Defining and Incorporating IPM

Amanda Skidmore, PhD

Extension IPM Specialist for Urban and Small Farms

College of Agriculture, Consumer, and Environmental Sciences

Department of Extension Plant Sciences

Department of Entomology, Plant Pathology, and Weed Science

NM STATE UNIVERSITY

BE BOLD. Shape the Future.

What is IPM?

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

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

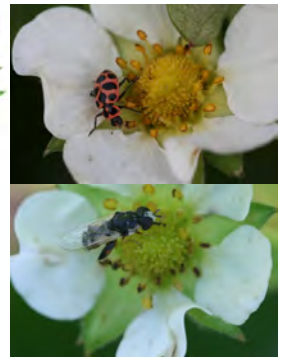
E. Beers

Pollinators in Agricultural Crops

R. Isaac

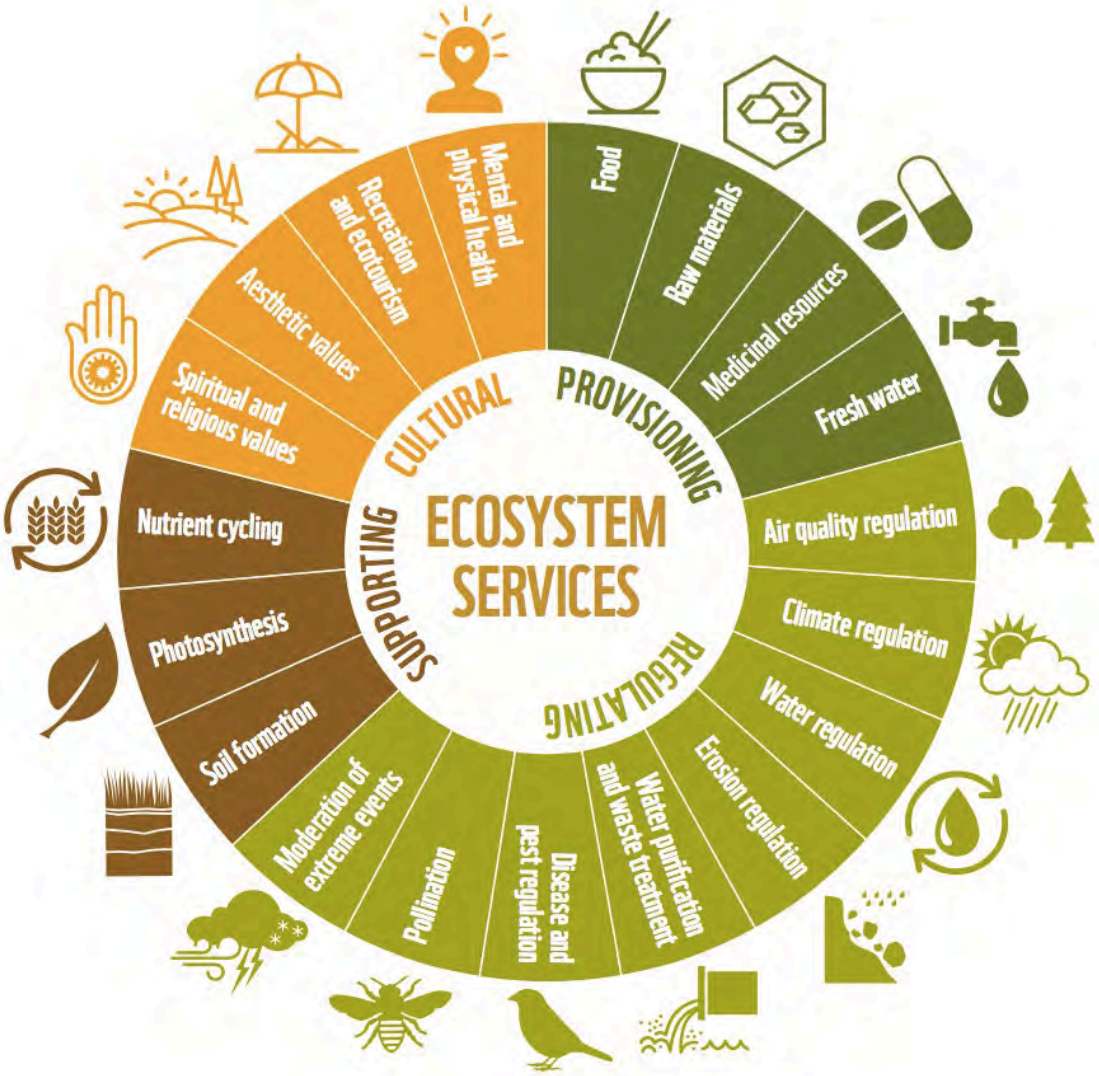
Hadel

G. Brust



J. Slone

Improving Ecosystem Services



Building and IPM Plan

NM STATE

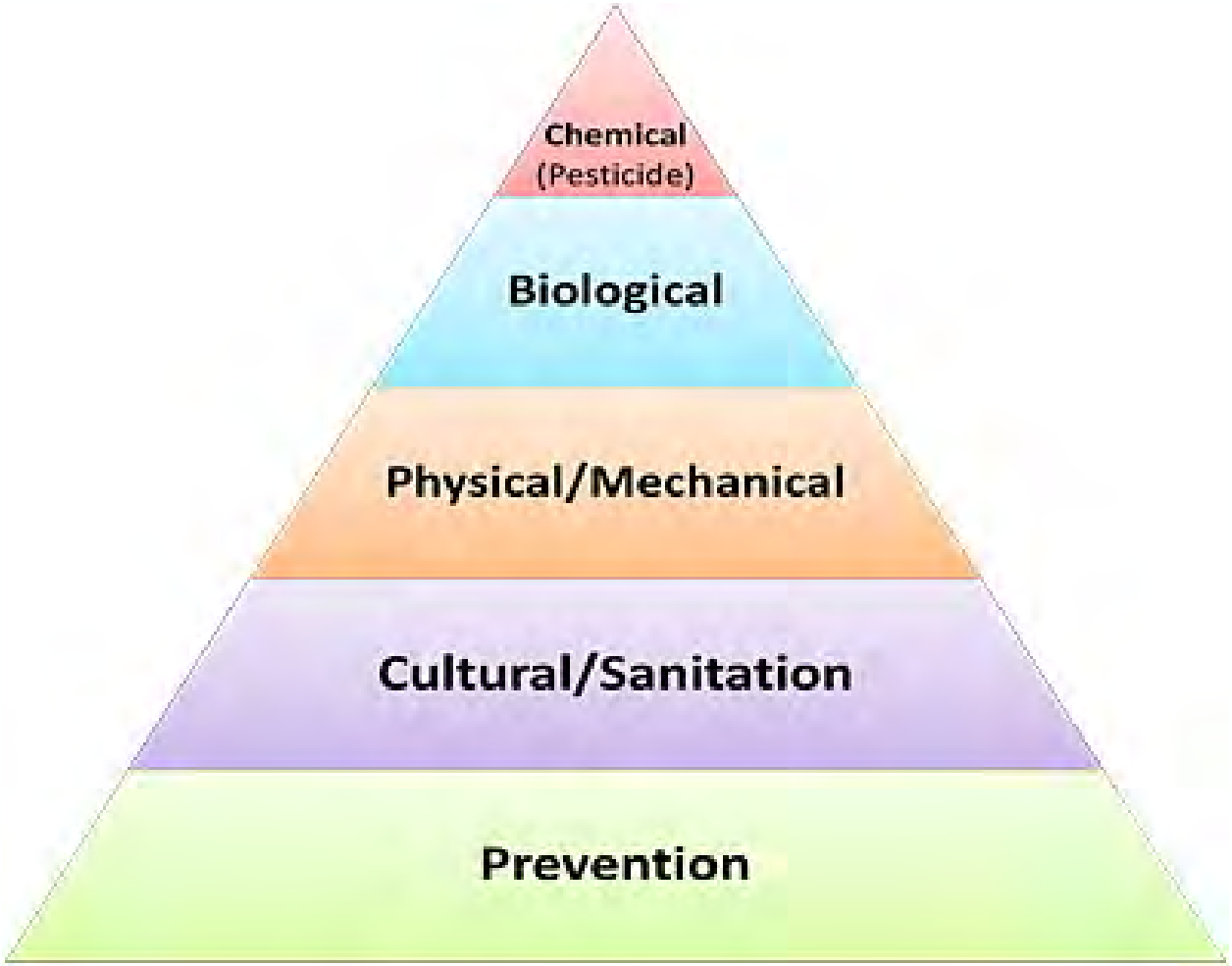
BE BOLD. Shape the Future.

What is a Pest?

Insect

Weed

Plant Pathogen

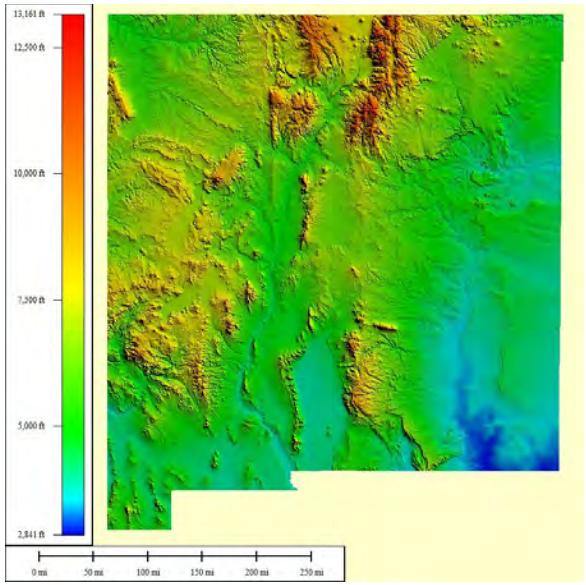

Chemical
(Pesticide)
Biological
Physical/Mechanical
Cultural/Sanitation
Prevention

