Introduction to Biotic Pests and How to Diagnose Them

- Types of pests
- Importance of pest identification
- Information resources

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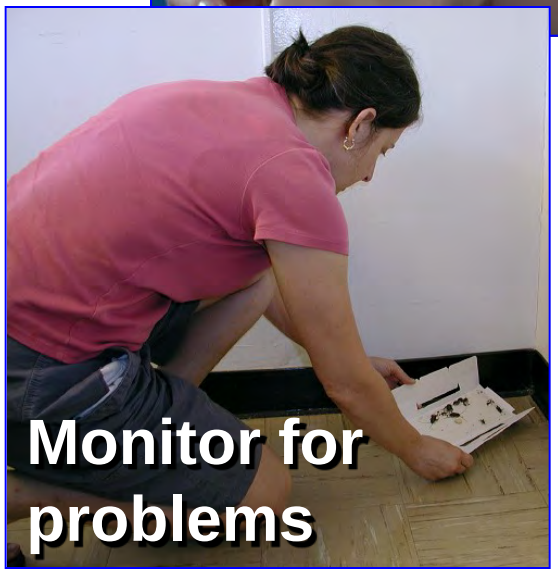
What is the idea behind IPM?

- Ecologically-based approach
- Prevents problems
- Based on knowledge of pest, biology, and habitat
- Don’t spray just because you see a pest
- Uses least-toxic methods to protect people and environment



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IPM tools and techniques

- Combine practices for long-term management

- ✓ Prevention
- ✓ Cultural practices
- ✓ Physical/ mechanical
- ✓ Biological control
- ✓ Pesticides, if needed
  - Monitor to detect and assess problems
  - Use least-toxic materials

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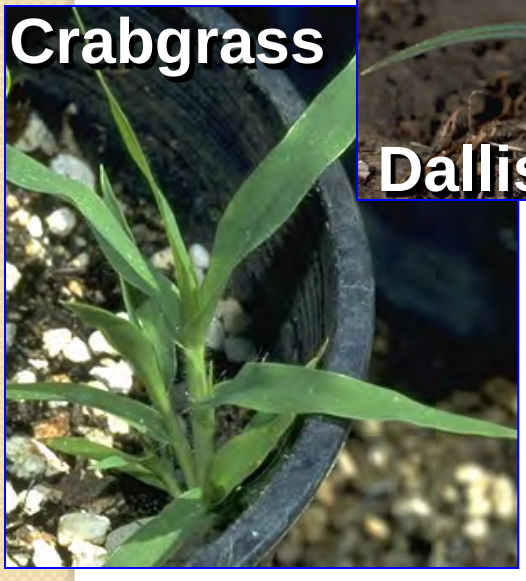
Identify your pest

- Identify your pest
- Understand its life cycle



Types of Pests

Insects/mites

Pathogens

Weeds

Molluscs

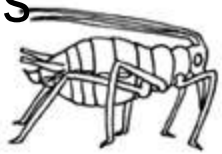
Nematodes

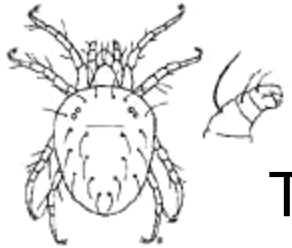
Vertebrates

Insects and Mites

Insects

Head, thorax, and abdomen
3 pairs of legs





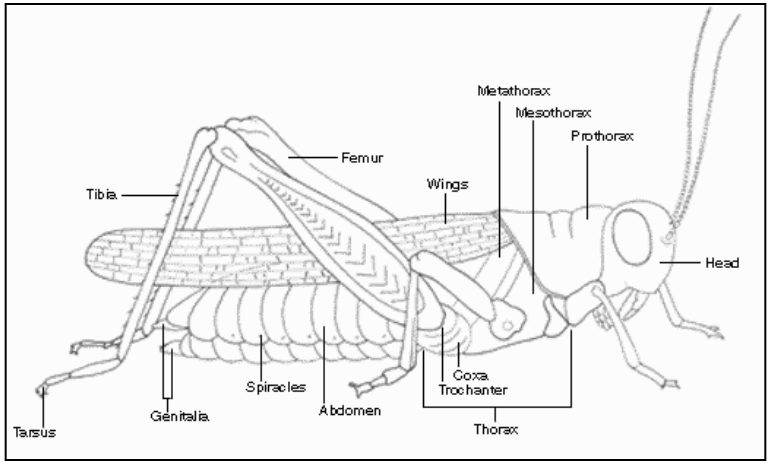
Mites

Two body parts
4 pairs of legs

Mouthparts

- **chewing** (beetles, caterpillars)
- **piercing-sucking** (aphids, bugs)
- **sponging** (flies)
- **siphoning** (moths)
- **rasping-sucking** (thrips)
- **cutting-sponging** (biting flies)
- **chewing-lapping** (wasps)

piercing-sucking



Weed Classifications

- Plant
  - Monocots Grasses and Sedges
    - Annuals
      - Winter
      - Summer
    - Perennials
  - Dicots Broadleaf
    - Annuals
      - Winter
      - Summer
    - Perennials

