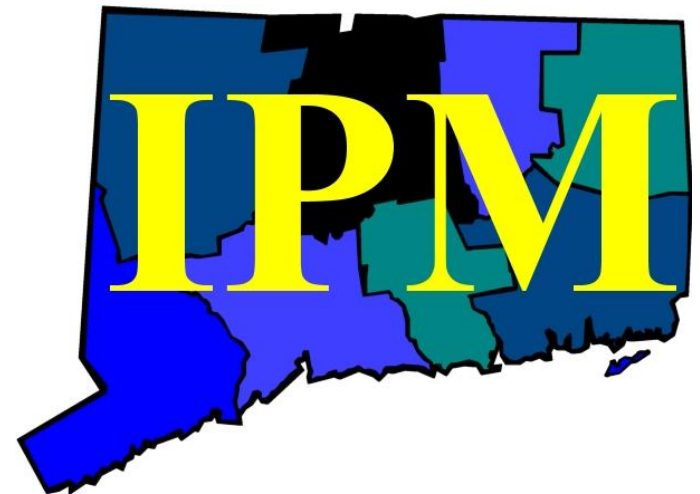


Integrated Pest Management: Principles & Practice

Dr. Ana Legrand
Connecticut IPM Program
University of Connecticut



Integrated Pest Management

IPM is the selection, integration and implementation of pest control tactics based on predicted economic, ecological and sociological consequences.

Objectives:

- To minimize economic risk
- To minimize health and environmental risks of pest management activities

Integrated Pest Management

- IPM uses all appropriate pest management methods in the most compatible way to keep pest populations at acceptable levels.
- Two central ideas of IPM:
 - Prevention
 - Natural control provided by pest natural enemies

IPM Program Components

- **Knowledge Base: key plants, key pests**
- Monitoring
- Decision-making rules: thresholds, tolerance levels
- Integration of pest management tactics
- Evaluation