Prevention

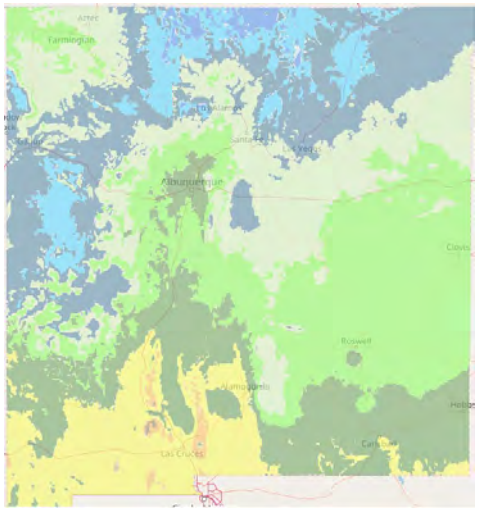
- Plan and select the correct plants for your landscape
  - Suitable for local environment and intended location
  - Soil type and pH
  - Light requirements
  - Soil moisture needs

Eco-Regions
(7)

Elevation
(2,800ft – 13,161ft)



Growing Zones
(11)

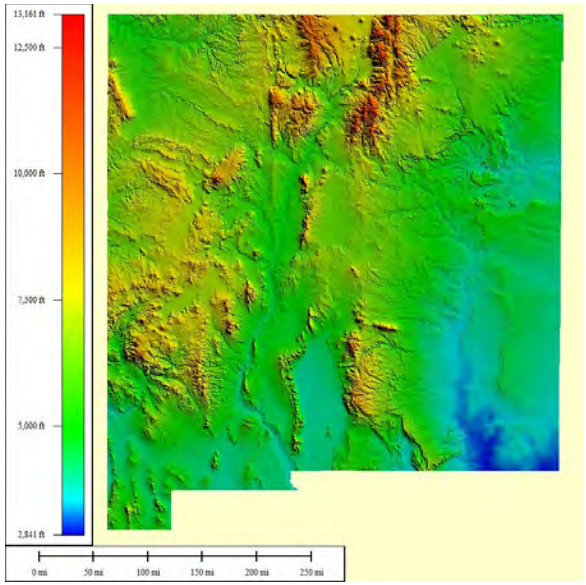


Average Rain Fall

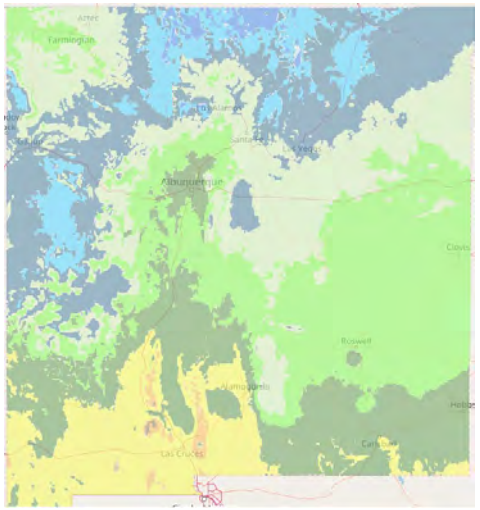
13.85 inches/year

Eco-Regions
(7)

Elevation
(2,800ft – 13,161ft)



Growing Zones
(11)

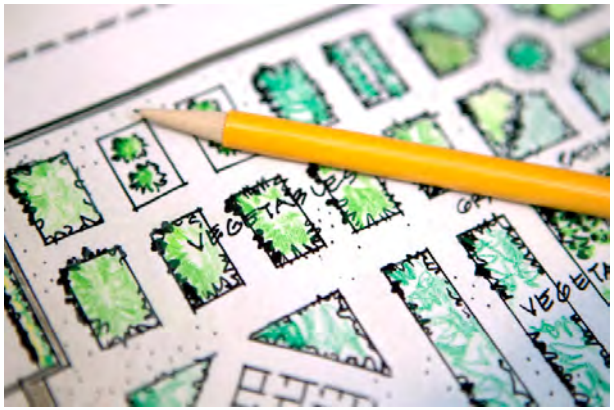


Average Rain Fall

13.85 inches/year

Prevention

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



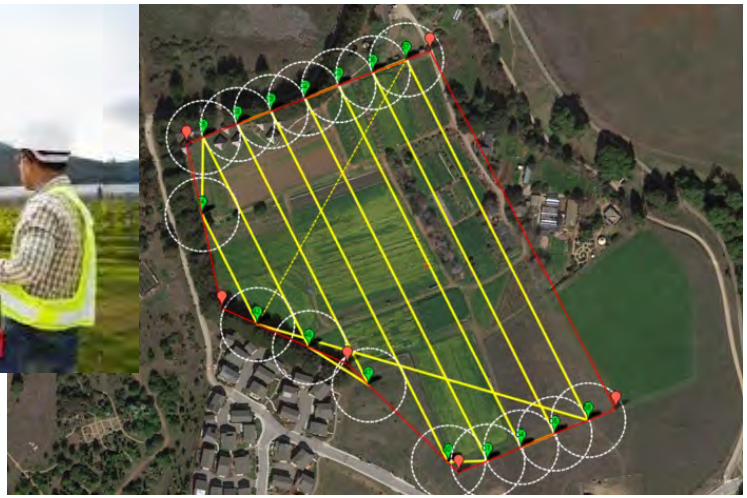
- **Keep it clean!**
  - Clean out old plant material
  - Remove weeds
  - Remove diseased or sick plants