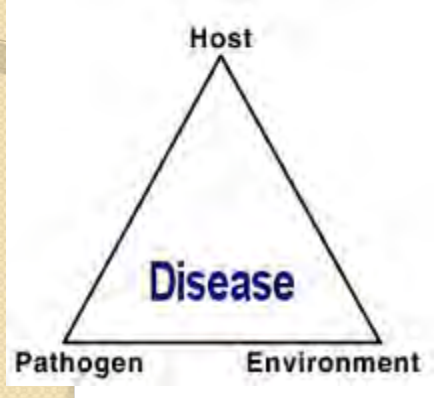
Annual bluegrass

Crabgrass

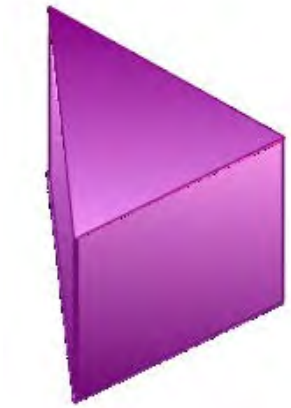
Mallow

Spotted spurge

Pathogens and Nematodes



Old model



time

New model

- Virus
- Bacteria
- Water molds

Verticillium Wilt

Female root-knot nematode next to root gall

Adult root lesion nematodes inside root

Vertebrates

Rabbits

Ground squirrels

Birds

Gophers

Voles

Snails and Slugs

Adult brown garden snail

“Hibernate” in hot weather

Gray garden slug

Importance of Pest Identification

- Have to identify the problem before it can be solved.
- Requires correlating pests to damage.
  - Damage from insects, diseases, weeds, etc., vs.
  - Damage from equipment, nutrition, water mgt., etc.

Big-eyed bug—beneficial insect

False chinch bug—sporadic, minor pest

Lygus bug—major pest

Herbicide damage vs. grub damage

Mower damage

Diagnosing Problems

- Just because you see a pest doesn't mean it caused the damage.
- Not all damage needs to be treated.
- Pests may no longer be present.
- Pest may be difficult to find
- Irrigation problems and nutritional deficiencies

Katydid damage

Stink bug damage

Belowground damage from root-knot nematode

Damping off from fungi, primarily weather-related

Getting Help—
Sources of Information

Science-based

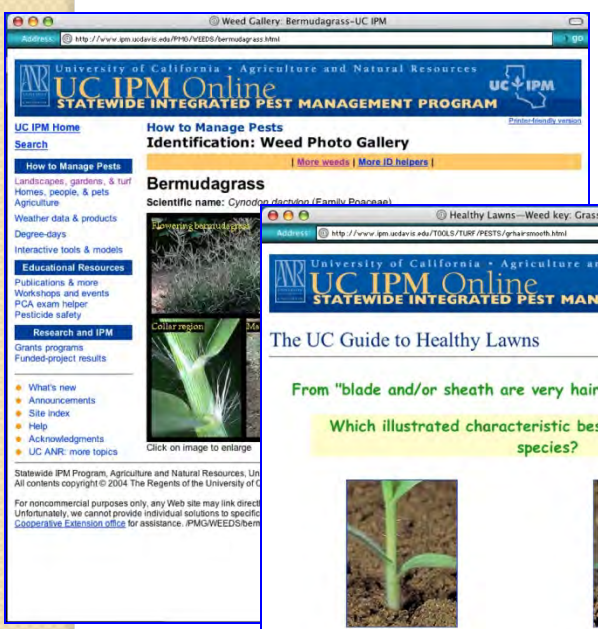
- University sources
  - Web site address ends in ".edu
  - www.ipm.ucanr.edu
  - UC Cooperative Extension
- Government sources
  - Often end in ".gov"
  - US EPA
  - DPR www.cdpr.ca.gov

