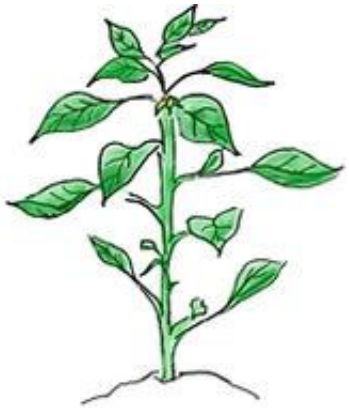
Starting to Grow Your Own Food?

Learn How to Win the Battle Against Pests

UC IPM

University of California
Agriculture and Natural Resources



Prepared by:
Carolyn Kinnon

Gardening the Healthy Way begins with…

Integrated Pest Management

A least hazardous strategy that combines several methods for controlling pests and maintaining healthy gardens rather than relying on only one method.

1. If applied incorrectly, pesticides can have toxic affects on non-target organisms.

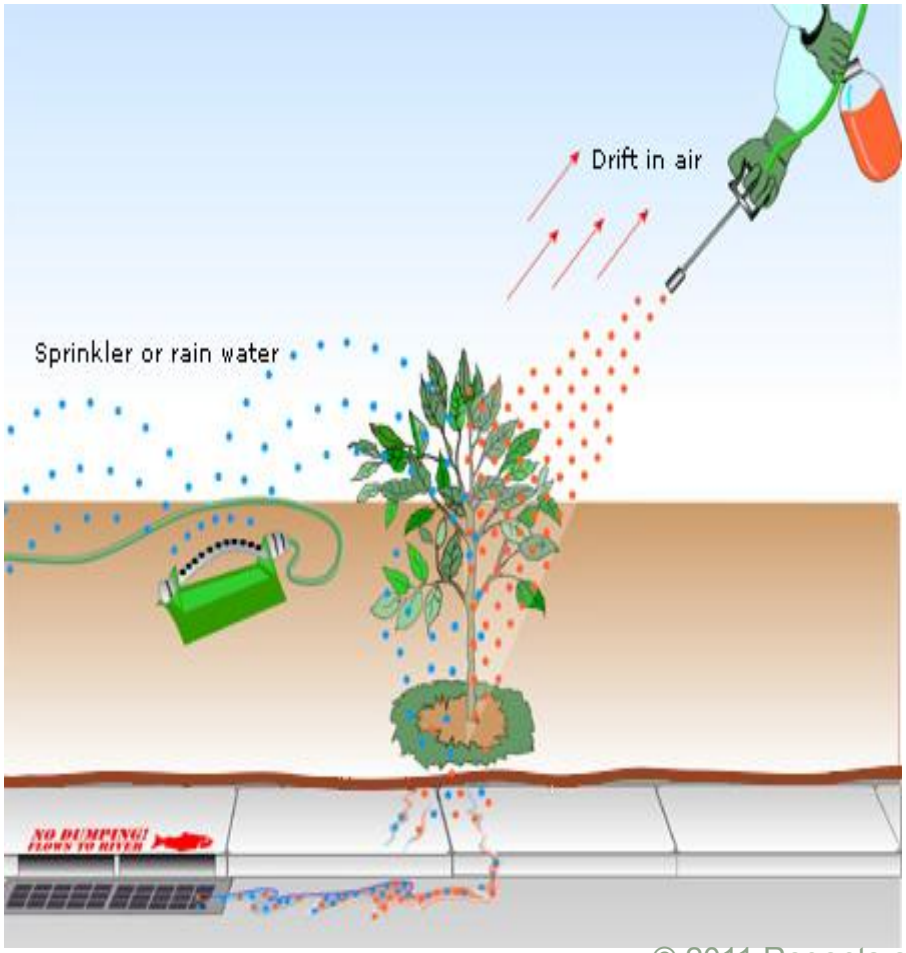
•Children

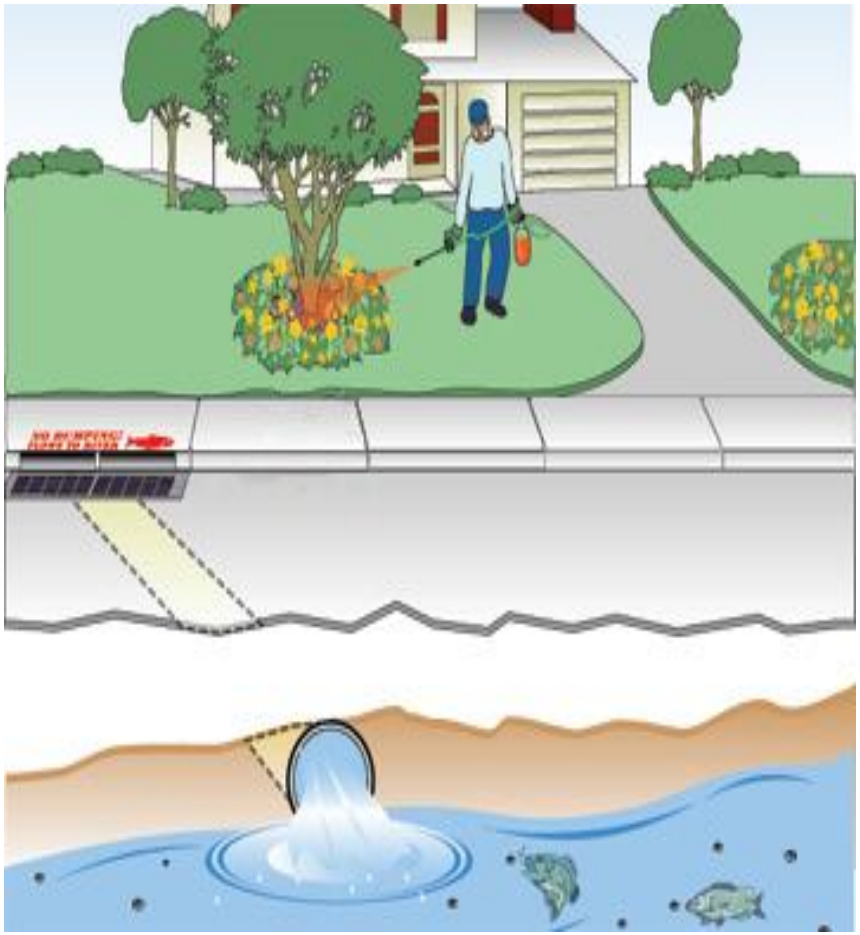
•Pets

•Beneficial Insects

•Plants

2. When pesticides are applied to our homes, gardens, and landscapes they may drift in the air or be washed into a storm drain by irrigation or rain.





It is unrealistic and impractical to attempt to eliminate plant pests from an outdoor environment.

Integrated Pest Management

- Scientifically based on the interaction of organisms in the environment
- Effective for the long-term
- Saves time and money
- Reduces or eliminates the need for pesticides

Rootbound

Prevention

Lack of water

- **Select Healthy Plants**
