IPM

Amanda Skidmore, PhD

Extension IPM Specialist for Urban and Small Farms

College of Agriculture, Consumer, and Environmental Sciences

Department of Extension Plant Sciences

NM STATE UNIVERSITY

BE BOLD. Shape the Future.

IPM

Integrated Pest Management

Integrated Pest Management

Effective and environmentally sensitive approach to pest management that relies on a combination of commonsense practices.

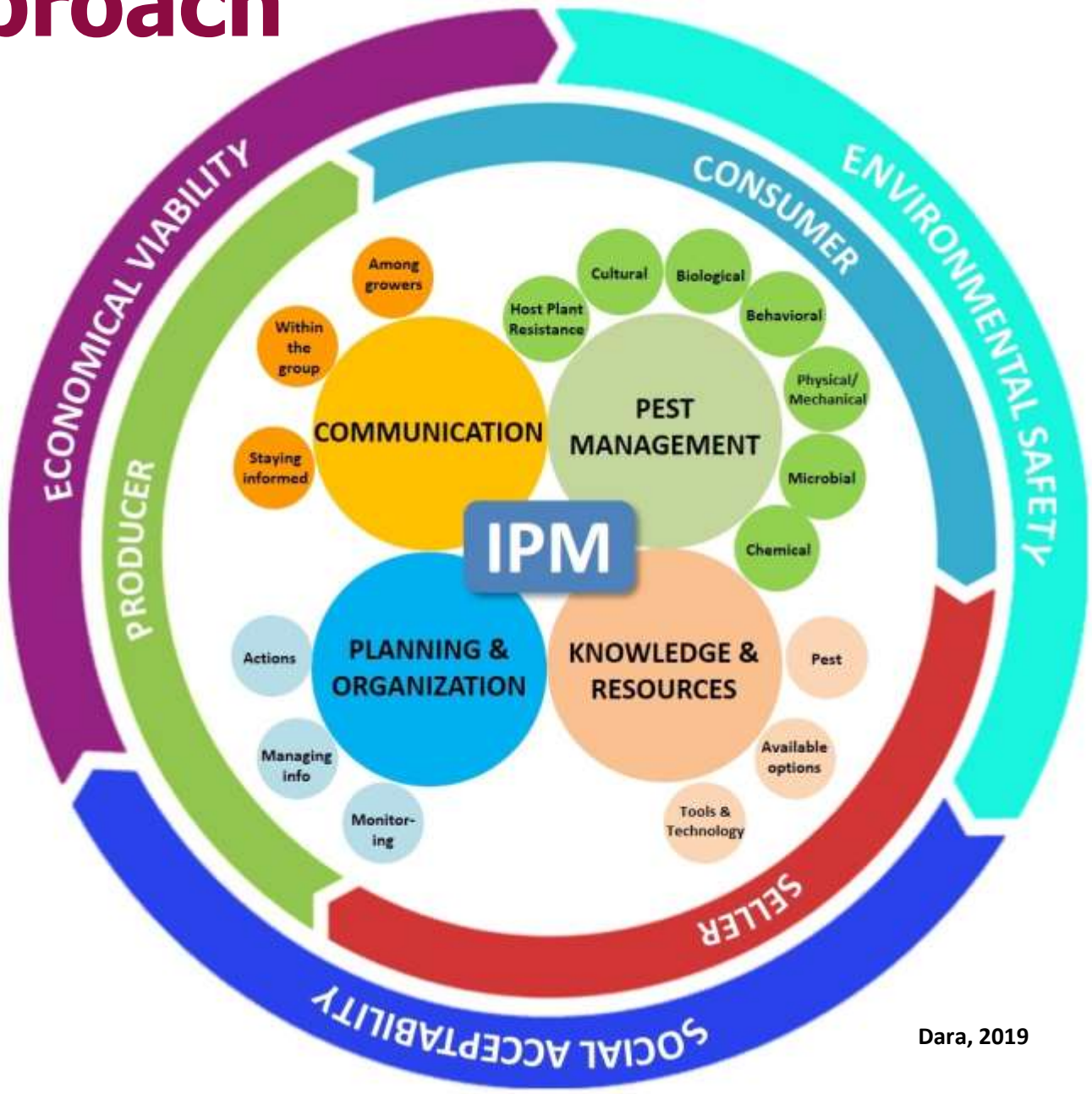
Goal: To keep pest populations below the level at which a pesticide is necessary

Benefits:

- Money savings through use of lower cost and targeted pest management practices
- Reduced chemical inputs
- Reduced Environmental Impact
  - Cleaner water, conservation of wild life, pollinator protection, improved human health

Holistic Approach

- Sustainability
- People
- Actions



Dara, 2019

Communication

- Stay Informed
  - Extension meetings, workshops, newsletters, webinars, apps
- Share your pest problems
  - Pests don't have boarders
- Information Helps IPM

Aren't sure of the right resources? We are happy to help!

Planning and Organization

- Active pest monitoring
- Record Keeping
  - Irrigation, plant nutrition, environmental factors, disease pressure, pest occurrence
- Timely Action
  - Reduces impact and spread
- Can help you trace back to the problem

Knowledge and Resources

- Identification of Pests
  - Life stage, economic significance, host preference, control options, cropping trends
- Available options
  - Each IPM plan will be different
- Know your options

Pest Management

- Prevent, reduce, action
- Domino effect
- Situational
  - Not one-size-fits-all


ECONOMICAL VIABILITY
CONSUMER
ENVIRONMENTAL SAFETY
PRODUCER
SELLER
SOCIAL ACCEPTABILITY
IPM
COMMUNICATION
PEST MANAGEMENT
PLANNING & ORGANIZATION
KNOWLEDGE & RESOURCES
Among growers
Within the group
Staying informed
Cultural
Biological
Behavioral
Physical/ Mechanical
Microbial
Chemical
Host Plant Resistance
Actions
Managing info
Monitor-ing
Pest
Available options
Tools & Technology