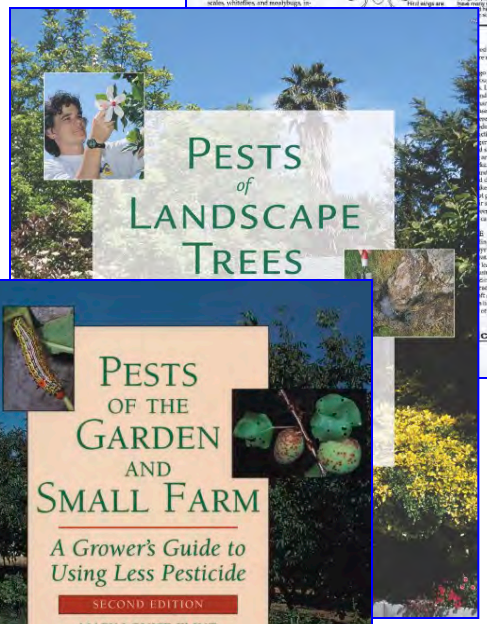
Resources to help you identify pests

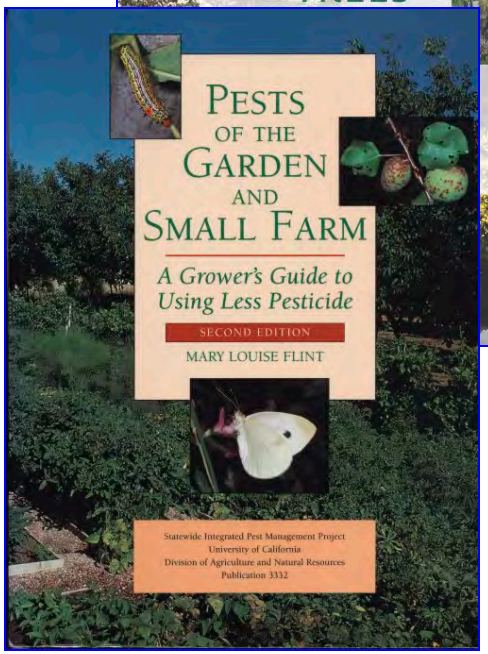
www.ipm.ucanr.edu

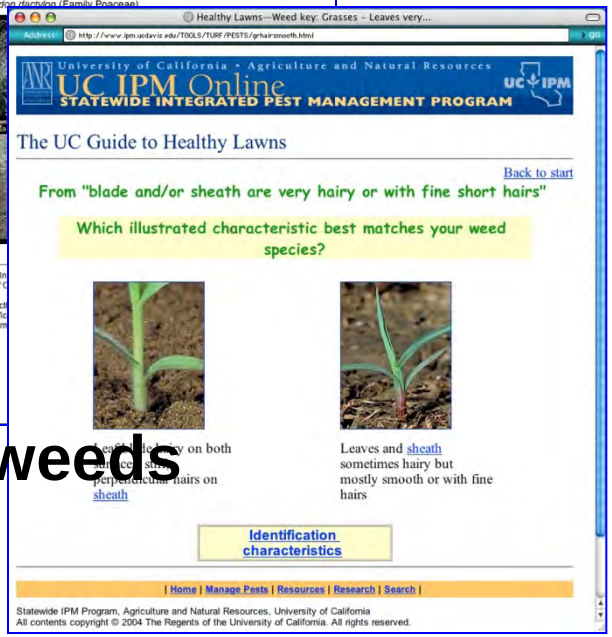
Pest notes

Weed photo gallery









Key to weeds in turf

UC IPM Publications

Be on the lookout

- Monitor regularly

Monitoring devices

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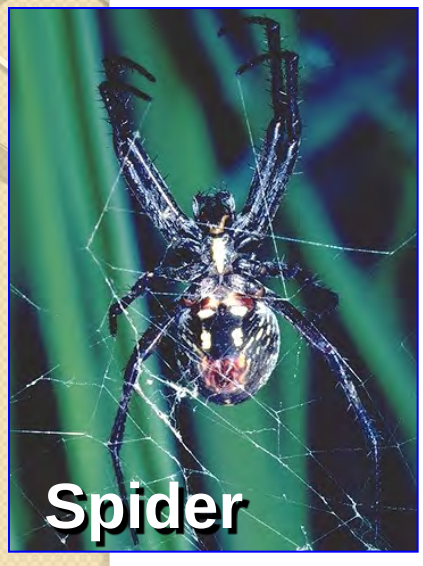
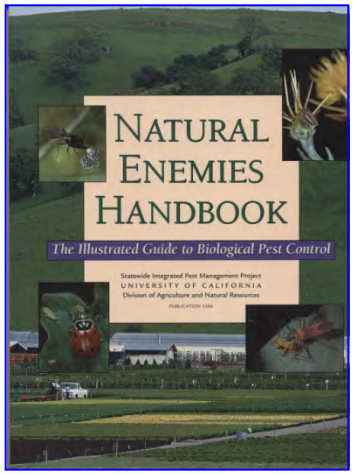
Biological control



Use of natural enemies to control pests



Predators

- **Attack, kill, and feed on other prey**

Pathogens

- **Cause disease**

Armyworm killed by virus

Parasites

- **Live and feed in a larger host**

Biological Control Arthropods

Controlling insects and mites with:

- Pathogens
- Predators
- Parasites

Parasites

- Female lays egg in host. The immature kills the host during its development, killing only one host.
- Adult is free living.
- Attack all stages: eggs, nymphs, larvae, pupae.

Parasitic groups:

- Wasps
- Tachinid flies

Predators

- Feed on more than one individual host during their lifetime.
- Many feed on a variety of insects and mites, pollen, nectar, and honeydew

Identification

Good or Bad?

Many beneficial insects such as the syrphid fly larvae and the cecidomyid midge look like plant pests, but are actually effective predators of aphids.