  - Avoid dry, overwatered, or root-bound plants
  - Look for evidence of existing pests

Leafminer Insect

- **Choose appropriate plants**
  - Location – light, heat, soil, space
  - Compatible plants – water, light, soil, nutrition

Prevention

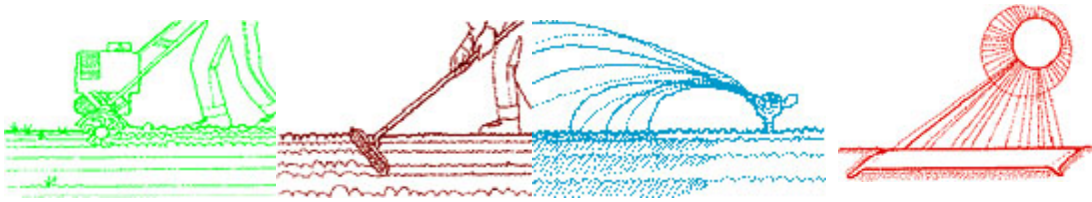
Nematode

Trellised Squash

- **Choose pest resistant plants**
  - Strawberries - short-day varieties (those that fruit in May and June only) such as Chandler
  - Tomatoes labeled with "Disease Identification Codes" (VFN) on the plant label or seed packet
  - Trellis vining plants to reduce vulnerability to some common pests
  - Ask your nursery professional for a recommendation

Prevention - Proper Site Preparation & Planting

- Control weeds
  - Hoeing
  - Soil solarization



- Loosen compacted soil and mix well
- Loosen container soil and mix with native soil
  - Plant trees about 2” higher than soil level
    - Planting too deeply favors root and crown diseases
  - Plant Vegetables deep enough to bury the stem as far as the first leaf
- Water thoroughly

Prevention - Cultural Practices

Proper cultural care yields maximum resistance to diseases, tolerance for insect damage, and vigorous growth!