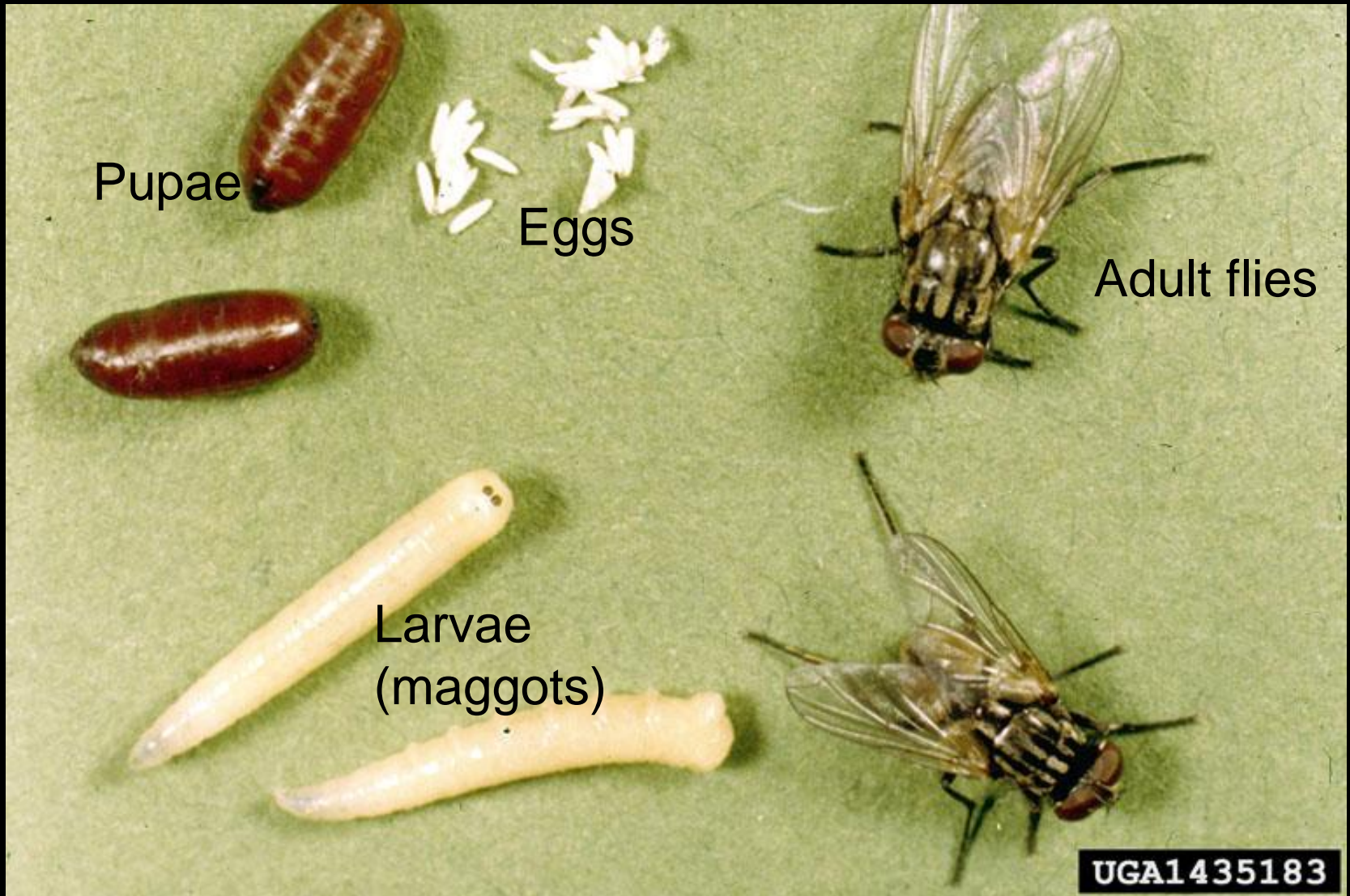


Whitney Cranshaw, Colorado State University, Bugwood.org



Sonya Broughton, Department of Agriculture & Food Western Australia, Bugwood.org

House Fly



Green bottle fly, *Phaenicia sericata*



UGA2102031

IPM Program Components

- Knowledge Base: key plants, key pests
- **Monitoring**
- **Decision-making rules: thresholds, tolerance levels**
- Integration of pest management tactics
- Evaluation

Monitoring

- Monitoring includes various activities and procedures that detect and document the presence, growth, population development or populations levels of an organism.
- Monitoring can include quantitative evaluations of pest populations or just determination of pest presence.

Advantages of Monitoring

- Early warnings
- Distribution & abundance of the pest
- Development/status of plants/animals
- Presence of beneficial organisms
- Impact of weather or other environmental factors
- Evaluation
- Provides historical record

Monitoring

- Direct observation/counts
- Traps:
 - Visual/Sticky traps
 - Bait traps
 - Pitfall traps
 - Blacklight traps



IPM Program Components

- Knowledge Base: key plants, key pests
- Monitoring
- Decision-making rules: thresholds, tolerance levels
- **Integration of pest management tactics**
- **Evaluation:**
 - Study by Kathy Murray, Maine Department of Agriculture, Food & Rural Resources