When are pesticides needed?

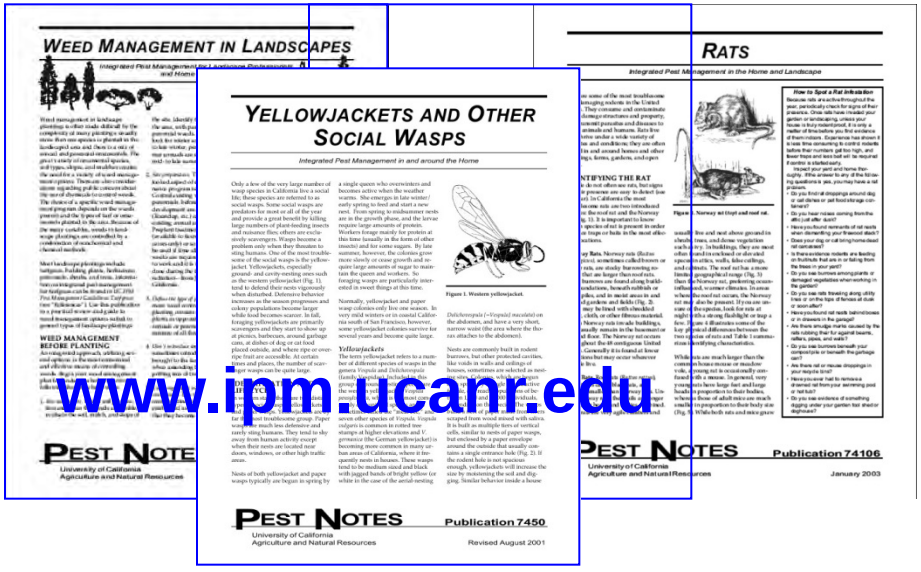
- When pests are causing intolerable damage
- Nonchemical methods aren't effective

How to know?

- Identify your pest
- Assess the problem
- Research and consider alternatives

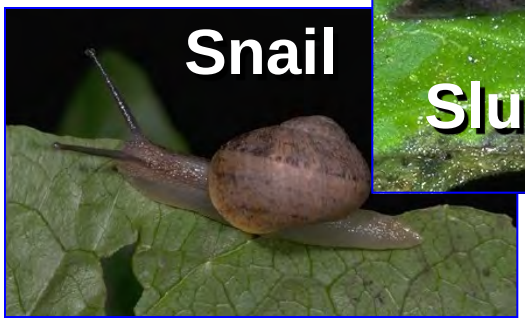
If you use pesticides

- Choose the least-toxic effective material
- Use in combination with other methods
- Follow label directions carefully
- Consult UC IPM Pest Notes



IPM for slugs and snails

1. Identify the pest

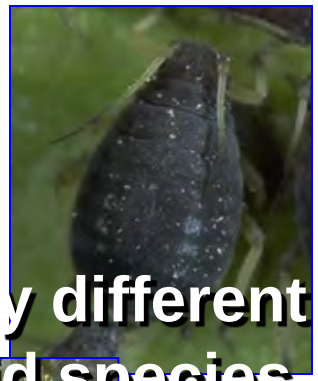


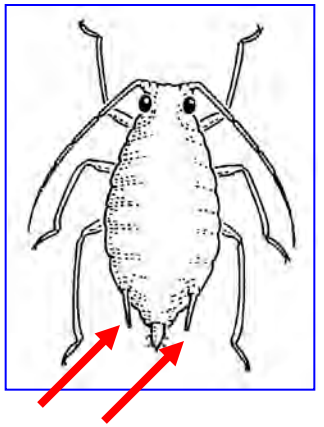
2. Determine if this pest is a problem you can't tolerate

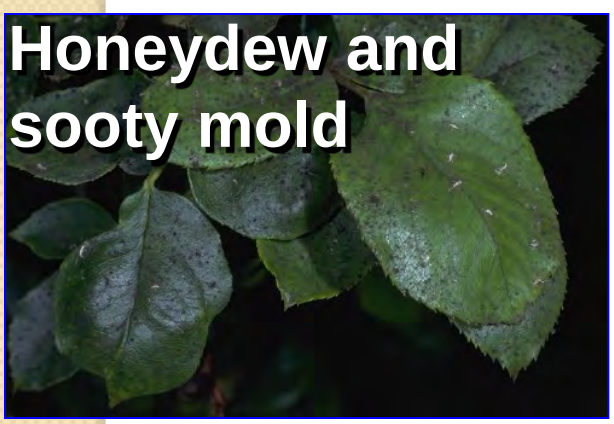
- Evaluate damage
- Consider types of plants
- Search hiding places

IPM for aphids

1. Identify the pest







2. Determine if this pest is a problem you can't tolerate

- High number of aphids?
- No natural enemies?
- Know facts about biology

IPM for aphids

3. **Identify the conditions that cause aphids to thrive**
   - Plants such as apples, roses, vegetables
   - New lush plant growth
   - Destruction of natural enemies by pesticides
   - Protection by ants

Lacewing larva

Parasites

Syrphid larva

Sticky tree wrap

How can you change these conditions?