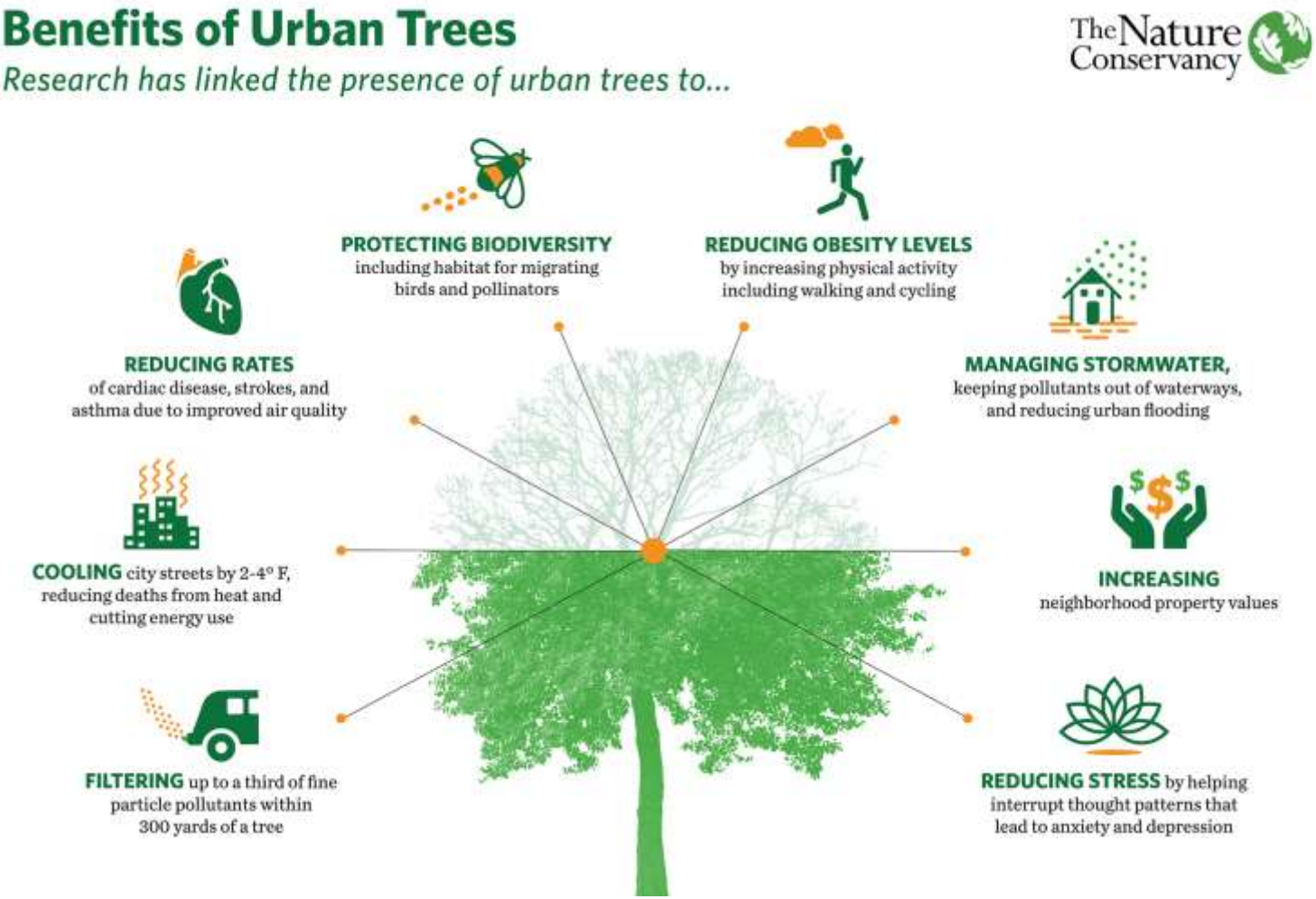
Why should you implement IPM practices?

- Money savings through use of lower cost and targeted pest management practices
- Conservation of wildlife, including beneficial insects

- Reduced chemical use
- **Ecosystem Services**

Improving Ecosystem Services

Improving Ecosystem Services



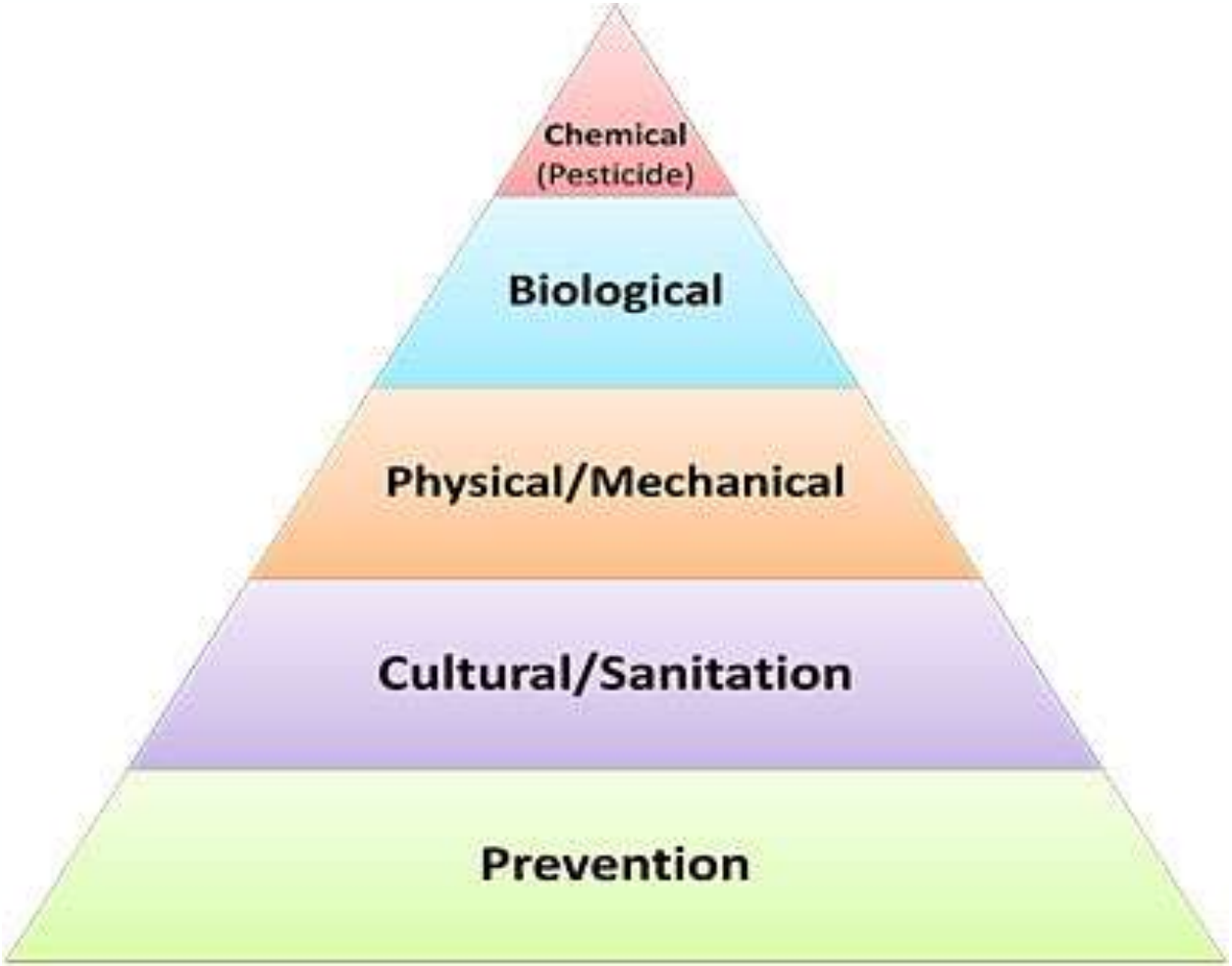
Building and IPM Plan

What is a Pest?