- Resources:
  - *Pests of the Garden and Small Farm: A Grower's Guide to Using Less Pesticide,* Pub. #3332
  - *California Master Gardener Handbook*

    Copyright Date: 2002, Pub. # 3382

  - *Vineyard Pest Identification and Monitoring Cards,* Pub . #3532

Integrated Pest Management Methods for Healthy Gardening

- Pest Identification
- Apply Appropriate Control Measures
  - Encourage Natural Enemies of Pests
- Use Reduced-Risk-Pesticides and Apply them Properly

4 Broad Categories of Plant Pests

1. Insects & Mites*
   - Sucking & Chewing Mouthparts
   - Honeydew and Chewed Plant Parts
2. Snails & Slugs*
   - Chewed Plant Parts
3. Diseases & Nematodes*
   - Foliar and Root Symptoms
4. Weeds
   - Compete for space, water, nutrients, light

* These Categories also include Natural Enemies

Insect Pests – **Aphids**

Sucking Mouthparts

Winged Adults

I.D. Aphids by “Cornicles”

Dense numbers

Sooty Mold

“epinasty”

Honeydew attracts ants

Aphids may transmit viruses plant to plant

Whitefly

Healthy mature nymphs of citrus whitefly

Giant whitefly pupae turn dark when parasitized.

Emergence holes in whitefly pupae from a parasitic wasp

Controls for Aphids & Whitefly

Sucking Insects

- Before planting, check surrounding areas for sources of aphids and remove them
  - Aphids often build up on weeds, moving onto crop seedlings after they emerge
- Grow seedlings under protective covers
- Prune out/pinch leaves with large populations
- Band of sticky material around the trunk (for ant control)
- Never use more nitrogen than necessary
- Knock off aphids with a strong spray of water

The New Kids in Town

Asian Citrus Psyllid (ACP)

http://ipm.ucanr.edu/QT/asiancitruscard.html

Yellowish nymphs with red eyes and distinguishing white waxy tubules.

- A tiny sap-sucking insect, about the size of an aphid.
- The nymphs feed on soft, young plant tissue and are found on immature leaves, stems and flowers of citrus and related plants.
- Flying adults transfer a bacterial pathogen (disease) from infected trees to healthy trees.
- The disease is the most serious threat to citrus trees worldwide—including those grown in home gardens and on farms.

- **Purchase trees from local reputable nurseries to avoid bringing ACP or HLB into your yard.**
- **Don't move citrus plants or clippings out of your area since this can spread ACP or HLB.**
- **Control the ants running up citrus tree trunks.**
- **Call the CDFA Exotic Pest Hotline at 1-800-491-1899**

Adult with mottled brown wings, a pointed front end, red eyes, and short antennae.
Feeds with its head down, its back end in the air, with body raised at an almost 45-degree angle. No other insect pest of citrus positions its body this way.

The New Kids in Town

These are NOT Ladybeetles!

Bagrada Bug

"Largest numbers are typically observed in organic farms, community gardens, and residential vegetable gardens where little or no pesticides are used".

CHECK PLANTS REGULARLY!

Use Soapy Water!

http://www.ipm.ucdavis.edu/EXOTIC/index.html

http://cisr.ucr.edu/pdf/bagrada-bug-capca-handout-sept-19-2012.pdf

Mites

Numerous in June through September

Leaf mottling and webbing from heavy infestation of spider mites

Two-spotted spider mite adult and immatures

Controls for Mites

Sucking Insects

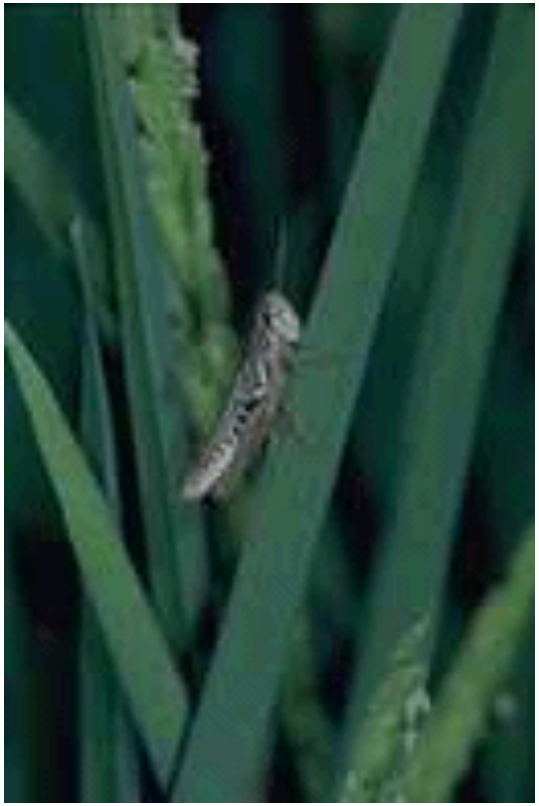
- Very high populations can be damaging to all plants
- Damage is usually worse when plants are water stressed