- **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

Know your pest

Invasive Species

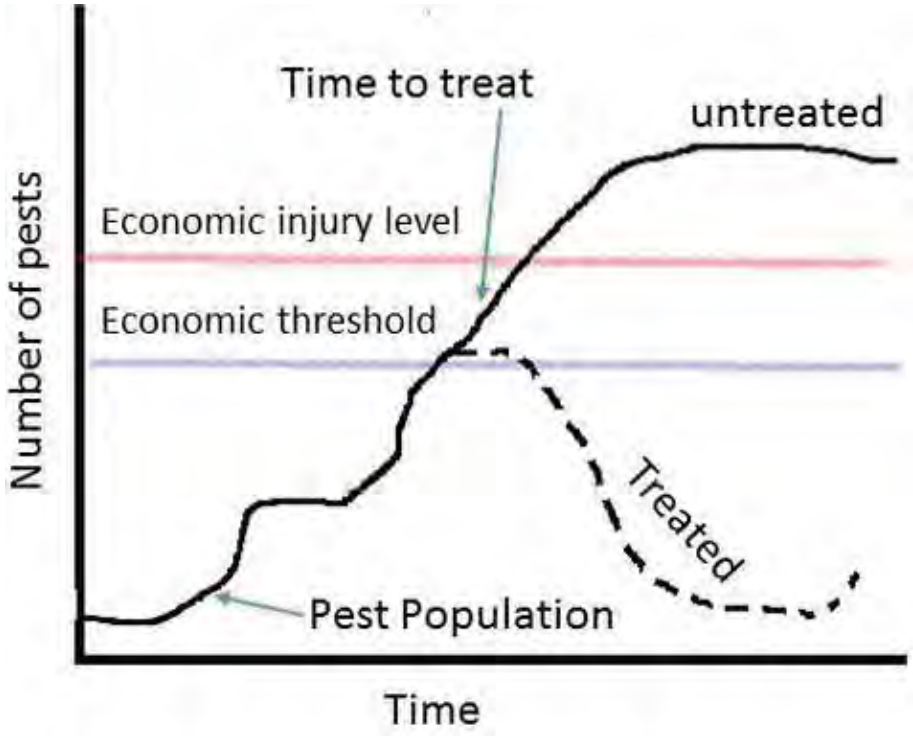
Host: More than 400 plant species within 95 families are susceptible to attack by this pest. Adult beetles not only damage numerous ornamental herbaceous plants, shrubs, vines and trees, but also small fruits, tree fruits, row crops, and many other plants. Beetle grubs will attack turf (lawns, golf courses,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

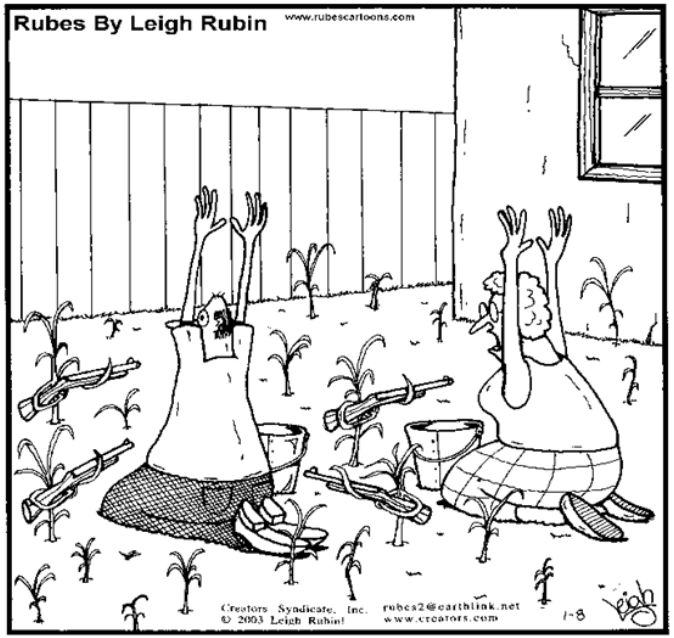
Monitoring – Thresholds

- 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
- Economic Threshold (ET)
  - 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

NM STATE UNIVERSITY

New Mexico Range Plants

Circular 374

Revised by Christopher D. Allison and Nick Ashcroft[1]

Cooperative Extension Service • College of Agricultural, Consumer and Environmental Sciences

New Mexico contains almost 78 million acres, more than 90 percent of which is in native vegetation grazed by domestic livestock and wildlife. The kinds of plants that grow on a range, along with their quality and quantity, determine its value. A successful rancher knows the plants on his or her range.