IPM

```
graph TD; IPM[IPM] --- CC[Cultural Controls]; IPM --- BC[Biological Control]; IPM --- PMC[Physical/Mechanical Controls]; IPM --- SP[Selective Pesticides]; IPM --- PI[Pest Identification]; IPM --- M[Monitoring]; IPM --- UT[Use of Thresholds];
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Cultural Controls

Biological Control

Physical/Mechanical
Controls

Selective
Pesticides

Pest
Identification

Monitoring

Use of
Thresholds

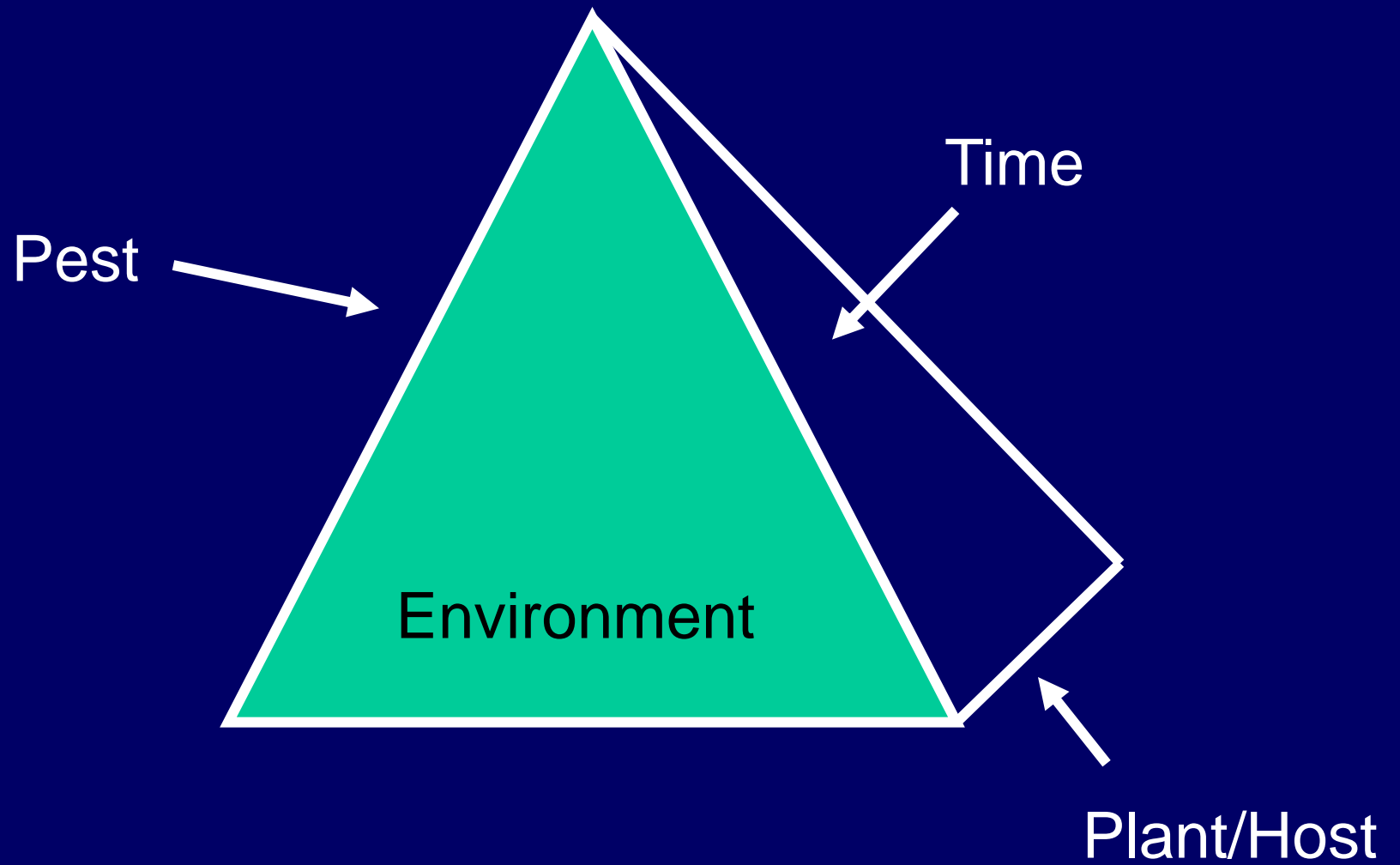
IPM Tactics

- Cultural controls
- Physical and mechanical controls
- Use of resistant varieties
- Biological control
- Behavioral modifications
- Legal / legislative control
- Use of selective pesticides



Cultural Control

- Cultural techniques involve the modification of the environment as to make it less suitable for pests or to manipulate their behavior.
- Understanding of the pest life cycle is essential.
- Used as preventive measures



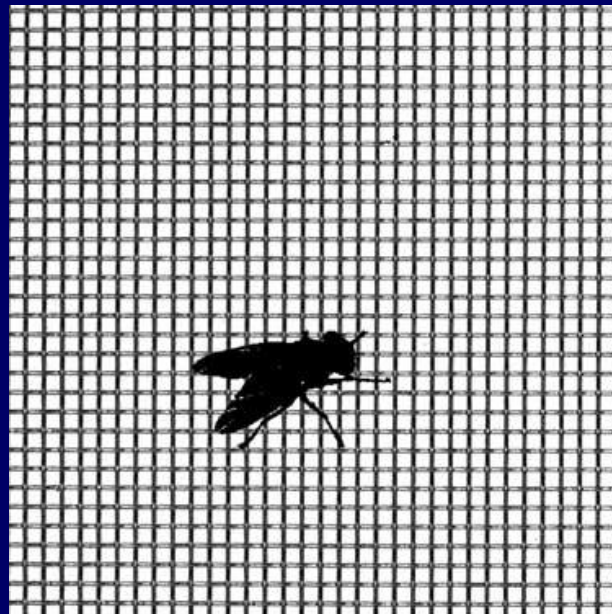
Cultural Control

Sanitation:

- Keep work areas clean and dry
- Remove spilled or wet feed
- Promptly remove dead animals and birds
- Mow grass and weeds adjacent to poultry house to eliminate resting areas for pests

Physical Controls

- Sticky traps, tangle foot barriers
- Screens for windows and doors



Physical Controls

Moisture management:

- Fresh poultry manure has 75 to 80% moisture content
- Flies can breed in manure that has 50 to 85% moisture levels
- Provide proper ventilation
- Avoid leaking waterers

Mechanical Controls

- Handpicking
- Vacuuming
- Pruning
- Mowing
- Tillage/
Cultivation



Biological Control

- Natural Control: Regulation of a pest population by biotic (food shortages, natural enemies) and abiotic factors (weather).