Insect

Weed

Plant Pathogen


Chemical
(Pesticide)
Biological
Physical/Mechanical
Cultural/Sanitation
Prevention

Prevention

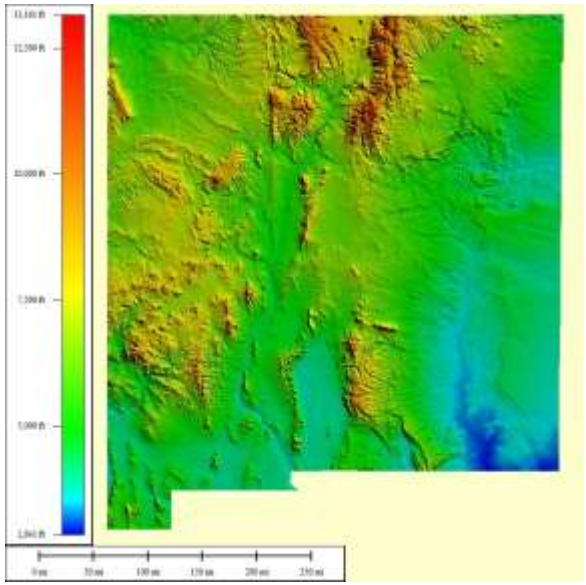
- Plan and select the correct plants for your landscape
  - Suitable for local environment and intended location
  - Soil type and pH
  - Light requirements
  - Soil moisture needs



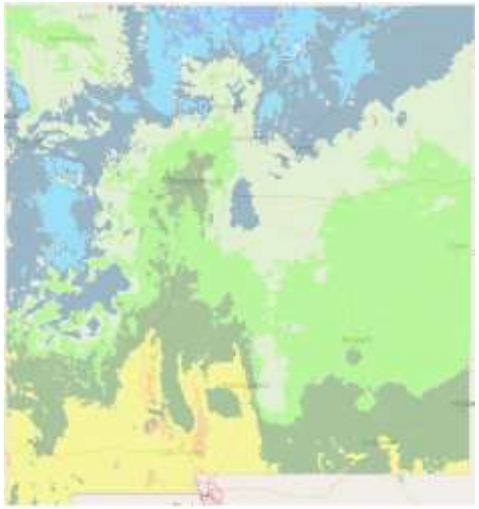



Eco-Regions
(7)

Elevation
(2,800ft – 13,161ft)



Growing Zones
(11)



Average Rain Fall

13.85 inches/year

Eco-Regions
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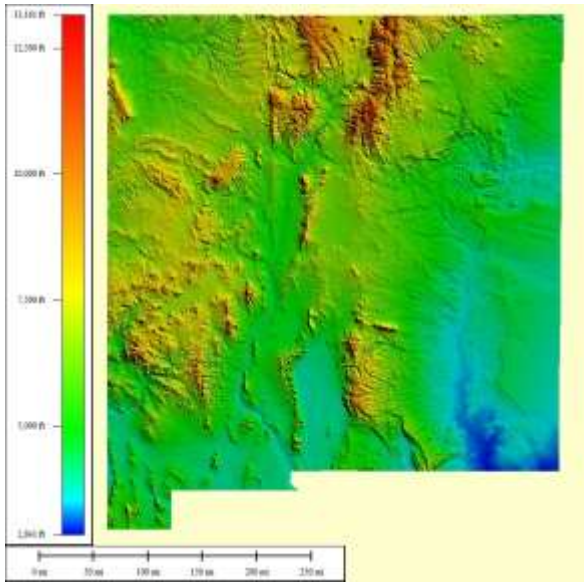
(2,800ft – 13,161ft)



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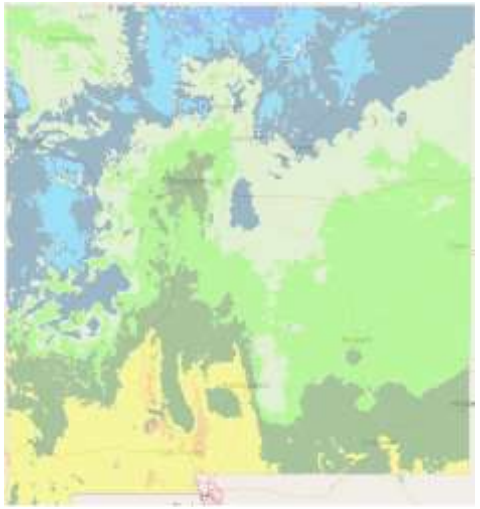


Average Rain Fall

13.85 inches/year

Prevention

- **Plan a head!**
  - Know your pests
  - Select cultivars that are resistant to pests

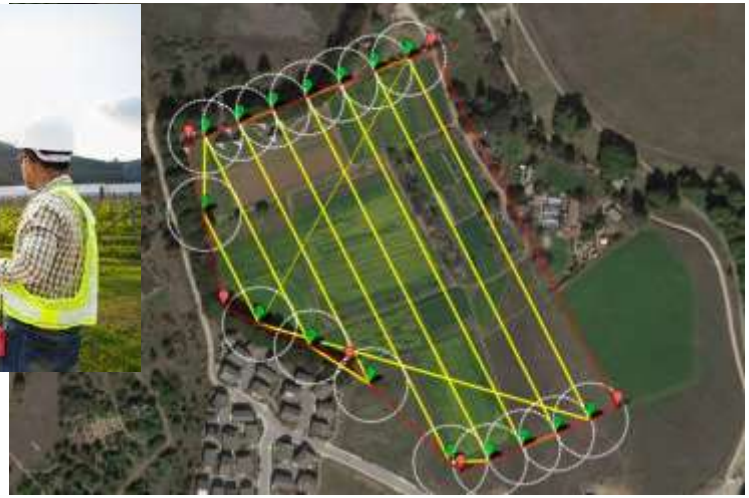
- **Keep it clean!**
  - Clean out old plant material
  - Remove weeds
  - Remove diseased or sick plants

- **Reduce plant stress!**
  - Water
  - Fertilize

Monitoring

- *Both a <u>Preventative</u> and <u>Cultural Control</u>*

- Regular inspect plants and monitor for pests



Monitoring

- *Both a Preventative and Cultural Control*
- Regular inspect plants and monitor for pests
- If damage is observed, ID the cause:
  - Insects – Animal - Abiotic stress - Water stress - Chemical drift - Frost
  - Note which part of the plant is being attacked
  - Which stage of the insect is causing the damage

Insect Damage: Signs

Chewing

Mining

Galls

Piercing/Sucking

Photo: Whitney Cranshaw, Bugwood.org

Piercing/Sucking

Photo: Eugene E. Nelson, Bugwood.org

Wood Boring

Photo: onetreeplanted.org

Weed Signs

Vine Girdling

Rooting

Competition

Disease: Signs

Fruit Rot

Bacterial Wilt

Molds

Cankers

Rusts

Blights

Viruses

Other Plant Damage

Water Stress

Herbicide Damage

Sun Scald

Weather Induced Necrosis

Mechanical Damage

Nutrient Deficiency

Animals

Know your pest

Invasive Species

Host: More than 400 plant species within 95 families are susceptible to attack by this pest. Adult beetles not only damage numerous ornamental herbaceous plants, shrubs, vines and trees, but also small fruits, tree fruits, row crops, and many other plants. Beetle grubs will attack turf (lawns, golf courses, and pastures) and the roots of many other crop and ornamental plants.