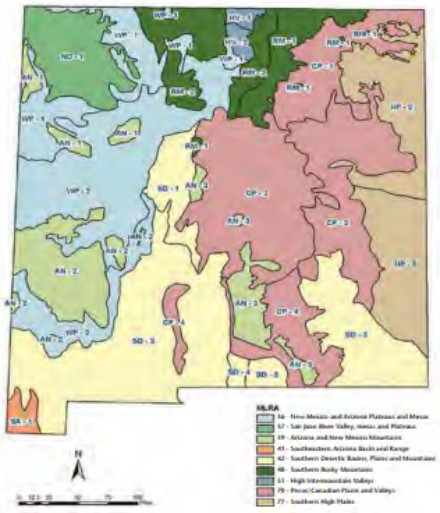
There are more than 3,000 species of plants in New Mexico. The 85 discussed here are most important to the livestock industry. Most of these are native plants.

RANGELAND AREAS OF NEW MEXICO

Figure 1 represents the major rangeland areas in New Mexico. The northern desert, western plateau, and high valley areas are enough alike to be described together, as are the central and high plains areas and the southern desert and basin.

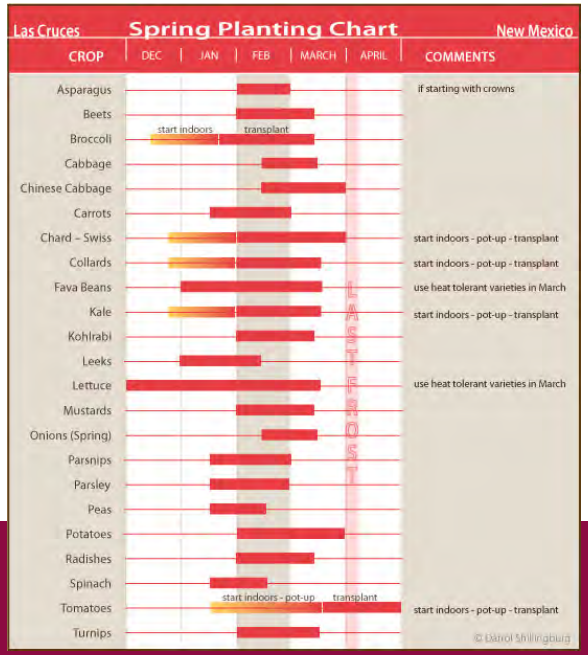
Southern Desert and Basin

The southern desert and basin occupies much of southern New Mexico at elevations between 3,000 and 5,000 feet. This area follows the Rio Grande north into the southern part of Sandoval County.



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; but these can also limit pollination

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

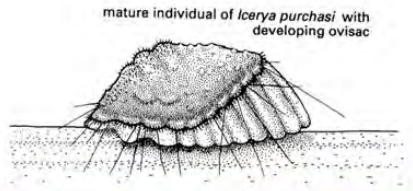
Biological Control

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

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

Classical Biological Control

- Pest: exotic or non-native
- Biocontrol agent: natural enemy from pest's country of origin
- How it works:
  - ID pest's country of origin
  - Go to that region to search for promising, specialized natural enemies
  - Import into US under permit by USDA
  - Placed in quarantine and research begins (e.g. non-target effects)



The Vedalia beetle, *Rodolia cardinalis*

The Vedalia beetle [& a parasitic fly, *Cryptochaetum iceriae* (not shown)] introduced from host country (Australia) to control cottony cushion scale on citrus in USA. The first major modern classical biological control success story.

Augmentation Biological Control

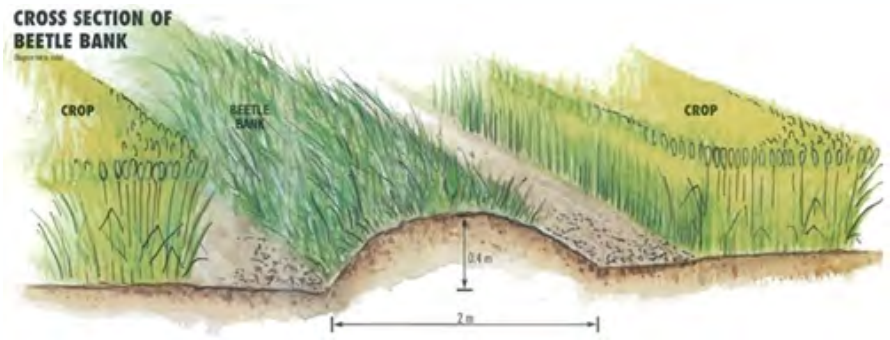
- Direct manipulation of natural enemy population through inundative or inoculative releases