Insect Pests – **Caterpillars & Grasshoppers**

Chewing Mouthparts

Cabbage Looper

Mature hornworm larva



Grasshopper nymph

Speckled green fruitworm larva (caterpillar) feeding on leaf

Snails & Slugs

Chewing Mouthparts

Slimy mucus trail

Chew irregular holes with smooth edges in leaves and flowers and can clip succulent plant parts and seedlings. They also can chew fruit and young plant bark.

Controls for Chewing Plant Pests

- Caterpillars:
  - Hand Pick
  - Clip and dispose of infested foliage/flowers
  - Microbial pesticides *(Bt)*

- Snails & Slugs:
  - Trap Them!

Baits alone won't effectively control snails or slugs!

- Grasshoppers:
  - Hand-pick and squash
  - Divert them from the garden (green border)
  - Insecticides are not very effective and must be re-applied
    - Carbaryl is especially toxic

Fusarium & Verticillum Wilt Diseases

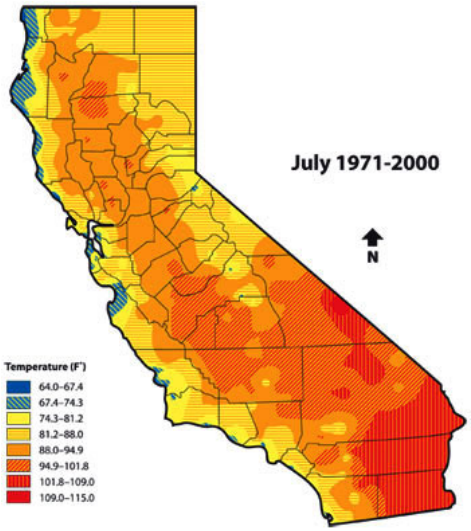
- Attack mainly herbaceous plants.
- Wilt symptoms often appear first on one side of a plant.

Verticillium

Fusarium

Controlling Fusarium & Verticillium

- Avoid overwatering and provide good drainage
- Avoid applying excessive fertilizer