- Choose plants not prone to aphid problems
- Avoid overfertilizing plants
- Avoid pesticides that kill natural enemies
- Keep ants off plants

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IPM for powdery mildew

1. Identify the pest

2. Determine if this pest is a problem you can't tolerate

   - Are your plants known to be susceptible?

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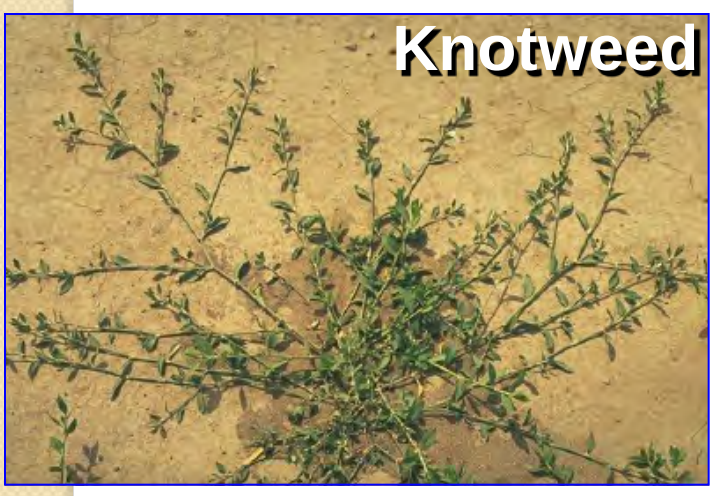
IPM for weeds

1. Identify the pest

- Know which weeds are invading
- Use tools on the UC IPM web site



2. Determine if this pest is a problem you can't tolerate

- Weeds in planting beds
- Perennial weeds

IPM for weeds

3. Identify the conditions that cause weeds to thrive

- Sources of weed seeds or propagules
- Unplanted areas
- Poorly maintained plantings

How can you change these conditions?

- Destroy weedy areas around gardens
- Don't bring in seeds or propagules
- Plant dense plantings
- Use mulch, mow strips, concrete strips
- Select competitive plants
- Install low-output irrigation systems
- Water, fertilize, prune, mow properly