- **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

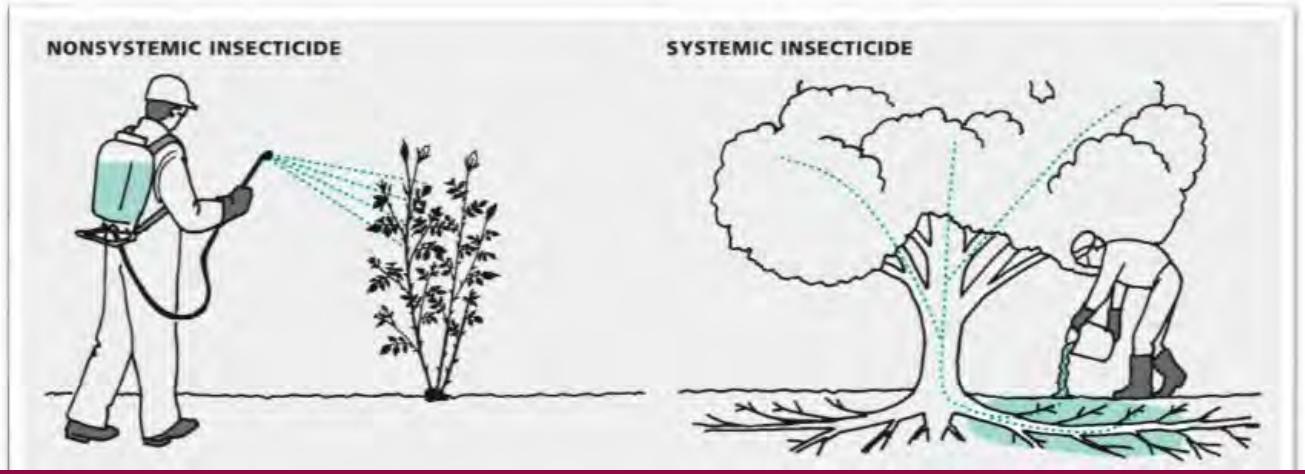
Chemical Control

- 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)

