Less Toxic Pest Control for Home and Gardens

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IPM for Pests of Crops, Lawn & Garden

- **Cultural**
  - site & plant selection, sanitation, rotations

- **Physical - Mechanical**
  - Insects: traps, barriers
  - Weeds: weed, mulch, till
  - Diseases: prune

- **Biological**
  - Predators, parasites, nematodes

- **Chemical**
  - Soaps, oils, baking soda, repellants, insect growth regulators (IGR), microbials

**Intervention**
- Prevention

**Toxicity**
- Conventional: pesticides that kill on contact
Pests in Urban Areas

• Can overlap with agricultural and forest pests
• Highly related to human aesthetics
• Connection point with human diseases
• Affect humans due to high population densities
Integrated Pest Management

- A integral component of a sustainable community development program
Roof Rats

Prevention through exclusion
- Seal openings ½ inch wide with concrete mortar, steel or copper wool or metal flashing
- Cover attic and foundation vents with ¼ inch wire mesh or heavy wire screen
- Use rat guards made from sheet metal 18-24 inches wide to prevent the rats from climbing

Habitat modification
- Secure garbage in rodent proof containers
- Store food properly
- Harvest fruits and vegetables in a timely manner and pick up fallen fruit promptly
- Remove attractants such as pet food, bird feeders and standing water
- Compost in closed compost containers
Roof Rats

Eliminate or reduce protective cover

- Prune shrubs so that the ground below is visible
- Mow, trim or remove ground cover plants that are over 1 foot in height
- Stack firewood or lumber at least one foot away from walls and fences and at least 18 inches off the ground

Eliminate pathways

- Eliminate or prune back vines growing on buildings or fences
- Remove tree limbs that overhang roofs
- Prune trees so that the branches do not touch fences, overhead wires or branches of adjacent trees
- Prune skirts of trees so that branches do not hang down to the ground
Rat Controls

- Exclusion
- Sanitation
- Raptors
- Cats
- Snakes
- Traps
- Vitamin D-3
Ants

Prevention
• Store food in airtight containers
• Keep counters clean and dry
• Caulk cracks and weather strip doors and windows where ants enter
• Keep pet dishes in soapy moats

Physical Controls
• Sticky barrier
• Teflon barrier
• Tree wrap

Less Toxic Chemical Controls
• Bait stations -- with boric acid, hydramethylnon, fipronil or arsenic
• Botanical sprays -- mint, cedar, orange and other herbal oils
• Borate-based insecticides borate liquid ant bait, borate gel bait, borate granular bait
• Diatomaceous earth (DE) -- baited DE or DE with pyrethrin
• Insecticidal soap
• Pyrethrin
• Silica aerogel
Cockroaches

Prevention
• Store food in refrigerator or sealed containers.
• Keep counters and food storage areas clean.
• Keep areas dry
• Seal crack and crevices
• Caulk cracks and weather strip doors and windows

Physical Controls
• Caulk
• Teflon barriers
• Sticky traps
• Pheromone traps
• Glue board traps and vacuums
Cockroaches

Less Toxic Chemical Controls

• Bait stations with abamectin, borate-based insecticide, hydramethylnon, fipronil or sulfluramid
• Botanical sprays: orange, mint or herbal oils
• Borate-based insecticides: liquid ant bait, gel bait, granular ant bait
• Diatomaceous Earth (DE): baited DE or DE with pyrethrin
• Hydroprene Insect Growth Regulator
• Pyrethrin
• Silica aerogel
Wasps

Prevention:
• Seal holes and cracks in walls, foundations and roofs to prevent wasps from entering
• Cover attic and crawl space vents with fine mesh insect screen
• Wasps scavenge for meat and sweet foods and drinks in outdoor garbage and recycling bins
• Clean recyclables before storing them
• Keep garbage cans clean and tightly covered, or seal all food garbage in plastic bags.

