available.
<b>Delphinium</b>	See Larkspur.	
<b>Forget-me-not</b>	Wilt ( <i>Sclerotinia sclerotiorum</i> )	Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil.
	Aphids	See Chrysanthemum.
	Flea beetles	These small black beetles cause minute shot holes in foliage. No cultural control is available.
<b>Geranium</b>	Bacterial blight	Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Practice crop rotation: locate new plants in a part of the garden different from the previous year's location. If that is not possible, remove infested soil and replace with fresh soil.
	Botrytis blight (Gray mold)	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings.
	Aphids	See Chrysanthemum.
	Caterpillars	Handpick and destroy.
	Whitefly	This insect causes yellowing and early drop of leaves. Do not purchase infested plants.



**Botrytis blight on a geranium flower cluster and leaf**

*continued*

**Table 9. Annual and perennial pest management** (continued)


<i>Plant</i>	<i>Pest/Disease</i>	<i>Pest management practices</i>
<b>Gladiolus</b>	Fusarium yellows	<p>Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil. Use resistant varieties. Dry corms thoroughly before storing in a cool place. Hot water treatment of corms is possible, but specific recommendations vary.</p>  <p><b>Fusarium yellows–infected gladiolus among healthy ones</b></p>
	Thrips	<p>Most serious pest of gladiolus. Feeding causes streaking of leaves and distortion of flowers or even failure of flowers to open. Two very important measures for controlling thrips are breaking tops from corms and discarding them immediately after digging; and storing corms at 35–40° F, which is too low for thrips to survive winter, or 40–50° F, which is too cool for population to build.</p>
<b>Hollyhock</b> ( <i>Althaea</i> sp.)	Fungal leaf spots	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible.
	Rust	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation.
	Beetles	Handpick.
	Leafhoppers	No cultural control is available.
	Spider mites	Spider mites cause leaves to yellow and have fine webbing. See <i>Ageratum</i> .
<b>Hosta</b>	Crown rot ( <i>Sclerotium rolfsii</i> )	Rogue infected plants.
	Foliar nematode	The foliar nematode enters leaves through stomata. It feeds on internal plant cells, causing death as it moves through leaf. Angular lesions are often observed on infested plants. Remove infested plants.



Thrips


Thrips

**Table 9. Annual and perennial pest management** (*continued*)

<i>Plant</i>	<i>Pest/Disease</i>	<i>Pest management practices</i>
<b>Hosta</b> ( <i>continued</i> )	Slugs	Damage is worse in years with wet spring weather. Slugs feed at night, eating out large, irregular areas in fruit and foliage, hiding during the day in damp refuse or soil. They leave a glistening slime trail that can be seen early in the day. Homemade traps can help; handpick and destroy slugs.
<b>Hydrangea</b>	Bacterial wilt ( <i>Pseudomonas solanacearum</i> )	Rogue; remove soil and replace. See Nasturtium.
	Fungal leaf spot	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Verify diagnosis.
	Powdery mildew	Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible.
	Aphids	See Chrysanthemum.
	Leaf-tier (caterpillar)	Handpick caterpillars and destroy.
 <b>Aphid</b>	Spider mites	See Ageratum.
<b>Impatiens</b>	Rhizoctonia web blight	Eliminate overhead watering; water early in the day.
	Seedling damping-off	Use sterile potting mix. Avoid overwatering. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Verify diagnosis.
	Verticillium wilt	Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil. Verify diagnosis.
	Aphids	See Chrysanthemum.
	Spider mites	See Ageratum.

*continued*

**Table 9. Annual and perennial pest management** (continued)

Plant	Pest/Disease	Pest management practices
<b>Iris</b> 	Bacterial leaf spot <i>(Xanthomonas tardicrescens)</i>	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings.
	Heterosporium (=Didymellina) leaf spot	Same as preceding entry.
	Aphids	Wash off as needed.
	Borer	Thoroughly clean up plant in fall and spring of each year. Control is based on destroying overwintering eggs. All debris (especially old leaves near plant base) in and around iris planting must be removed and destroyed by late winter. Prune off or squeeze damaged leaves as soon as feeding is noticed. During division, every few years, discard all damaged rhizomes. Beneficial nematodes may be used for control of larvae once they are in rhizomes in soil.
	<b>Heterosporium            (=Didymellina)            leaf spot on iris</b>	
<b>Larkspur            (Delphinium)</b>	Bacterial leaf spot <i>(Pseudomonas syringae)</i>	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings.
	Bacterial soft rot <i>(Erwinia carotovora)</i>	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Cut rotted areas from rhizomes. Dry in direct sunlight for one day.
	Crown rot <i>(Sclerotium rolfsii)</i>	Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil.
	Powdery mildew	Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible.
	Aphids	See Chrysanthemum.
Borers	Collect and bury large-stemmed weeds and all larkspur and delphinium debris after frost in autumn.	