Native species

Hosts: The beetles injure fruits of many kinds, including grapes, peaches, raspberry, blackberry, apple, pear, quince, plum, prune, apricot, and nectarine, and frequently feed as well on the sap of oak, maple, and other trees, and on the growing ears of com. They are attracted to ripe (especially overripe) fruits. The larvae feed on decaying organic matter in the soil or in well-rotted manure or compost piles.

Know your pest…

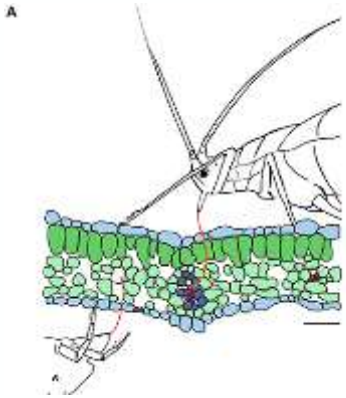
Leafminer

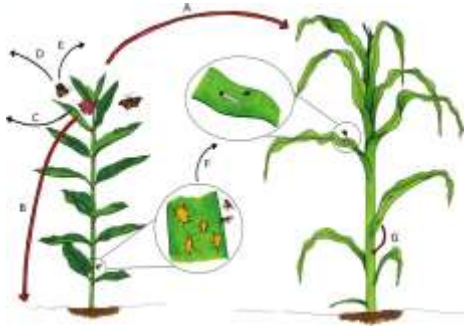
Syrphid

~1/4 inch

Compounding Problems

- Weeds
  - Pest insect habitat
  - Plant diseases increase
  - Overcrowding
- Insects
  - Vector plant pathogens
- Plant Pathogens
  - Secondary infections
  - Weaken immune system





Submitting a sample to NMSU Plant Clinic

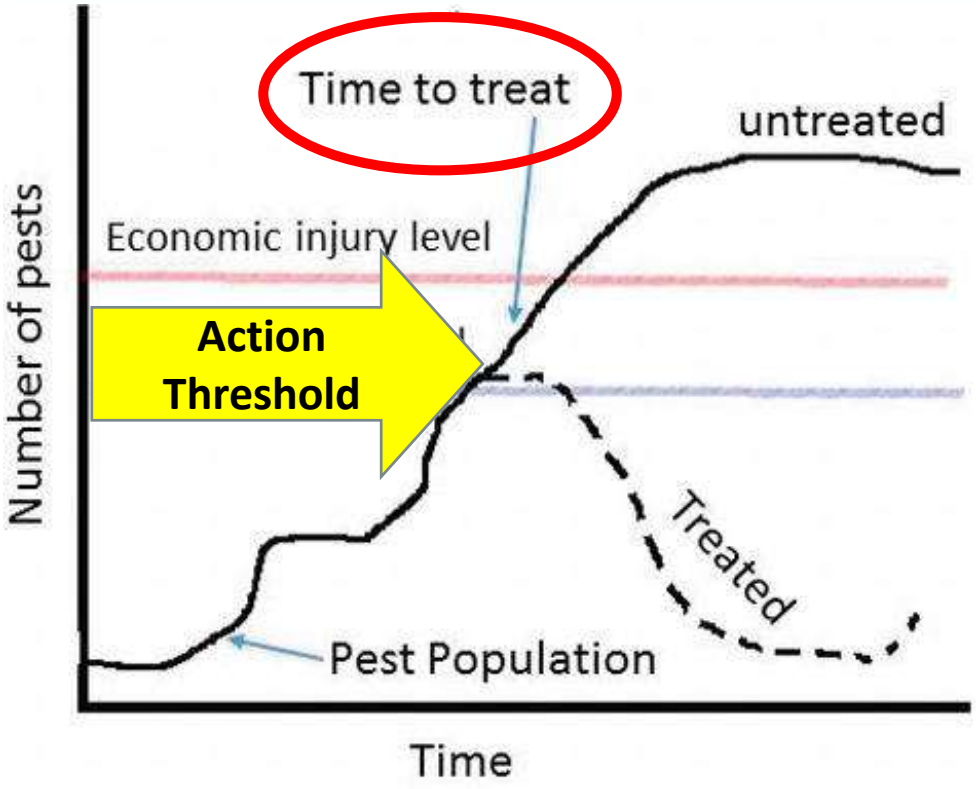
Phillip Lujan
pl11@nmsu.edu

For Active Pests

- Contact your local extension agent
- Collect fresh samples
- More information, including address, sampling, forms: https://aces.nmsu.edu/ces/plantclinic/

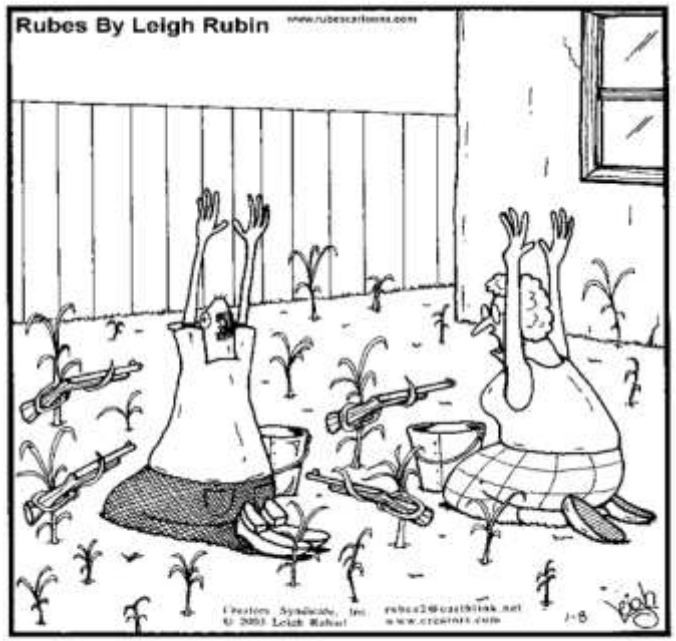
Monitoring – Thresholds

- Economic Injury Level (EIL)
  - Pest population level at which the dollar cost of crop yield loss begins to exceed the dollar cost of pest control measures
  - Economic loss →
    Yield Loss > Cost of control
- Action Threshold
  - Economic Threshold
  - Pest population level that if left untreated is likely to reach or exceed the EIL
  - Point at which action should be taken against the pest