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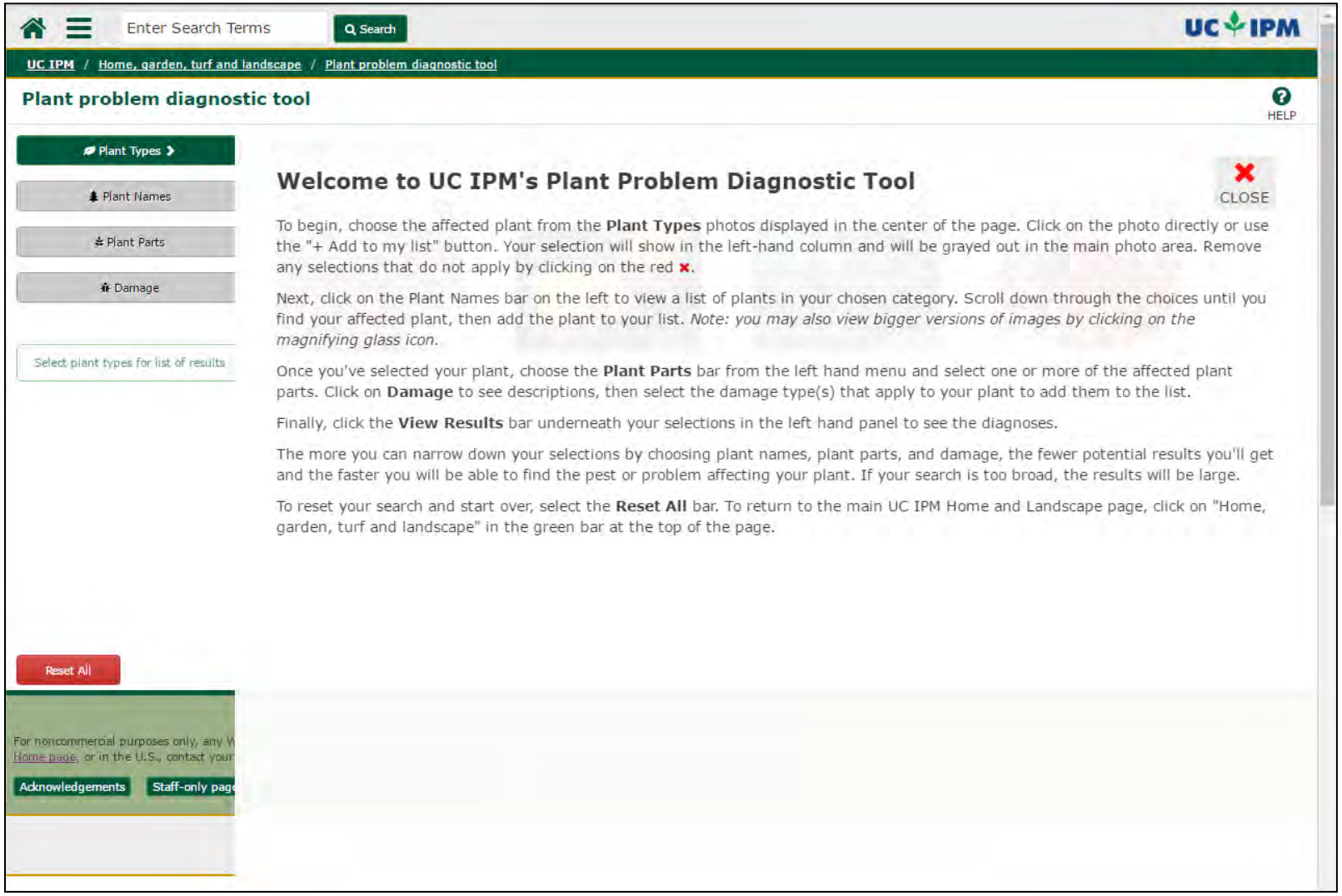
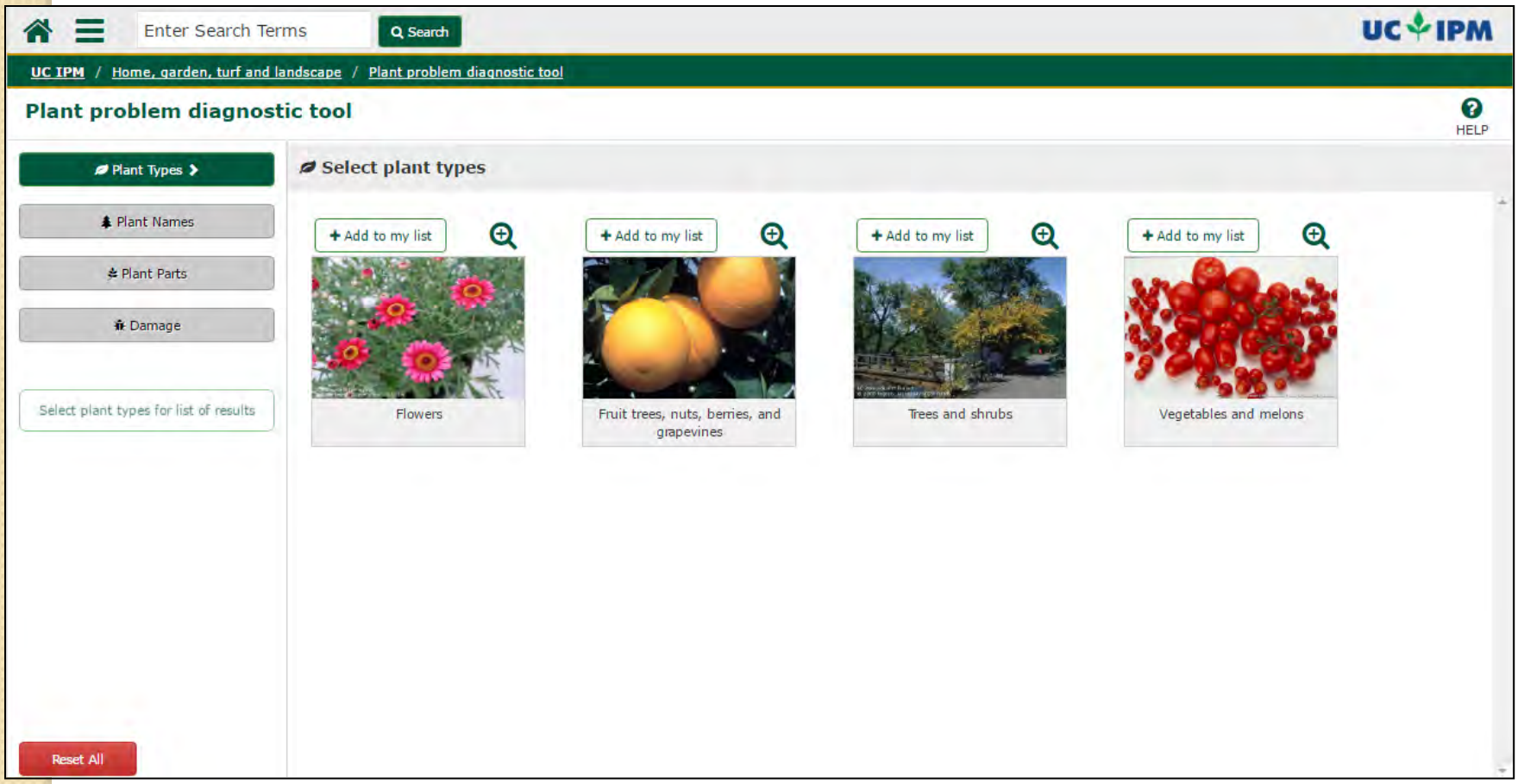