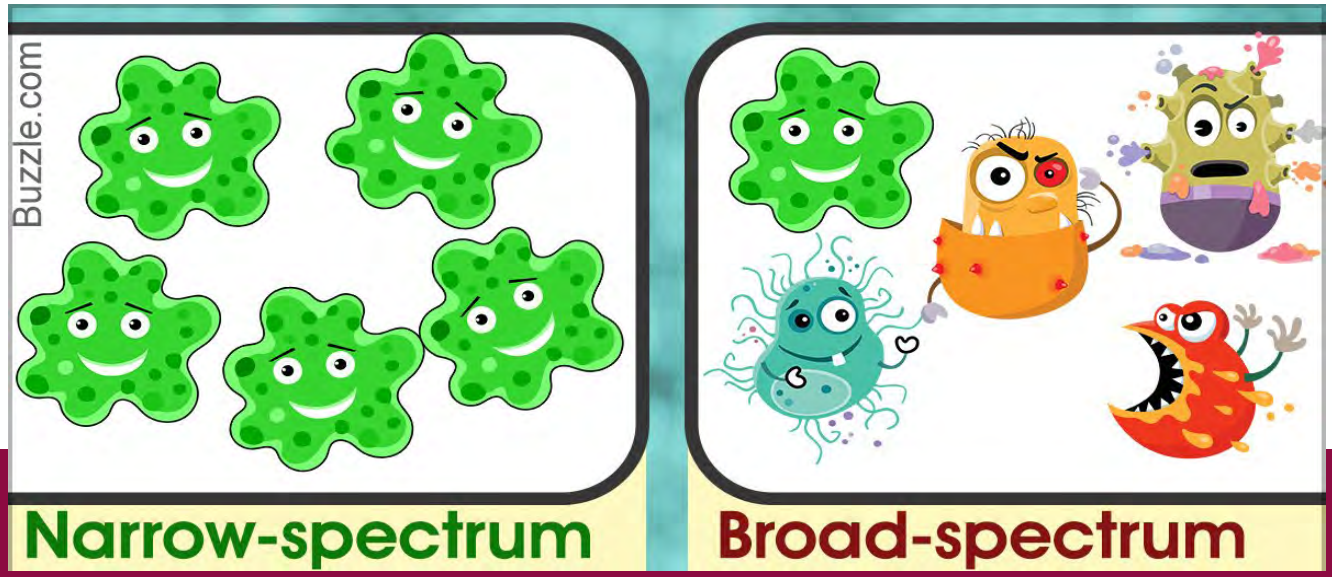
Chemical Control

- 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

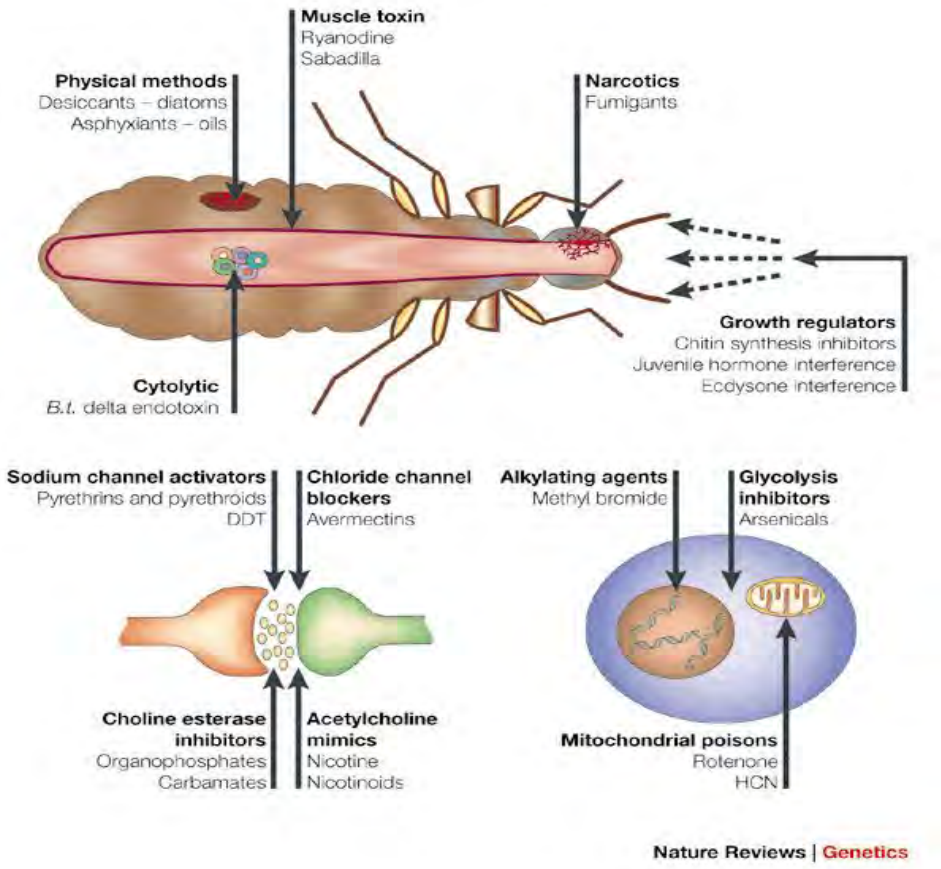


Chemical Control

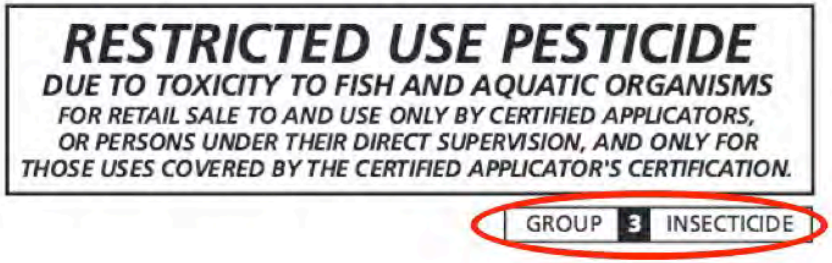
- Selective vs. broad spectrum
  - Selective: Kill a certain type of pests, often safer for natural enemies
  - Broad spectrum: Kill a wide range of pests, including natural enemies



Chemical Control: Mode of Action



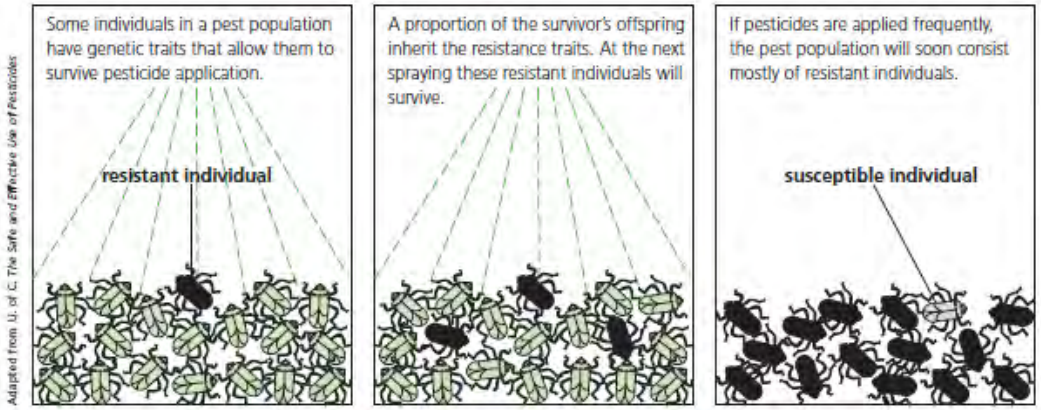
Chemical Control: Mode of Action



- Avoid spraying the same chemical consecutively
- Avoid using the same chemical family
- https://www.youtube.com/watch?v=pS7pxpTwMoQ

Chemical Control: Resistance Management

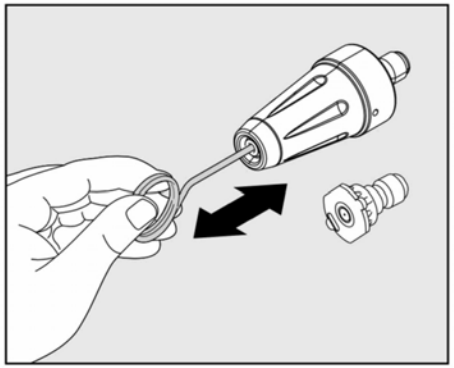
- Residual persistence
  - How long the chemical remains active in the environment
- Pesticide resistance
  - The ability of pests to survive exposure to a particular pesticide



Chemical Control: Resistance Management

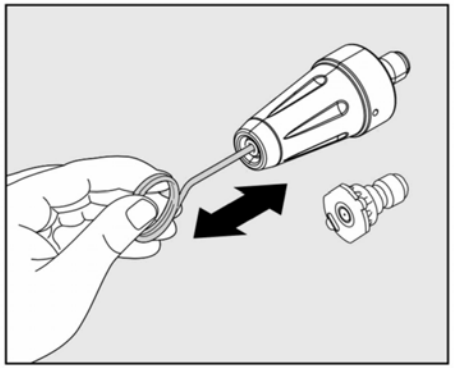
- Target younger plants and more susceptible life stages

