GILA RIVER INDIAN COMMUNITY DEPARTMENT OF ENVIRONMENTAL QUALITY

PESTICIDE CONTROL OFFICE

Community Applicator Certification Training

Image Credit: GRIC PCO

Module 1: Pest Management and the IPM Philosophy

Pest Management & the IPM Philosophy

This Module Will Help You:

- Understand the historical perspective of pest management
- Know the main groups of pests
- Learn about resources to identify specific pests and damage symptoms
- Understand Integrated Pest Management (IPM)
- Explain the significance of preventive measures
- Interpret pest population levels and environmental influences
- Perceive pesticide resistance and what causes pesticides to fail

History of Pesticides

Media Credit: Penn State Extension, the Pesticide Education Program, and the Pennsylvania Department of Agriculture
https://www.youtube.com/watch?v=gyZPDcr5_dw

What is a Pest?

Any organism that is detrimental to humans

- Destroys crops & structures
- Poses threats to human health and livestock
- Reduces aesthetic and recreational value

Scorpion phosphoresces under black light
Image Credit: UA Association of Environmental and Engineering Geologists

House mouse (Mus musculus)
Image Credit: Jim McCormac, Ohio Department of Natural Resources

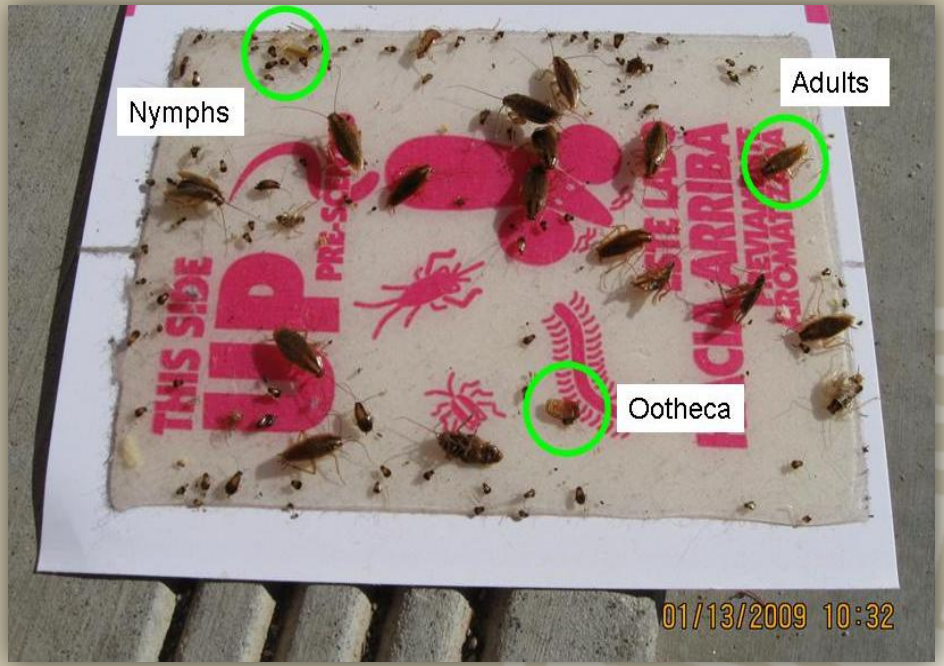
Kudzu (Pueraria montana var. lobata), a common sight in the South
Image Credit: Johnny Randall, North Carolina Botanical Garden

Four Major Pest Categories

- **Weeds**: Undesirable plants
- **Invertebrates**
  - Insects
  - Spiders and mites
  - Sowbugs, pillbugs
  - Snails, slugs, and mussels
- **Vertebrates**
  - Birds
  - Snakes
  - Fish
  - Rodents and other mammals
- **Plant diseases**
  - Pathogens: Living Agents
    - Fungi
    - Bacteri
    - Viruses
    - Nematodes
    - Phytoplasmas
  - Non-living Agents
    - Temperature extremes
    - Air pollution
    - Lack of or excess nutrients