**Table 9. Annual and perennial pest management** (*continued*)

<i>Plant</i>	<i>Pest/Disease*</i>	<i>Pest management practices</i>
<b>Larkspur (Delphinium)</b> ( <i>continued</i> )	Cyclamen mite	Plant becomes deformed. Destroy infested plants.
	Spider mites	See Ageratum.
<b>Lilies (Lilium sp.)</b>	Bacterial soft rot ( <i>Erwinia carotovora</i> )	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots.
	Botrytis blight (Gray mold)	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings.
	Wilt ( <i>Sclerotium rolfsii</i> )	Rogue plants; remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil.
	Aphids	May transmit virus. See Chrysanthemum.
<b>Lupine (Lupinus sp.)</b>	Crown rot	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Improve soil drainage or relocate plants to a better-drained area.
	Powdery mildew	Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible.
	Aphids	Green with white wax, sometimes numerous. See Chrysanthemum.
	Whitefly	See Ageratum.
<b>Marigold (Tagetes sp.)</b>	Alternaria leaf spot	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Verify diagnosis.
	Botrytis blight	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings.


*continued*



**Table 9. Annual and perennial pest management** (continued)


<i>Plant</i>	<i>Pest/Disease*</i>	<i>Pest management practices</i>
<b>Marigold</b> ( <i>Tagetes</i> sp.) (continued)	Root rot	Improve soil drainage. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil. Rogue plants: remove and destroy or discard entire infected plant and immediately surrounding soil or soil clinging to roots.
	Sclerotinia stem rot	Same as for root rot.
	Wilt	Same as for root rot.
	Slugs and snails	Slugs look like snails without shells. Look for both slugs and snails at night or in rain or look for slime trails and feeding damage early in the day. Feeding often starts on lower leaves and moves upward. Traps that produce a cool, shady hideout during the day work well; with certain traps you must collect slugs and dispose of them daily. If you handpick, you may want to wear gloves. Avoid too much organic mulch near planting; mulch keeps environment moist, which slugs like.
	Spider mites	See Ageratum.
<b>Nasturtium</b>	Bacterial leaf spot ( <i>Pseudomonas syringae</i> )	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings.
	Bacterial wilt ( <i>Pseudomonas solanacearum</i> )	Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil.
	Fungal leaf spot	See Hydrangea.
	Aphids	Bean aphid is black and easily seen. See Chrysanthemum.
	Spider mites	See Ageratum.
	Tarnished plant bug	Keep weeds down in vicinity of garden.
<b>Pansy</b> ( <i>Viola</i> sp.)	Anthracnose	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings.
	Downy mildew	Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings.
	Fungal leaf spot	See Anthracnose.
	Scab ( <i>Sphaeceloma violae</i> )	See Anthracnose.
	Aphids	See Chrysanthemum.
 <b>Long-tailed mealybug</b>	Mealybug	Discard badly infested plants.

**Table 9. Annual and perennial pest management** (continued)



<i>Plant</i>	<i>Pest/Disease*</i>	<i>Pest management practices</i>
<b>Pansy</b> ( <i>Viola</i> sp.) (continued)	Spider mites	See Ageratum.
<b>Peony</b> ( <i>Paeonia</i> sp.)   <b>Japanese beetle</b>	Botrytis blight (Gray mold)	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, cut back to ground, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings.
	Redspot ( <i>Cladosporium paeoniae</i> )	See Botrytis blight.
	Root rot	Improve soil drainage; avoid overwatering.
	Japanese beetle and rose chafer	Handpick beetles when first seen and repeat as necessary.
	Thrips	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof.
<b>Petunia</b>	Botrytis blight (Gray mold)	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Water early. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space them apart to allow air circulation; prune to thin plants or plantings. Remove spent flowers.
	Sclerotinia stem rot	See Marigold.
	Viral diseases	Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Do not save seed from infested plants. Manage insect vectors.
<b>Phlox</b>	Fungal leaf spot	See Cockscomb.
	Powdery mildew	Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Place in a sunny location. Plant species or varieties that are resistant or less susceptible.
	Plant bugs	Bugs cause white to brown spots on leaves, deformed buds. No cultural control is available.
	Spider mites	Destroy severely infested plants or portions thereof. Wash plants with a forceful spray of water every other day at least three times to knock off mites.