Enter Search Terms
Search
UC IPM
UC IPM / Home, garden, turf and landscape / Plant problem diagnostic tool
Plant problem diagnostic tool
HELP
Plant Types
Plant Names
Plant Parts
Damage
Select plant types for list of results
Reset All
Acknowledgements
Welcome to UC IPM's Plant Problem Diagnostic Tool
CLOSE
To begin, choose the affected plant from the Plant Types photos displayed in the center of the page. Click on the photo directly or use the "+ Add to my list" button. Your selection will show in the left-hand column and will be grayed out in the main photo area. Remove any selections that do not apply by clicking on the red ×.
Next, click on the Plant Names bar on the left to view a list of plants in your chosen category. Scroll down through the choices until you find your affected plant, then add the plant to your list. Note: you may also view bigger versions of images by clicking on the magnifying glass icon.
Once you've selected your plant, choose the Plant Parts bar from the left hand menu and select one or more of the affected plant parts. Click on Damage to see descriptions, then select the damage type(s) that apply to your plant to add them to the list.
Finally, click the View Results bar underneath your selections in the left hand panel to see the diagnoses.
The more you can narrow down your selections by choosing plant names, plant parts, and damage, the fewer potential results you'll get and the faster you will be able to find the pest or problem affecting your plant. If your search is too broad, the results will be large.
To reset your search and start over, select the Reset All bar. To return to the main UC IPM Home and Landscape page, click on "Home, garden, turf and landscape" in the green bar at the top of the page.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UC IPM
UC IPM / Home, garden, turf and landscape / Plant problem diagnostic tool
Plant problem diagnostic tool
HELP
Plant Types
Plant Names
Plant Parts
Damage
Select plant types for list of results
Reset All
Select plant types
+ Add to my list
Flowers
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Fruit trees, nuts, berries, and grapevines
+ Add to my list
Trees and shrubs
+ Add to my list
Vegetables and melons

+ Add to my list

Cauliflower

+ Add to my list

Corn

+ Add to my list

Cucumbers

+ Add to my list

Eggplants

+ Add to my list

Garlic

+ Add to my list

Lettuce

+ Add to my list

Onions

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Peas

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Peppers

+ Add to my list

Potatoes

+ Add to my list

Pumpkins

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Spinach

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Squash

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Tomatoes

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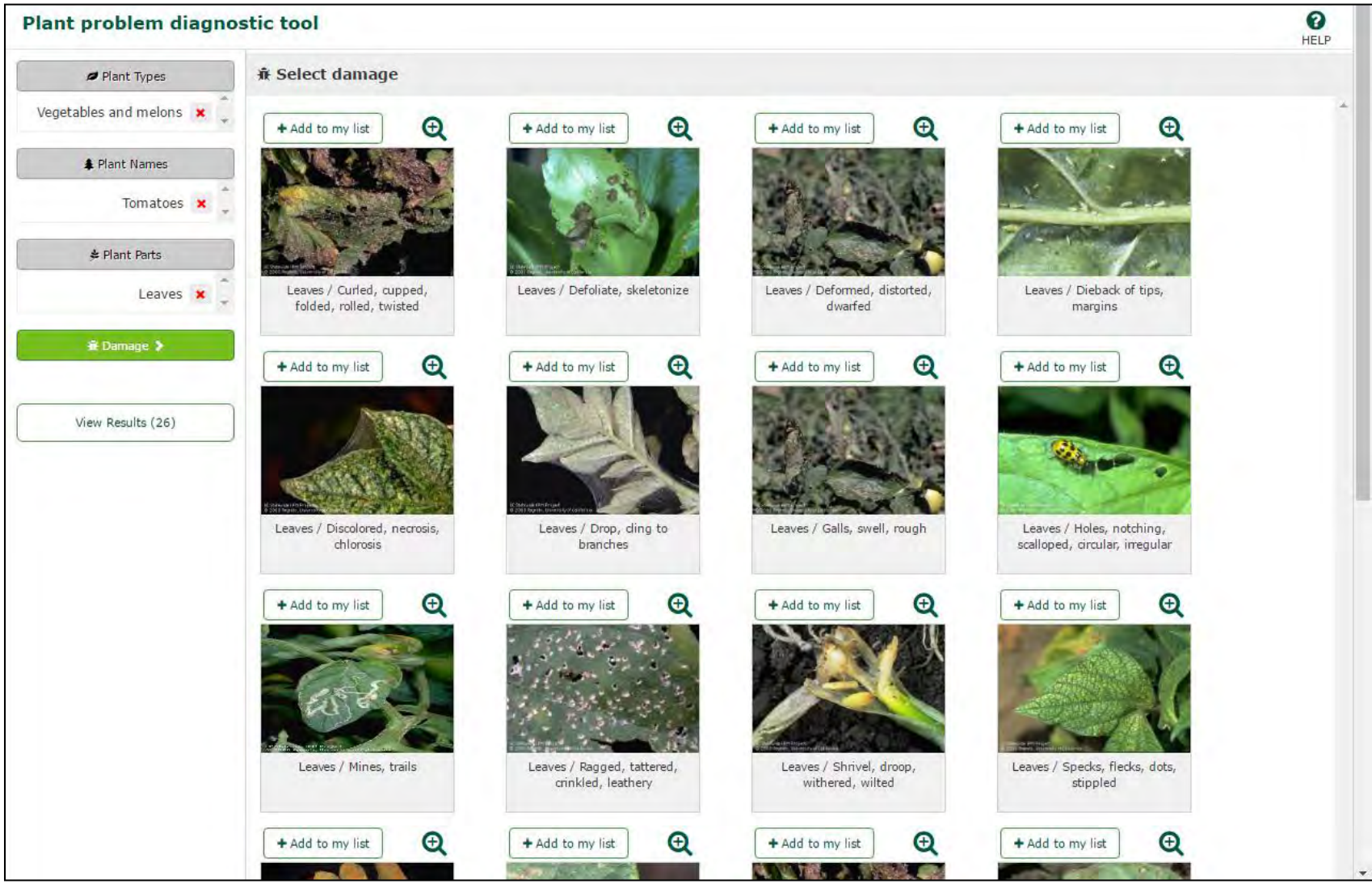
Watermelon