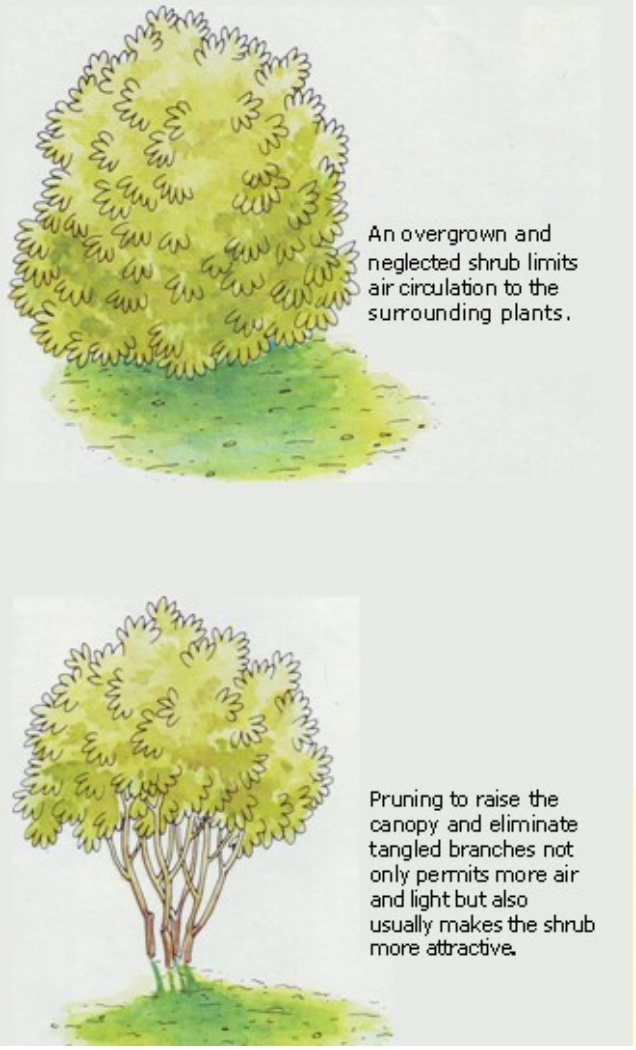


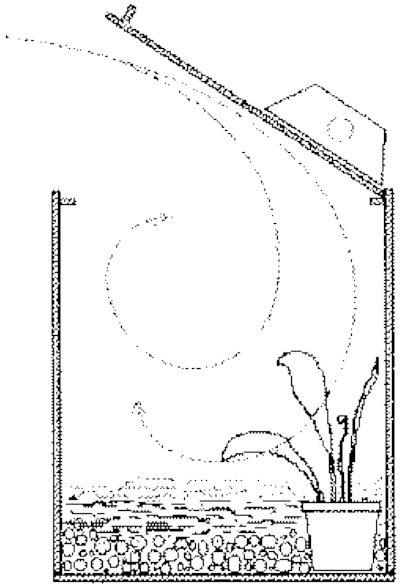
Powdery Mildew Disease

- Affects many plants
- Use resistant plant varieties
- Fungicide treatments like oils or sulfur may be required

Moderate temperatures (60° to 80°F) and shade encourage the disease

Controlling Powdery Mildew





Biological Fungicides are commercially available beneficial microorganisms formulated into a product that, when sprayed on the plant, inhibit or destroy fungal pathogens – *Bacillus subtilis*

Nematodes

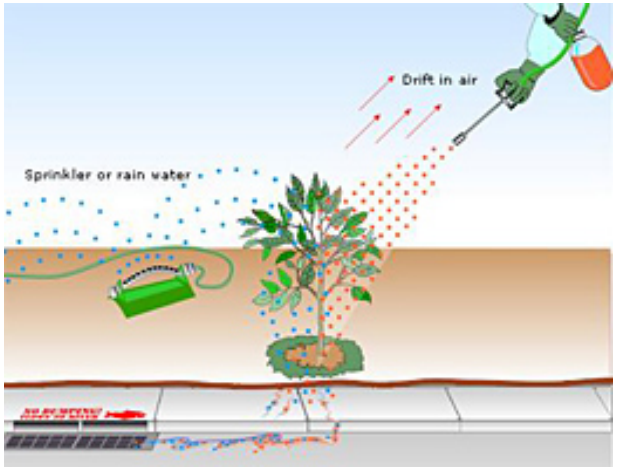
Microscopic Roundworms

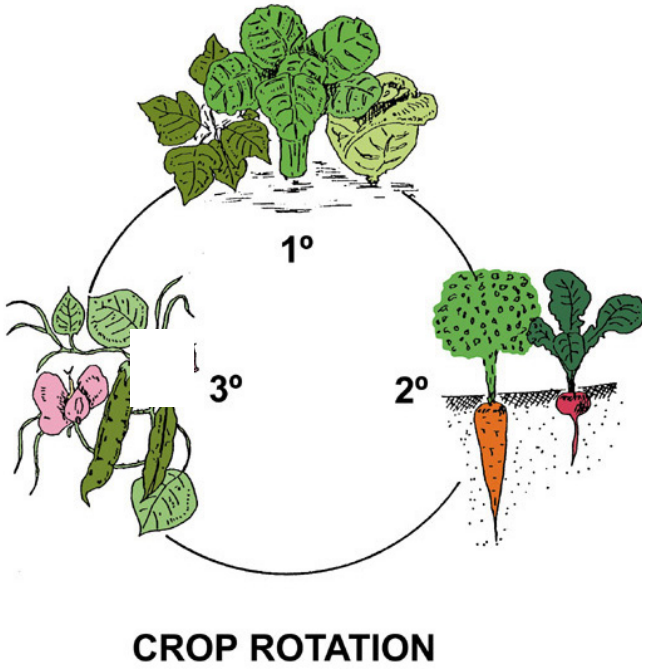
Annual plants may be killed by nematodes

Root knot nematodes usually cause distinctive swellings, called galls, on the roots of affected plants.