continued

**Table 9. Annual and perennial pest management** (*continued*)

<i>Plant</i>	<i>Pest/Disease*</i>	<i>Pest management practices</i>
<b>Poppy</b> ( <i>Papaver</i> sp.)	Bacterial blight ( <i>Xanthomonas papavericola</i> )	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil. Use treated, disease-free seed.
	Aphids	See Chrysanthemum.
	Leafhoppers	No cultural controls are available.
<b>Roses</b>		See Table 11, Tree and shrub pest management.
<b>Shasta dairy</b>  Aphid or plant louse	Fungal leaf spot	See Cockscomb.
	Aphids	See Chrysanthemum.
	Beetles	Handpick and destroy.
<b>Snapdragon</b> ( <i>Chrysanthemum maximum</i> )	Anthracnose	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Use disease-free seed.
	Powdery mildew	Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible.
	Rhizoctonia root and stem rot	Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil. Improve soil drainage.
	Rust	See Chrysanthemum.
	Aphids	See Chrysanthemum.
	Beetles	Handpick and destroy.
	Spider mites	See Ageratum.
	<b>Stock</b> ( <i>Matthiola</i> sp.)	Fungal leaf spot
	Wilt	Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil.

**Table 9. Annual and perennial pest management** (continued)

<i>Plant</i>	<i>Pest/Disease*</i>	<i>Pest management practices</i>
<b>Sweet alyssum</b> <i>(Lobularia maritima)</i>  <b>leafhopper</b>	Downy mildew	Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Use treated, disease-free seed.
	Rhizoctonia root and stem rot	See Snapdragon.
	Leafhoppers	No cultural controls are available.
	Whitefly	See Ageratum.
<b>Sweet pea</b> <i>(Lathyrus odoratus)</i>	Anthracnose	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings. Use disease-free seed.
	Fungal leaf spot	See Cockscomb.
	Root rot	Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Improve soil drainage. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil.
	Aphids	See Chrysanthemum.
	Leafminer	Attracted by high organic matter. Remove and bury infested leaves.
	Seedcorn maggot	Use successive plantings 7 to 10 days apart. Some plants will escape damage. Use row cover over seed bed during germination.
<b>Tulip</b> <i>(Tulipa sp.)</i>	Botrytis blight (Tulip fire)	Trim leaves off just after they turn yellow. Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots.
<b>Verbena</b>  <b>Leafminer injury</b>	Bacterial wilt ( <i>Pseudomonas solanacearum</i> )	Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Practice crop rotation: locate new plants in a part of the garden different from previous year's location. If that is not possible, remove infested soil and replace with fresh soil.
	Powdery mildew	Avoid crowding plants; space apart to allow air circulation. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible.
	Aphids	See Chrysanthemum.
	Leafminer	Handpick infested leaves.
	Plant bugs	No cultural control is available.
Spider mites	See Ageratum.	

continued

**Table 9. Annual and perennial pest management** (continued)

<i>Plant</i>	<i>Pest/Disease*</i>	<i>Pest management practices</i>
<b>Zinnia</b>	Alternaria leaf spot	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Avoid crowding plants; space plants apart to allow air circulation; prune to thin plants or plantings.
	Bacterial leaf spot ( <i>Xanthomonas</i> )	Practice plant sanitation: when plants are not wet, carefully remove and destroy or discard affected plant parts or portions thereof. In autumn, rake and remove all garden debris. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible. Improve air circulation.
	Powdery mildew	Avoid crowding plants; space apart to allow air circulation; prune to thin plants or plantings. Avoid wetting foliage if possible. Water early in the day so aboveground plant parts will dry as quickly as possible.
	Sclerotinia stem rot	See Marigold.
	Viral diseases	Rogue plants: remove and destroy or discard entire infested plant and immediately surrounding soil or soil clinging to roots. Manage insect vectors.
	Japanese beetle	Handpick and destroy beetles.
	Spider mites	See Ageratum.

**FURTHER READING**

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