Controls:
Contact the Sacramento-Yolo Mosquito & Vector Control District at 1-800-429-1022. Depending on their workload they will respond to Yellow jacket control calls. They do not remove bee hives or paper wasps nests.
Paper wasps - Jet spray mint based insecticide
Other Household Pests

- Spiders
- Fleas
- Flies
- Mosquitos
- Boxelder Bug
- Clothes Moths
- Pantry Pests
- Silverfish
- Termites
- Wildlife
Pest Management is Based on Soil Health

• A healthy soil feeds and nurtures the plants

• A diverse soil contains many beneficial organisms that compete with pests.
Garden Pests

- Weeds
- Insects & mites
  - Beneficials
  - Aphids
  - Worms
  - Bugs
  - Beetles
  - Spider mites
- Mollusks
  - Snails & slugs
- Diseases
  - Foliar
  - Root
- Rodents
- Birds
- Wildlife
What is a Weed?

• A undesirable plant
• A plant out of place
• A plant who’s value has not been discovered
Which are Easier to Control?

Initial control will save time and $

Early competition will reduce yields and quality
Cardboard Mulch
Wood Chips
Straw Mulch
Pre-Irrigation
Transplants
Mechanical
Solarization
Chemical Controls
Aphids
Caterpillar Pest & Natural Enemies
Generalist Predators in California

- Ant-like flower beetles - e.g., *Anthicus* spp.
- Assassin bugs - e.g., *Zelus renardii*
- Big-eyed bugs - *Geocoris* spp.
- Brown lacewings - e.g., *Hemerobius* spp.
- Damsel bugs - *Nabis* spp.
- Green lacewings - e.g., *Chrysoperla carnea*
- Minute pirate bug - *Orius tristicolor*
- Striped collops - *Collops vittatus*
- Various spiders - e.g., *Erigone* spp.
Habitat Needs

• Overwintering
  • Nesting
  • Shelter
  • Water
  • Nectar
  • Pollen
• Alternate Hosts
• Alternate Prey
Cucumber Beetle
Lygus Bug

Black exudate seeping from feeding sites

Healed feeding scar
What is a Plant Disease?

Any disturbance of a plant caused by organisms that interfere with the plant's normal structure, its function or its economic value.
What Causes Plant Diseases?

- Fungi
- Bacteria
- Virus
- Nematodes
- Parasitic Plants
to a plant cell.

Figure 2.

Schematic diagram of the shapes and sizes of certain plant pathogens in relation to a plant cell.
When pathogens are present in the field, their damage can be minimized by manipulating one of these tree points.
Development Stages of Plant Diseases

1) Inoculation: the organism reaches the plant and recognizes it as a host
2) Penetration
3) Infection or parasitism
4) Invasion—ramification
5) Growth and reproduction
6) Dissemination
7) Dormancy or continue the cycle
Disease Management Strategies

- Resistant cultivars - breeding for resistance
- Site selection
  - Planting and rotation strategies
  - Avoid problem areas
  - Good drainage, exposure and air circulation
- Exclusion
  - Keeping contaminated material out
  - Clean stock
  - Equipment
  - Water
Disease Management Strategies

- Cultural Practices
  - Rotation - cover crops
  - Timing (seasons, weather)
  - Irrigation and fertilization management
  - Sanitation and weeds
  - Solarization
  - Organic Mulch

- Control materials
  - Copper, sulfur, oils, biocontrol, bicarbonate

- Compost

- Proper Diagnosis
Mulch Matters

http://www.sciencenews.org/articles/20040710/fob5.asp
Soil Borne Diseases

- Verticillium
- Phytophthora sp.
- Rhizoctonia
- Anthracnose
- Fusarium
Fig. 1. Schematic illustration of the distribution of microorganisms in the root zone.
Rhizosphere

- Root excretions benefits for microorganisms (carbon compounds)
  - Amino acids
  - Organic acids
  - Carbohydrates = sugars
  - Nucleic acids
  - Growth factors
  - Sloughed off tissue
Benefit to plants
- Recycling nutrients
- Produces hormone (auxins, cytokinins)
- Resistance to diseases
- Tolerance to toxic compounds
- Provides essential nutrients (N & P) when lacking
Phytosphere
Foliar Disease Control

- Compost Tea
- Bicarbonate Soda
- Vegetable oil
- Vinegar
- Yeast-sugar solution
- Milk solution 10-50%
- Nettle, Chamomile Tea
- Garlic, Chives teas
- Seranade™
- Hydrogen Peroxide
Vertebrates

- Rodents
  - Mice – voles
  - Gophers
  - Squirrels
  - Rabbits

- Birds
- Deer
- Feral Pigs
- Wild life
  - Raccoons
  - Opossums
  - Skunks