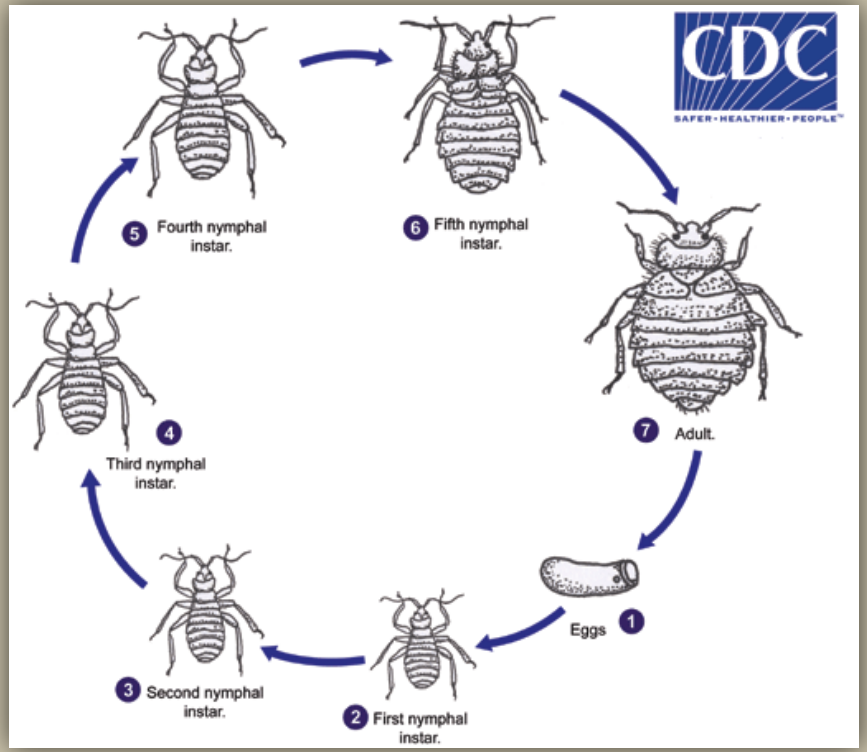
Pest Management

- Is the pest really causing the problem?
- 1st Step: Always identify the pest before taking action!
- Become familiar with its life cycle and habits
- Design a pest management plan
- Misidentification = ineffective control



German Cockroaches on glue trap
Image Credit: Daniel F. Hoyt, GRIC EHS

Pest Identification is Critical



Bed Bug lifecycle chart
Image Credit: Centers for Disease Control

- Understand that all stages of a pest do not look the same
- Know the host of the pest
- Use books, extension bulletins, field guides, Web, etc.
- Have pests examined by specialists

Characteristic Signs of Pests

Mouse rubbing on entrance to opening in drywall
Image Credit: Daniel F. Hoyt, GRIC EHS

- **Birds and Rodents:** Unique nests
- **Insects:** Feeding damage
- **Fecal Material:** Frass or guano
- **Weeds:** Flowers, seeds, or unusual growth habits
- **Pathogens:** Patterns or growths on plant tissue

Control Methods

- **Natural Controls:**
  - Wind
  - Temperature
  - Humidity, rain
  - Rivers, lakes, mountains
  - Pathogens, predators
  - Food supply of the pest
- **Human-applied Controls:**
  - Biological
  - Mechanical
  - Cultural
  - Physical
  - Genetic
  - Chemical
  - Regulatory

Biological Control

Gambusia affinis, mosquito larvae
Image Credit: Los Angeles County West Vector & Vector-Borne Disease Control District

- Usually, pests are not native to area
- Locate pest's native homeland and find natural enemies
- Before releasing natural enemy, evaluate if suitable
- Rear, release, redistribute

Mechanical Control

Use of devices, machines, and other physical methods to reduce pest populations or to alter the environment-

- **Cultivation:**
  - Disrupt soil conditions for weeds and insects
    - Hoes
    - Plows
    - Disks
  - Control growth or destroy plants
    - Mowers
- **Trapping:**
  - Use of mechanical or sticky device
  - Captures pests in a holding device
  - Restrains the pest
  - Kills the pest

Mechanical Control

Pigeon exclusion materials
Image Credit: Tony McCandless, GRIC PCO

- **Exclusion:**
  - Nets, screens, air curtains
  - Caulking, steel wool
  - Metal tree collars
  - Sticky materials
  - Sharp objects