Cultural Control

- Make the environment less suitable for pests



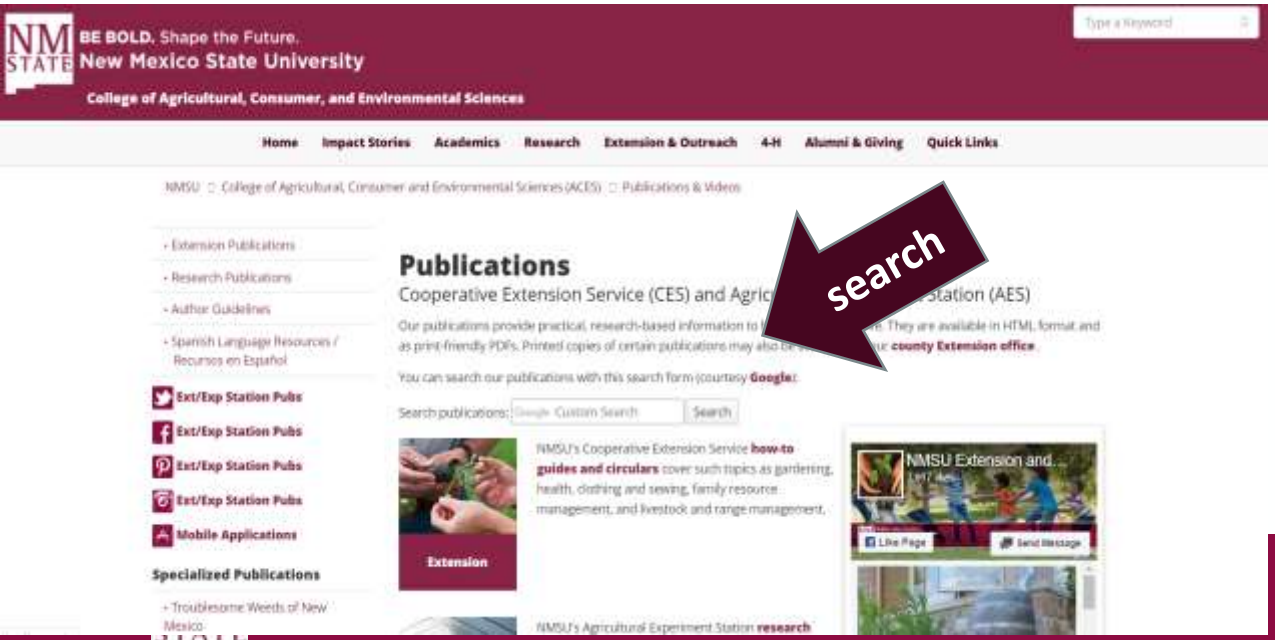
"We never should have waited this long ...
Now the weeds have *completely*
taken over."

Cultural Control – Strategies

- Reduce or remove pest habitat
    - Removing crop/plant residues – removes overwintering habitat and kills pest in residues
    - Crop rotation
    - Removal Practices: cultivation, infested branches
    - Sanitation practices – ex. Remove fallen fruit which harbor and support pests

Cultural Control – Strategies

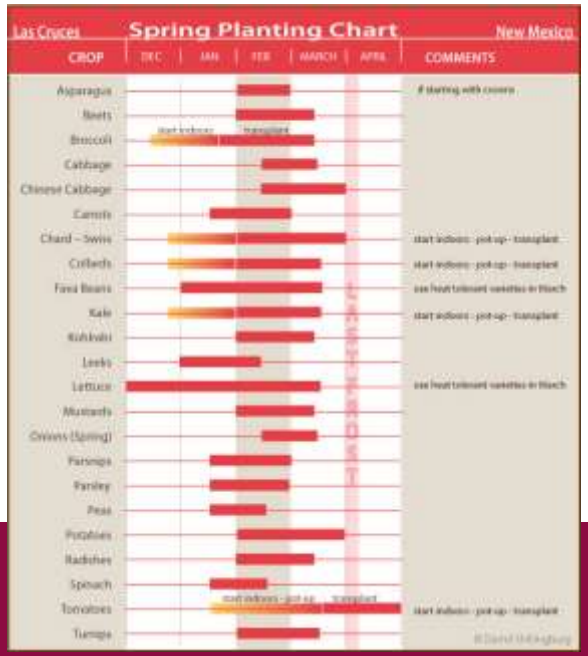
- Reduce insect injury
  - Improve plant health through proper irrigation, fertilizer, and weed control
  - Select plants that are drought tolerant, cold tolerant, or resistant



aces.nmsu.edu/pubs

Cultural Control – Strategies

- Planting
  - Adjust plant spacing through density or diversity
  - Adjust timing
    - Plant before or after pest is active
    - Planting early may result in a larger, healthier plant that can tolerate more damage
    - Harvest before pest is active



Mechanical Control

- Use of physical methods that directly remove or reduce pests or that create a protective barrier between plants and insects

Mechanical Control – Strategies

- Cultivation
  - Destroy weeds by plowing, disking, or mowing
  - Disruption of soil can kill larva and overwintering insects

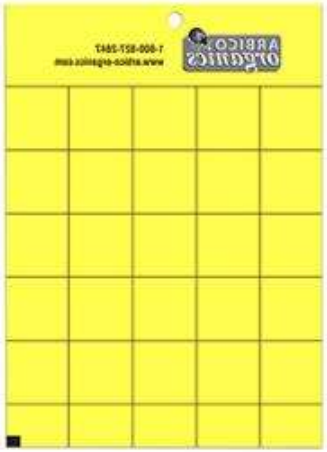
Mechanical Control – Strategies

- Exclusions
  - Install screens, row covers, fencing that can protect against pests
  - Challenges: limit pollinator access, increased temperatures, plants growth

Mechanical Control – Strategies

- Traps (ex. Sticky traps and pheromone traps)
  - Trap enough insects to lower pest pressure
  - Monitoring Tool

  *NOTE: may also trap beneficial insects



Mechanical Control – Strategies

- Strategy: Hand removal
  - Manually remove and destroy pests
  - Better for small areas; labor intensive

- High pressure water
  - Dislodge pests from trees and shrubs

Biological Control

- Use of living organisms to suppress pest populations below an economically damaging or unacceptable aesthetic level

- Three types:
  - Classical/Importation
  - Augmentation
  - Conservation

Augmentation Biological Control

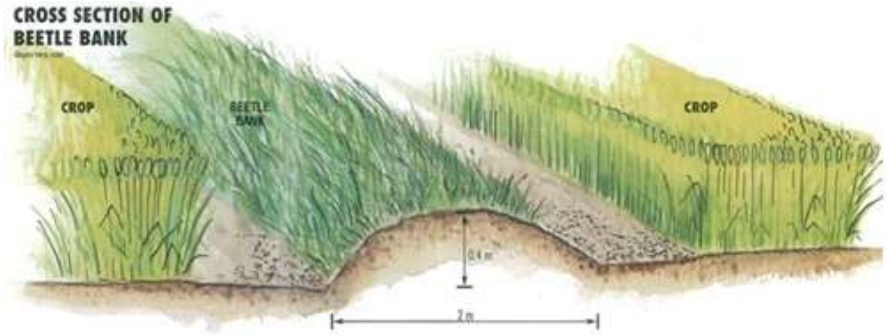
- Direct manipulation of natural enemy population through inundative or inoculative releases

- **Inundative**: single mass release of natural enemies
  - The goal is to overwhelm, not expecting population to establish

- **Inoculative**: one or more smaller releases
  - Expect populations to establish and spread

Conservation Biological Control

- Manipulation of the habitat to favor existing natural enemies by:
  - Adding flower resources
    - Pollen and nectar
    - Alternative prey
    - Overwintering habitat/nesting sites




S. Jordan

Conservation Biological Control

- Manipulation of the habitat to favor existing natural enemies by:
  - Adding flower resources
    - Pollen and nectar
    - Alternative prey
    - Overwintering habitat/nesting sites