- Maintain equipment to get full coverage



Chemical Control: Resistance Management

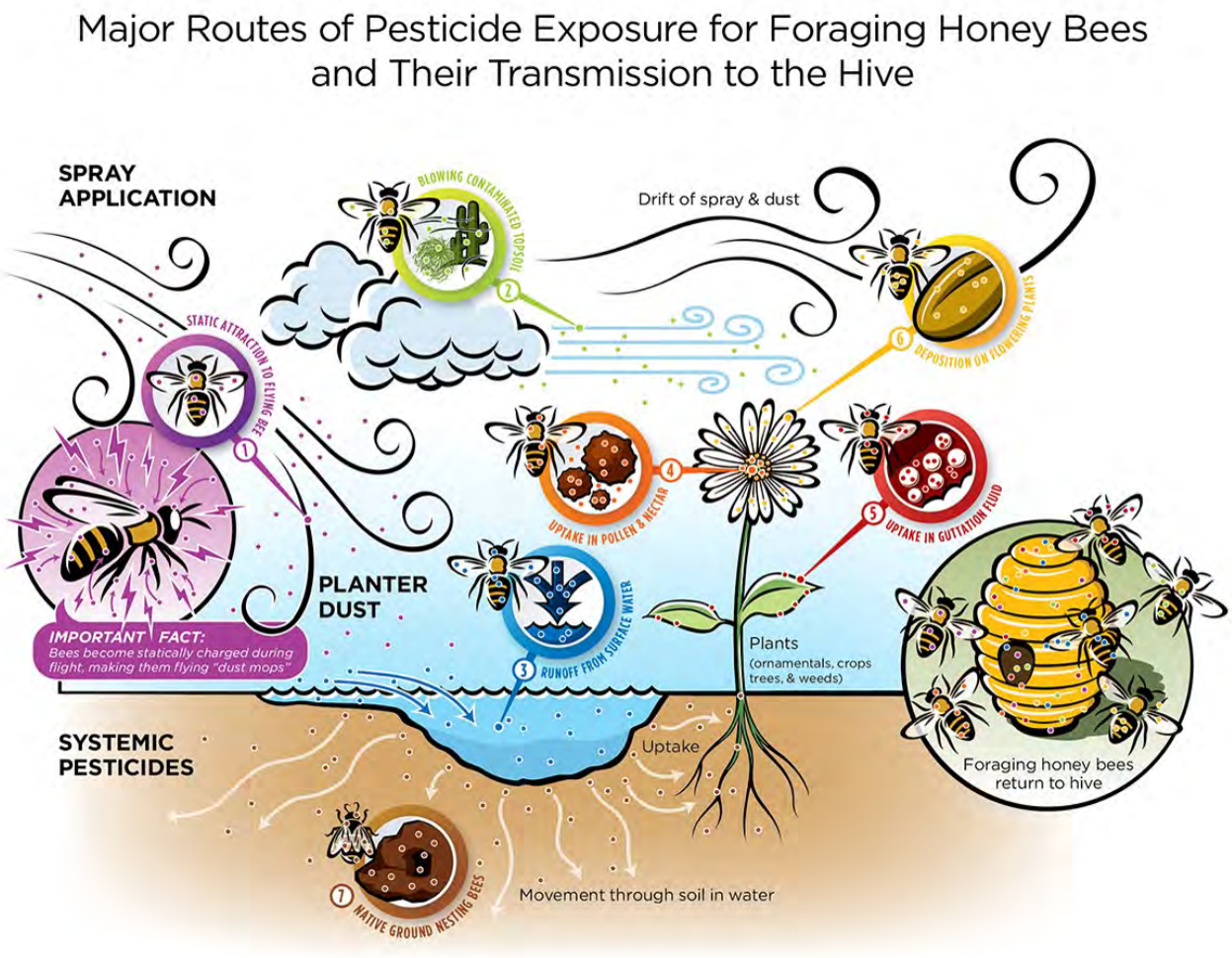
- Target younger plants and more susceptible life stages
- Maintain equipment to get full coverage
- Use selective (narrow spectrum) pesticides
  - For insects, this targets pests and protects natural enemies
  - When natural enemies are eliminated, outbreaks of pests that are usually not a problem can occur, such as mites and aphids
  - Avoids secondary pest outbreaks



Chemical Control: Best Practices

- Scout and monitor pest populations; Apply only when needed
- ID the pest and use the correct pesticide
- Apply to the correct life stage
- Apply at the correct time
- Apply under the correct environmental conditions
- 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

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

Resources:

- New Mexico Range Plants
  - https://aces.nmsu.edu/pubs/_circulars/CR374_SM.pdf
- Alfalfa Weevil Control Options in New Mexico
  - https://aces.nmsu.edu/pubs/_a/A338.pdf
- Insecticide Resistance Action Committee
  - https://www.irac-online.org/
- The new IPM paradigm S. Dara
  - https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=28210