Controlling Nematodes

- Do not allow irrigation water from around infested plants to run off and spread the pest





CROP ROTATION

Look for Disease Code "N" on seed packets

Weeds

- A plant or plants growing where they are not wanted
- Compete for space, water, nutrients, light
- Harbor insects and disease

Creeping woodsorrel

Dandelion

Sow Thistle & Aphids

Petty Spurge

Controls for Weeds

- Mulch to a depth of about 3 inches
- Weed by hand or with tools
- Deplete perennial weed reserves by constantly removing new shoot growth

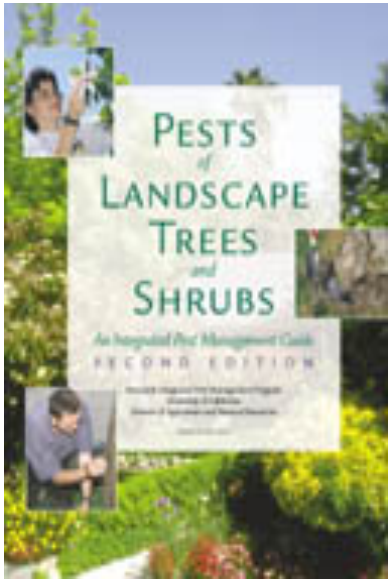
Integrated **P**est **M**anagement Methods for Healthy Gardening

- ✓ Pest Identification
- ✓ Apply Appropriate Control Measures
  - ❑ Encourage Natural Enemies of Pests
- ❑ Use Reduced-Risk-Pesticides and Apply them Properly

Natural Enemies are those organisms in the environment that prey on or parasitize plant pests.

Identification of Natural Enemies

- Resources:
  - *Pests of Landscape Trees and Shrubs*, Pub. 3359
    - http://www.ipm.ucdavis.edu/GENERAL/orderpubs.html
  - UC IPM Pest Notes
    - http://www.ipm.ucdavis.edu/
      - Click on: homes, gardens, landscapes
    - Request copies from UC Extension Office
  - UC IPM Natural Enemies Gallery
    - http://www.ipm.ucdavis.edu/PMG/NE/index.html



Encourage Natural Enemies

- Plant Diversity of Flowering & Non-Flowering Plants for Beneficial Insect Habitat
- Reduce dust on plants
- Use selective pesticides
- Control Ants

Natural Enemies of Aphids

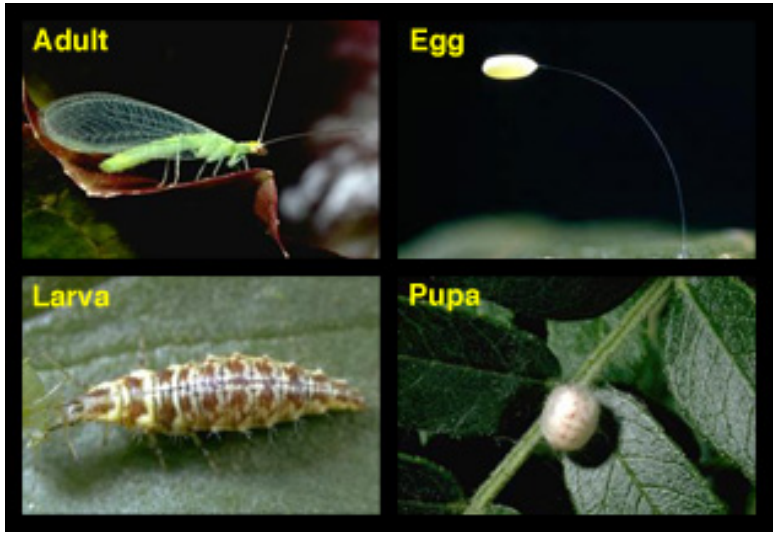
Convergent Lady Beetle

Green Lacewing

Natural Enemies of Whitefly

Minute Pirate Bug

Whiteflies have many natural enemies, and outbreaks frequently occur when these natural enemies have been disturbed or destroyed by pesticides, dust buildup, or other factors.