- Minimize chemical exposure

- Minimize tilling to conserve overwintering bees and natural enemies in soil

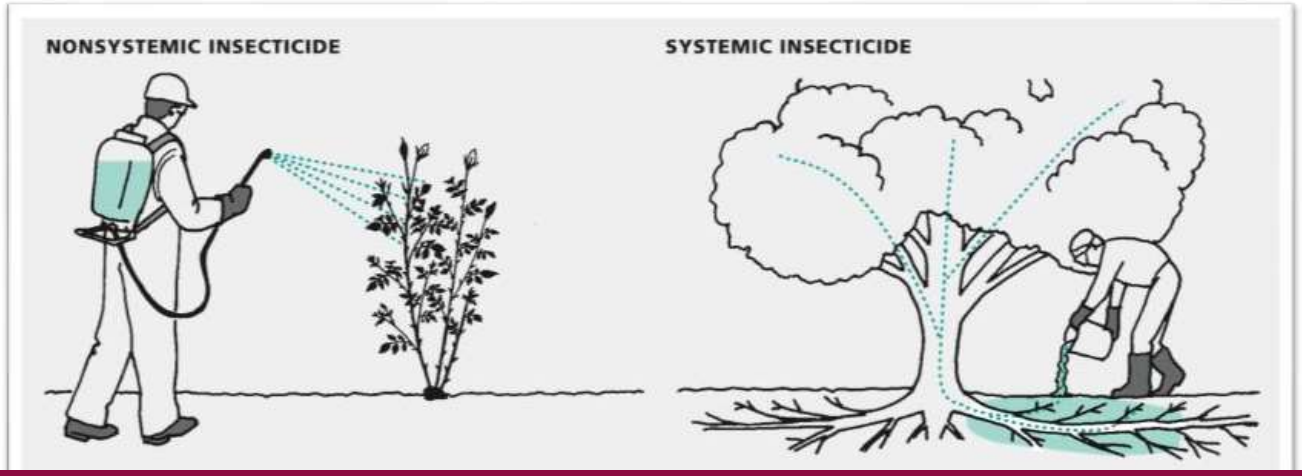
Chemical Control

- Use of pesticides that are either naturally derived or synthesized

- What is a pesticide?
  - A material applied to plants, soil, water, crops, structures, clothing, or animals to kill, repel, regulate, or interrupt the growth of a pest (weed, insect, disease)

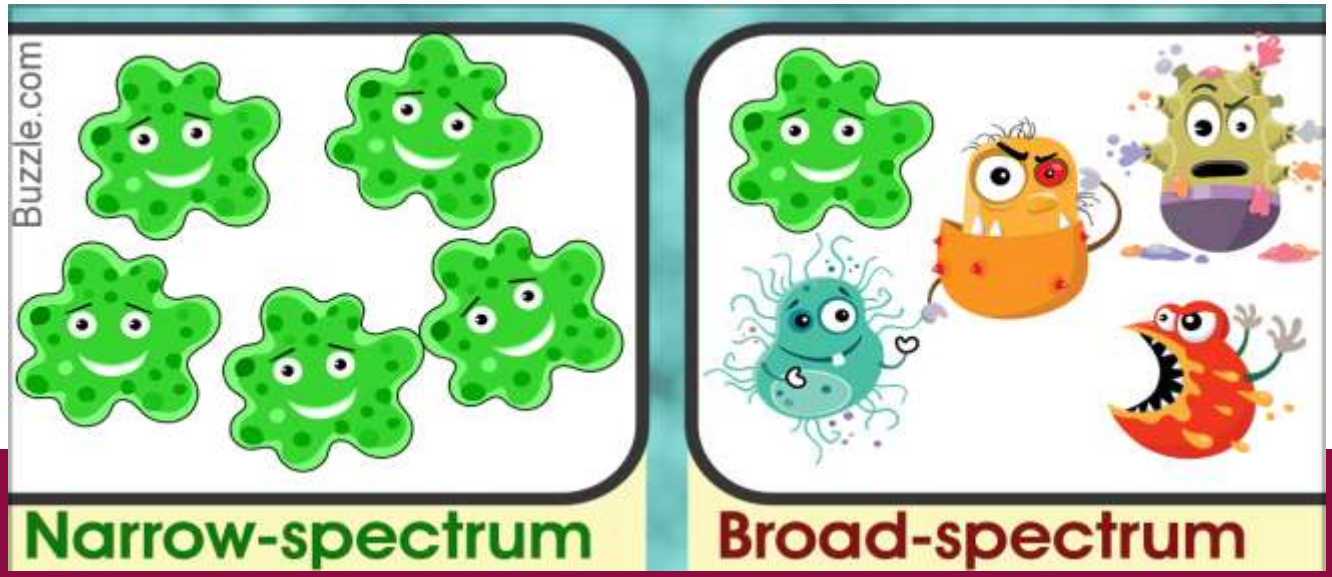
Chemical Control

- Systemic vs. contact
  - Systemic: Absorbed by the plant to target plant-feeding pests
    - Spray or soil application
  - Contact: Not absorbed and must directly touch pest
    - Spray application



Chemical Control

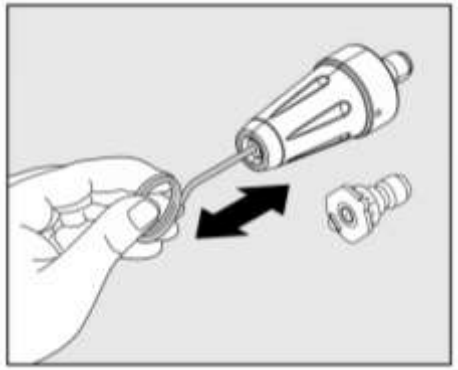
- Selective vs. broad spectrum
  - Selective: Kill a certain type of pests, often safer for natural enemies
  - Broad spectrum: Kill a wide range of pests, including natural enemies