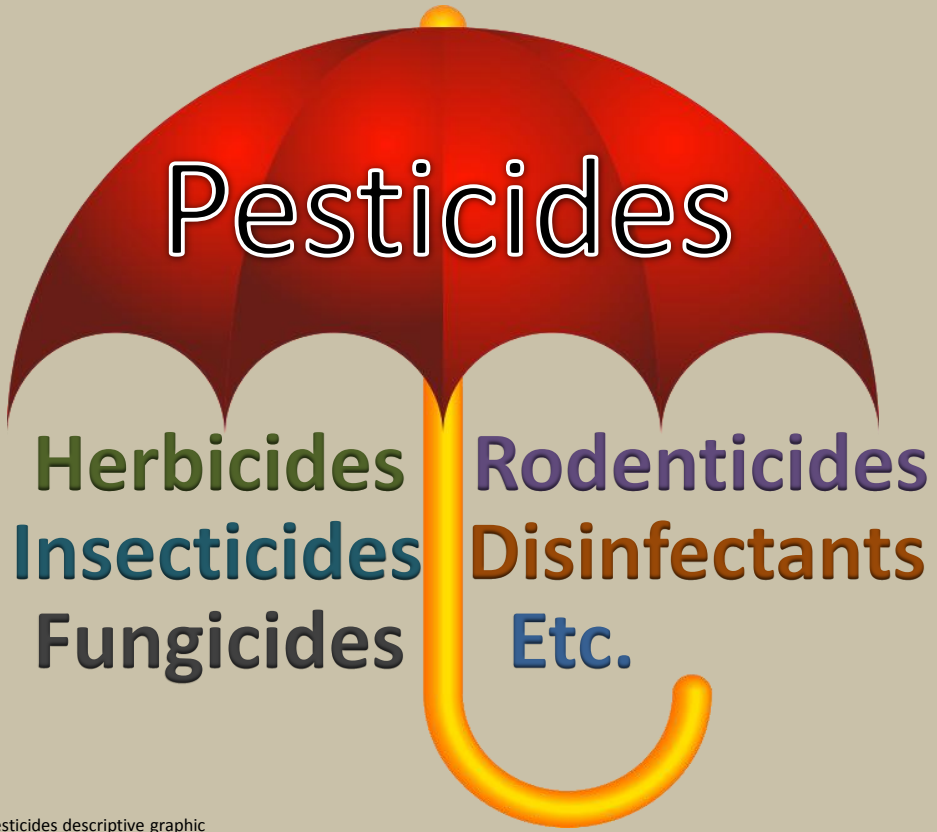
Cultural Controls

- **Alter Conditions or Pest Behaviors:**
  - Mowing
  - Irrigation
  - Aeration
  - Fertilization
  - Mulching
  - Tolerant crop varieties
  - Planting timing
  - Crop rotation
  - Trap crops
- **Sanitation- Eliminate Food, Water, and Shelter:**
  - Destroy infected crop residues
  - Weed to reduce pest harborage
  - Manage manure
  - Seal garbage cans
  - Remove soil near siding

Physical, Genetic, and Regulatory Controls

- **Alter the Physical Environment:**
  - Humidity
  - Temperature
  - Air movement
  - Water
  - Light
- **Genetics or Host Resistance:**
  - Add or modify genetic material in crops and ornamental plants
  - Breed or select plants for resistance
- **Regulatory- Quarantine prevents pests from entry or movement:**
  - Monitor airports, ocean ports, borders
  - Nursery stocks and other plant materials
  - Eradication programs eliminate a pest from a defined area
  - Mosquito Abatement: Used for public health

Chemical Control



Pesticides descriptive graphic
Image Credit: Tony McCandless, GRIC PCO

- **Pesticide**: Any material that is applied to kill, attract, repel, or regulate pests
  - Disinfectants, fungicides, herbicides, insecticides, repellents, defoliants, etc.
- Advantages: Effective, fast, easy

Pesticides Vary by…

- **Mode of Action:** How They Work to Control the Pest
  - **Systemic pesticides** are absorbed through tissues and transported elsewhere where the pest encounters it through feeding
    - Used on plants or livestock
  - **Contact pesticides** must come in direct contact with the target pest
- **Selectivity:** What Range of Pests They Affect
  - **Selective:** Kills only certain weeds, insects, plant pathogens
  - **Non-selective:** Kills all related pests

Pesticides Vary by…

- **Persistence:** How Long They Remain Active
  - **Residual Pesticides:** Remain active for weeks, months, years
  - **Non-residual:** Inactivated immediately or within a few days

Residual vs. Non-residual

Termite pretreatment
Image Credit: Ralph Morris, GRIC PCO

Non-residual spray application
Image Credit: Tony McCandless, GRIC PCO

Pesticide Resistance

The ability of a pest to tolerate a pesticide that once controlled it

- Intensive pesticide use kills susceptible pests in a population, leaving some resistant ones to reproduce
  - Use of similar modes of action
  - Frequency of applications
  - Persistence of the chemical
  - Pest rate of reproduction & offspring numbers

Exposed to a non-lethal dose

Now resistant pest has offspring, resistance passed onto some

Pesticide resistance graphic
Image Credit: Tony McCandless, GRIC PCO

Resistance Management

- Do not use products repeatedly that have similar modes of action
- Allow some pests to survive
  - Limit treatment areas
  - Consider using lower dosages
- Use caution: new compounds having very specific actions - may develop resistance more quickly
- Use non-chemical means to control resistant pest populations

What is Integrated Pest Management?

- **A Balanced, Tactical Approach…**
  - Anticipates and prevents damage
  - Uses several tactics in combination
  - Improves effectiveness, reduces side effects
  - Relies on identification, measurement, assessment, and knowledge

- **Why Practice IPM?**
  - Maintains balanced ecosystems
  - Pesticides alone may be ineffective
  - Promotes a healthy environment
  - Saves money
  - Maintains a good public image

Components of IPM

Media Credit: University of Maryland Extension
https://www.youtube.com/watch?v=GqjJg6KGOe4

Integrated Pest Management

- **Considerations for Choosing Control Methods**
  - Determine damage level you can withstand
  - Determine desired outcomes
    - Prevention
    - Suppression
    - Eradication
  - Manage for pesticide resistance
  - Estimate costs
    - Monetary
    - Environmental impacts

- **IPM is Driven by Decisions**
  - Identify pest and know its biology
  - Monitor and survey for pests
  - Set IPM goal: prevent, suppress, eradicate
  - Implement
    - Select control strategies
    - Timing
    - Economics
    - Environmental impacts
    - Regulatory restrictions
  - Evaluate

Acknowledgements

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for use by the

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