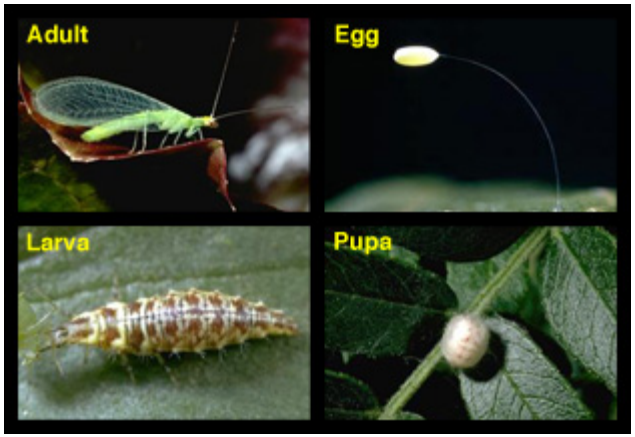
Green Lacewing

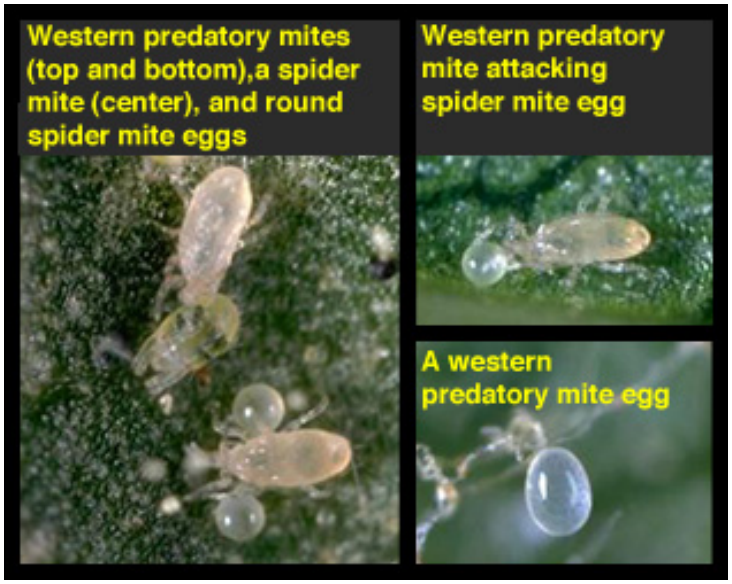
Asian Ladybeetle

Natural Enemies of Mites

- Western Predatory Mites, Red Mite (*Phytoseiulus persimilis*), and Green Lacewing

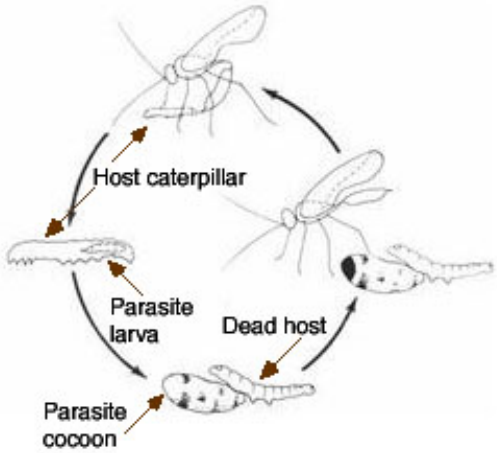
- Predatory mites are more active than pest mites!





Natural Enemies of Caterpillars & Grasshoppers

- Birds and Chickens
- Parasites
- Beneficial pathogens are commercially available



Life cycle of a *Hyposoter* parasite

Natural Enemies of Snails & Slugs

- Decollate Snails
- Ducks
- Rats

Integrated Pest Management Methods for Healthy Gardening

- ✓ Pest Identification
- ✓ Apply Appropriate Control Measures
  - ✓ Encourage Natural Enemies of Pests
- ❑ Use Reduced-Risk-Pesticides and Apply them Properly

Pesticides should be used in combination with non-chemical methods.

Healthy Gardening & Pesticide Use

Using certain pesticides may be an option for growing a healthy garden, but when other non-chemical methods are used first, pesticides are often not needed!

Reduced-Risk-Pesticides

- Use only narrow-range insecticidal soaps or oils (Neem) that minimize impact on natural enemies!

http://www.gardenallyear.com

http://www.pestproducts.com

- Use only when plants are not water-stressed and when temperatures are below 80^0F.

http://countrystoreandgardens.com

Reduced-Risk-Pesticides

- Avoiding the use of insecticides that kill beneficial organisms is a very important aspect of healthy gardening.
- Products containing carbaryl, pyrethroids, diazinon, or imidacloprid can be particularly disruptive to natural enemies.

http://www.portofsandiego.org/sandiego_environment/how_you_can_protect_the_bay.