Chemical Control: Resistance Management

- Target younger plants and more susceptible life stages

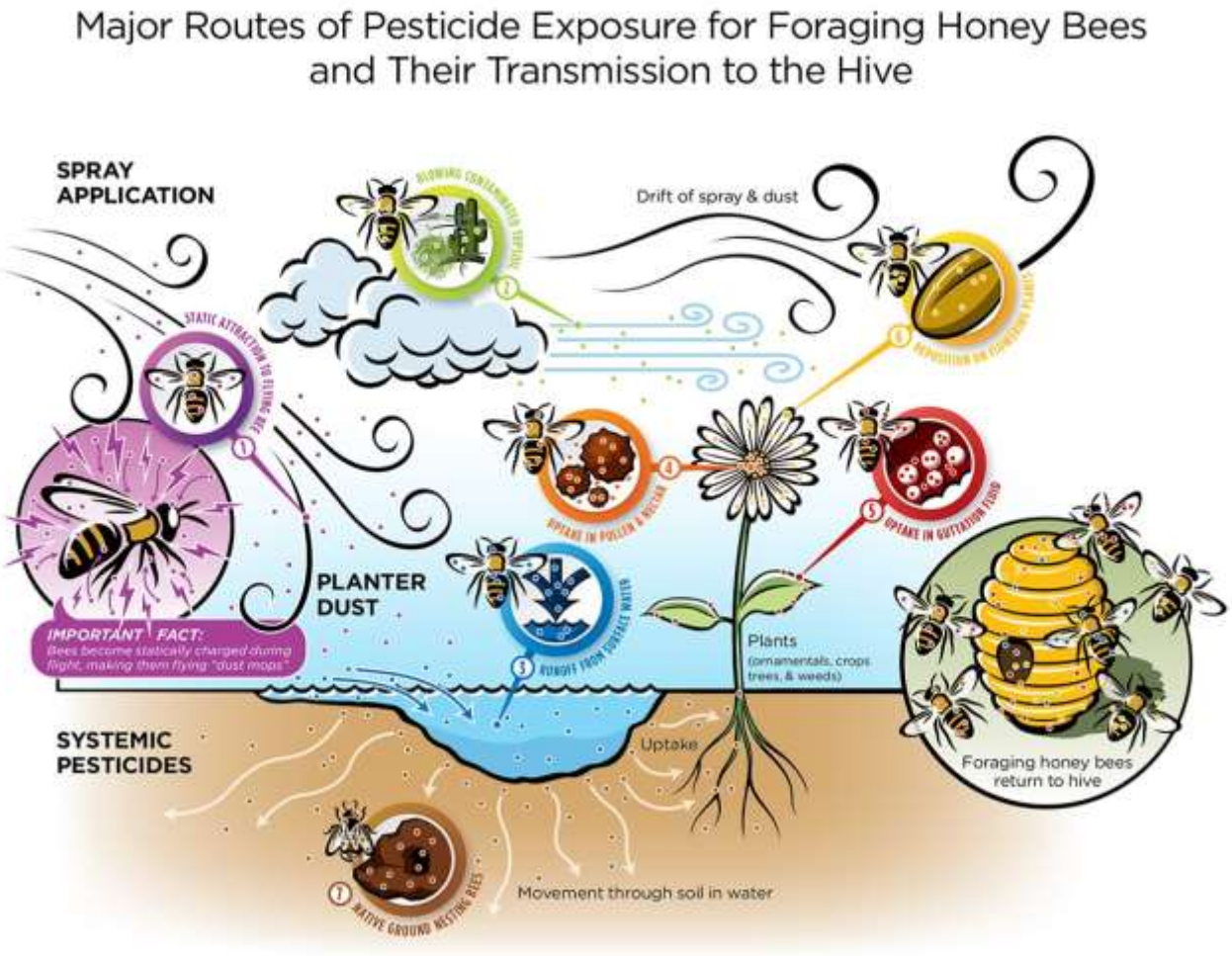
- Maintain equipment to get full coverage



Chemical Control: Best Practices

- Monitor pest populations and apply only when needed
- Apply under the correct environmental conditions
- ID the pest and use the correct pesticide
- Apply to the correct pest life stage
- Apply at the correct time
- **Use label rates**

Chemical Control – Beneficial Insects



Chemical Control – Beneficial Insects

- Use practices to reduce beneficial arthropod exposure
  - Spray in the evening
  - Avoid spraying when windy
  - Avoid spraying while flowers are in bloom

- As a general rule, insecticides are more toxic to arthropods than fungicides and herbicides.

- **Read Labels – Check the Area**
  - Pollinator Protection Statements
  - Check for the presence of blooming plants and pollinators
  - Do this BEFORE you schedule an application

IPPM

Integrated Pest and Pollinator Management

- Beetles
- Moths
- Butterflies
- Flies
- Wasps
- Beetles
- Bats
- Birds – Hummingbirds
- **Bees**








IPPM
Integrated Pest and Pollinator Management

Native Bees: Over 1000 species in New Mexico

Bee hives in apple orchard

E. Beers

Pollinators in Agricultural Crops

R. Isaac

Hadel

G. Brust

J. Slone

Implementing IPPM

Pollinators forage across the landscape, need a landscape approach to their management

- Pests
  - Consider all suitable practices for controlling pests
  - Use practices that discourage pests
  - Carefully diagnose your pest problems.

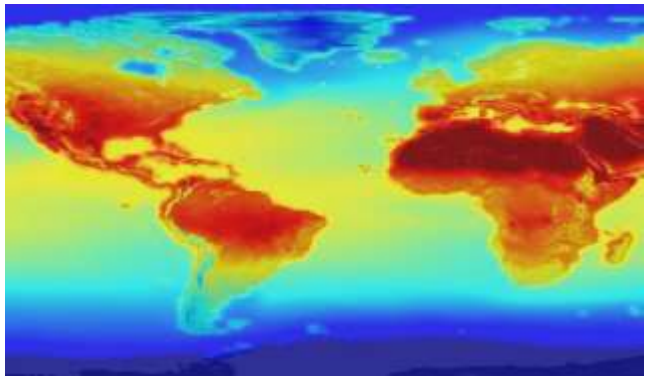
- Determine the need for treatment through pest scouting or monitoring

- When Using Pesticides
  - Use pesticides only when needed
  - Use the recommended pesticide at the lowest appropriate labeled rate with the proper timing and placement.
  - Prevent drift and consider timing!

Outside of your control

Surrounding landscape

Climate



Pollinators can have large foraging ranges

Provide pollinators with resources!

Insects & Arthropods

https://www.youtube.com/watch?v=2ivZ6GSaK1M

Key Pests

Squash Bugs

Egg Mass

Young nymphs

Adults

Squash Bugs

- Hemiptera – piercing, sucking mouthparts
- Adults overwinter in dead leaves, vines, buildings
- Attack: squash, pumpkin, cucumber, melons (cucurbits)
- Adults lay eggs on underside of leaves
- Damage:
  - Causes yellowing and brown spots
  - Phytotoxic saliva causes wilting

Photo: Gerald Holmes, Bugwood.org

Photo: Whitney Cranswhaw, Bugwood.org

Squash Bugs

IPM	Strategies
Monitor	• Check for eggs, bugs, damage to plants
Cultural	• Choice of cultivar, planting time • Remove plant debris (overwintering sites) • Avoid mulches (harbor bugs) • Rotate to non-cucurbit crop
Physical	• Row covers • Hand picking into soapy water
Biological	• Tachinid fly lays eggs on nymphs and adults • Spiders, ground beetles, robber flies
Chemical	• Best to target nymphs; more difficult to kill adults • Diatomaceous earth (abrades) • Alternative insecticides (ex. Neem oil, but expensive and marginally effective) • Conventional – follow label

Aphids

Hosts – MANY

>1,000 aphid species in US

Generalists and Specialist

Oleander Aphid

Pea Aphid

Green Peach Aphid

Melon Aphid

Aphids

Vector Viruses

Cause secondary problems (sooty mold)

Aphids

IPM	Strategies
Monitor	• Check plants
Cultural	• Proper nutrients (too much can attract aphids) • Encourage natural enemies • Control weeds • Tolerant cultivars • Prune
Physical	• High-pressure water • Hand picking into soapy water
Biological	• Predators: Ladybugs, syrphid larvae, lacewings, spiders, minute pirate bugs • Parasitoids
Chemical	• Contact, systemic • OMRI → neem, dormant oils, insecticidal soap • Conventional – follow label