Reset All


Plant problem diagnostic tool
HELP
Plant Types
Vegetables and melons
Plant Names
Tomatoes
Plant Parts
Leaves
Damage
View Results (26)
Select damage
+ Add to my list
Leaves / Curled, cupped, folded, rolled, twisted
Leaves / Defoliate, skeletonize
Leaves / Deformed, distorted, dwarfed
Leaves / Dieback of tips, margins
Leaves / Discolored, necrosis, chlorosis
Leaves / Drop, cling to branches
Leaves / Galls, swell, rough
Leaves / Holes, notching, scalloped, circular, irregular
Leaves / Mines, trails
Leaves / Ragged, tattered, crinkled, leathery
Leaves / Shrivel, droop, withered, wilted
Leaves / Specks, flecks, dots, stippled

Enter Search Terms Search UC IPM

UC IPM / Home, garden, turf and landscape / Plant problem diagnostic tool

Plant problem diagnostic tool

HELP

Results for: vegetables and melons, tomatoes, leaves, specks, flecks, dots, stippled

› Leafminers

Thrips

← Back to diagnostics

Leafminers—*Liriomyza* spp.

On vegetables, the most common leafminers are the larvae of small flies belonging to the genus *Liriomyza*, including the vegetable leafminer (*L. sativae*), serpentine leafminer (*L. trifolii*), and the pea leafminer (*L. langei*).

Identification

Adult leafminers are small, active, black flies often with a prominent yellow triangle between the bases of the wings. The head behind the eyes is mostly black. Other species may have the thorax covered with overlapping bristles that give fresh specimens a silvery gray color with the area behind the eyes yellow. Larvae are yellow cylindrical maggots that feed beneath the leaf surface. The yellowish maggots and brown, seedlike pupae of the two species are too similar to distinguish.

Life cycle

In warm weather, leafminers may be more active. The life cycle is only 2 weeks long. Eggs are inserted into leaves and larvae feed between leaf surfaces, creating a "mine." At high population levels, entire leaves may be covered with mines. Mature larvae leave the mines, dropping to the ground to pupate. There can be five to ten generations per year. Development continues all year, the population moving from one host to another as new host plants become available each season.

Damage

Leafminers attack many different vegetable and flower hosts, including cole crops, cucurbits, tomatoes, peas, beans, aster, begonia, dahlia, impatiens, lily, marigold, petunia, and verbena. Adult female leafminers puncture leaves and sometimes petals to feed on exuding sap. These punctures eventually turn white, giving foliage a stippled or speckled appearance. The most obvious evidence of leafminers is the twisting trails (or mines) the larvae leave as they feed beneath the leaf surface. The mine becomes longer and wider as the larva grows. Mining usually has little impact on plant growth and rarely kills plants. Unusually heavy damage can slow plant growth and may cause infested leaves to drop. Damage will not be serious on most plants older than seedlings, although it may make spinach or chard unsightly.

Solutions

Leafminers rarely require treatment in gardens. Provide proper care, especially irrigation to keep plants vigorous. Clip off and remove older infested leaves. Plant resistant species or varieties. Small seedlings can be protected by protective cloth. On plants such as cole crops, lettuce, and spinach, clip off and remove older infested leaves. Leafminers are often kept under good control by natural parasites. Insecticides are not very effective for leafminer control.

Leafminer adult

Adult serpentine leafminer

Leafminer mines and feeding punctures

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