Reading a Pesticide Label
Look for Least Toxic A.I.

Active Ingredient

Azadirachtin.....4.38%

Inert Ingredients.....95.62%

KEEP OUT OF REACH OF CHILDREN

CAUTION

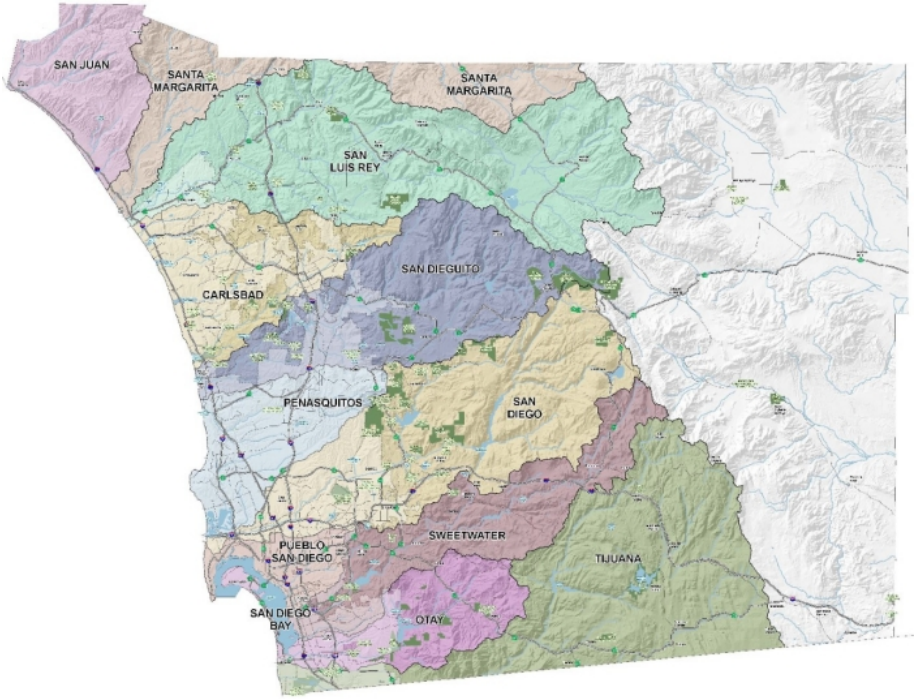
See back panel for additional precautionary statements.

NET CONTENTS 32 FL OZ (1QT) 946mL

Azadirachtin is derived from the natural oil found in seeds of the Neem tree

Our Watershed Provides Water Resources

- Municipal & Domestic Water Supply
- Recreation
- Wildlife and Estuarine Habitat



11 westward draining watersheds of San Diego County

We can Reduce the Use of Chemicals that Pollute our Water Resources!

- ✓Insecticides
- ✓Miticides
- ✓Herbicides
- ✓Fertilizers

IPM!

Integrated **P**est **M**anagement Methods for Healthy Gardening

- ✓ Pest Identification
- ✓ Apply Appropriate Control Measures
  - ✓ Encourage Natural Enemies of Pests
- ✓ Use Reduced-Risk-Pesticides and Apply them Properly

It's The Water That Connects Us!

- Read Pesticide Labels and Follow Directions to the Letter!
- Store Pesticides in a Safe Manner.
- Dispose of Unused Pesticides Properly.

Useful Phone Numbers:

- Unused Pesticide Disposal: 1-800-CLEANUP
- Master Gardener Hotline: (858) 822-6910
- UC Cooperative Extension: (858) 822-7711
- Agricultural Commissioners' Office: (858) 694-2739

Resources for this presentation include:

Pests of Landscape Trees and Shrubs. An Integrated Pest Management Guide. Agriculture and Natural Resources Publication 3359, Second Edition. 2004.

http://cisr.ucr.edu/bagrada_bug.html
http://www.projectcleanwater.org
http://cisr.ucr.edu/brown_marmorated_stinkbug.html

UC IPM Online. Statewide Integrated Pest Management Program. University of California Agriculture and Natural Resources. http://ipm.ucdavis.edu

Photographs and Pictures are the property of:

University of California Agriculture and Natural Resources, unless otherwise noted.

HEALTHY GARDEN
HEALTHY HOME

Thank you for joining us today!

University of California
Agriculture and Natural Resources

UC IPM