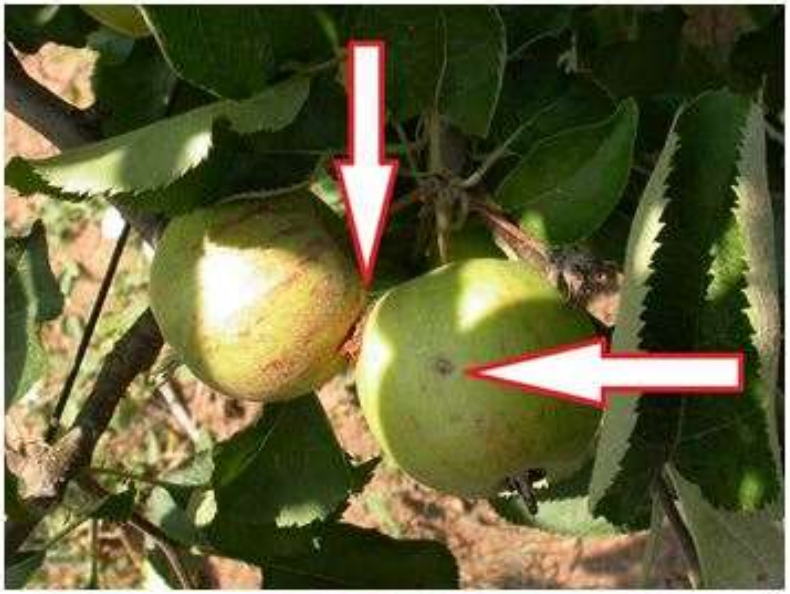
Codling Moth

Hosts

Pear, Apple, Walnut

Larva

Codling Moth



Codling Moth

IPM	Strategies
Monitor	• Monitor→ degree days, climate features, pheromone traps
Cultural	• Remove hosts from surrounding landscape, • **Sanitation**, remove infested fruits and dropped fruits • Trapping/Tree Banding
Physical	• Pheromone Traps • Bag fruits (in small production)
Biological	• Can help, can't control • Some known parasitoids
Chemical	• OMRI → Granulovirus , Spinosid, oils. Bt, Pyrethrin, neem, insecticidal soaps • Diatomaceous earth (abrades) • Mating disruptors • Sodium Channel Blocking Insecticides, Pyrethroid

Bagworm

Hosts

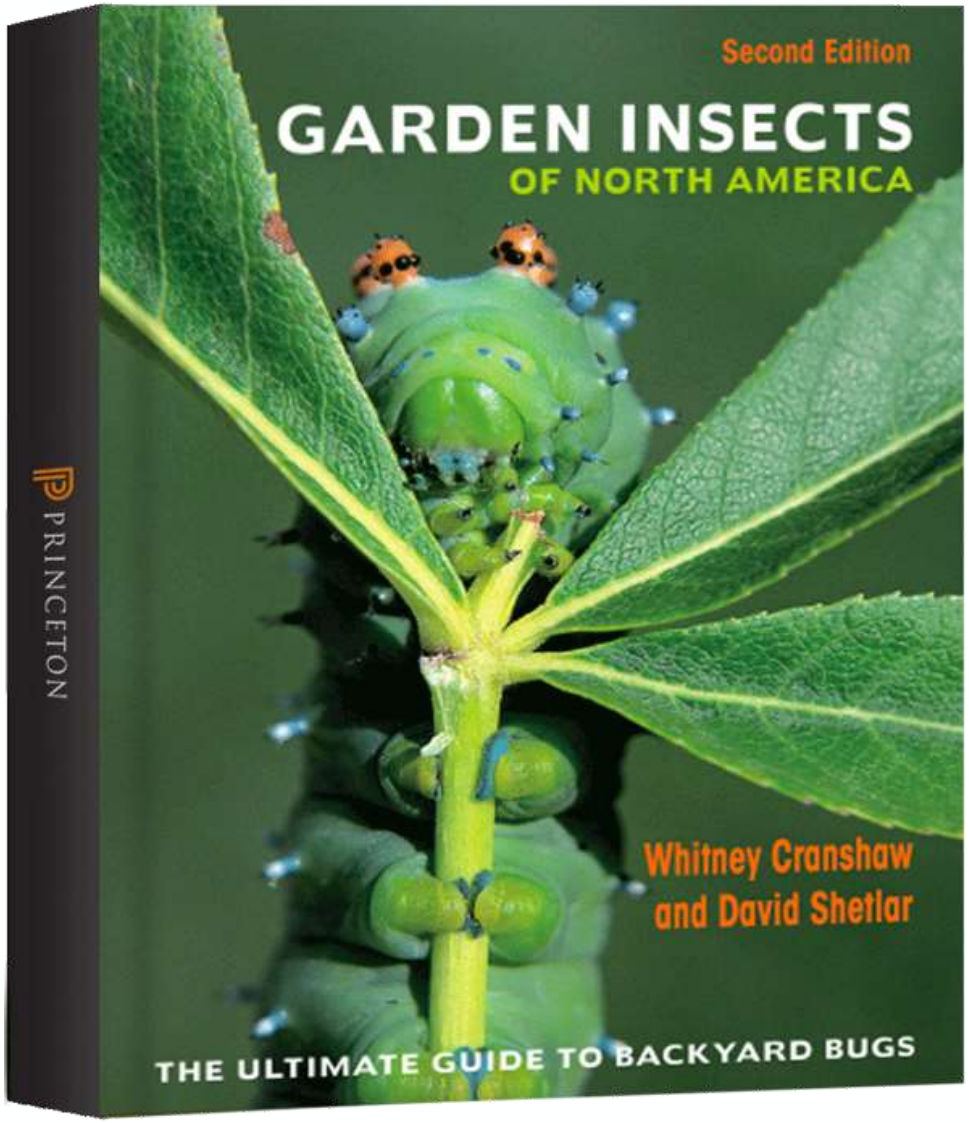
Conifers and deciduous trees, arborvitae, pine, locust, sycamore, and oak.

Female

Male

Bagworm

IPM	Strategies
Monitor	• Monitor for bags
Cultural	• Keep trees healthy • Prune heavily damaged areas
Physical	• Remove bags and destroy (burn, sealed bag) • Phenome traps
Biological	• Parasitoids (in NM???) • Nematodes
Chemical	• Early life stages must susceptible • Contact insecticides • Bt, Pyrethrum • Conventional – pyrethroids, malathion*


Second Edition
GARDEN INSECTS
OF NORTH AMERICA
PRINCETON
Whitney Cranshaw
and David Shetlar
THE ULTIMATE GUIDE TO BACKYARD BUGS

Contact Information

Amanda Skidmore, PhD

Email: skid@nmsu.edu

Twitter: @Dr_Skidmore and @NMSU_IPM

Resources:

- Website: https://aces.nmsu.edu/ipm
- Guides
  - IPM for Home Gardeners
  - Backyard Beneficial Insects in New Mexico
  - Pocket Guide to the Native Bees of New Mexico
  - Landscape Design for Pollinators
  - IPM Strategies for Common Garden Pests