- Biological Control: Purposeful manipulation of natural enemies to help in the regulation of pests.
 - Human intervention is part of the process.

What are natural enemies of a pest?

- Pathogens:
 - Bacteria
 - Viruses
 - Fungi
- Nematodes
- Predators
- Parasitoids

Parasitoids

Adults do not consume prey but lay one or many eggs on/in a suitable host for their offspring to develop.

- *Muscidifurax raptor*
- *Muscidifurax raptorellus*



Muscidifurax raptor



Predators

Consume many prey throughout their life.

- Macrochelid mites
- Hister beetles



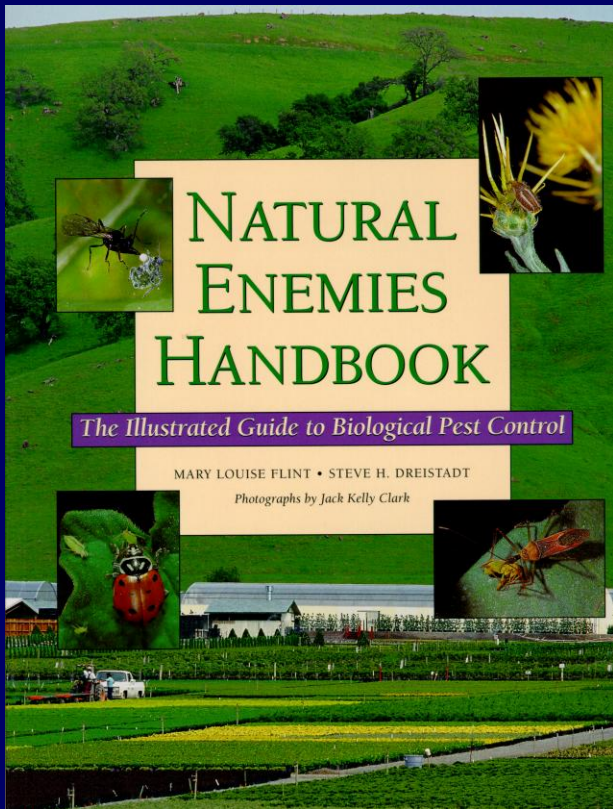
Macrocheles predatory mites

What can
you do to
conserve
your
natural
enemies?



Hister beetle: house fly egg predator

Learn to identify them



- Cornell's Biocontrol website:

<http://www.biocontrol.entomology.cornell.edu/>

- **Natural Enemies Handbook**
by Mary Louise Flint and
Steve Dreistadt

Minimize natural enemy mortality due to pesticides

- Avoid broad spectrum pesticides with long residual action
- Use materials that need to be ingested by the pest rather than contact insecticides.



Baited jug trap

Use of Pesticides

- Use to supplement other tactics and as a last resort
- Baits
 - boric acid, methomyl
- Rotate insecticide class to minimize development of resistance
 - Pyrethroids, carbamates, organophosphates



IPM Program Components

- Knowledge Base: key plants, key pests
- Monitoring
- Decision-making rules: thresholds, tolerance levels
- Integration of pest management tactics
- **Evaluation:**
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IPM vs Conventional Fly Control Demonstration

Dorothy Egg Farm-1999

Conventional Program

- Insecticides:
 - pyrethrin space sprays when needed
 - 90 bait stations
- Weekly manure cleanout



Bait Station

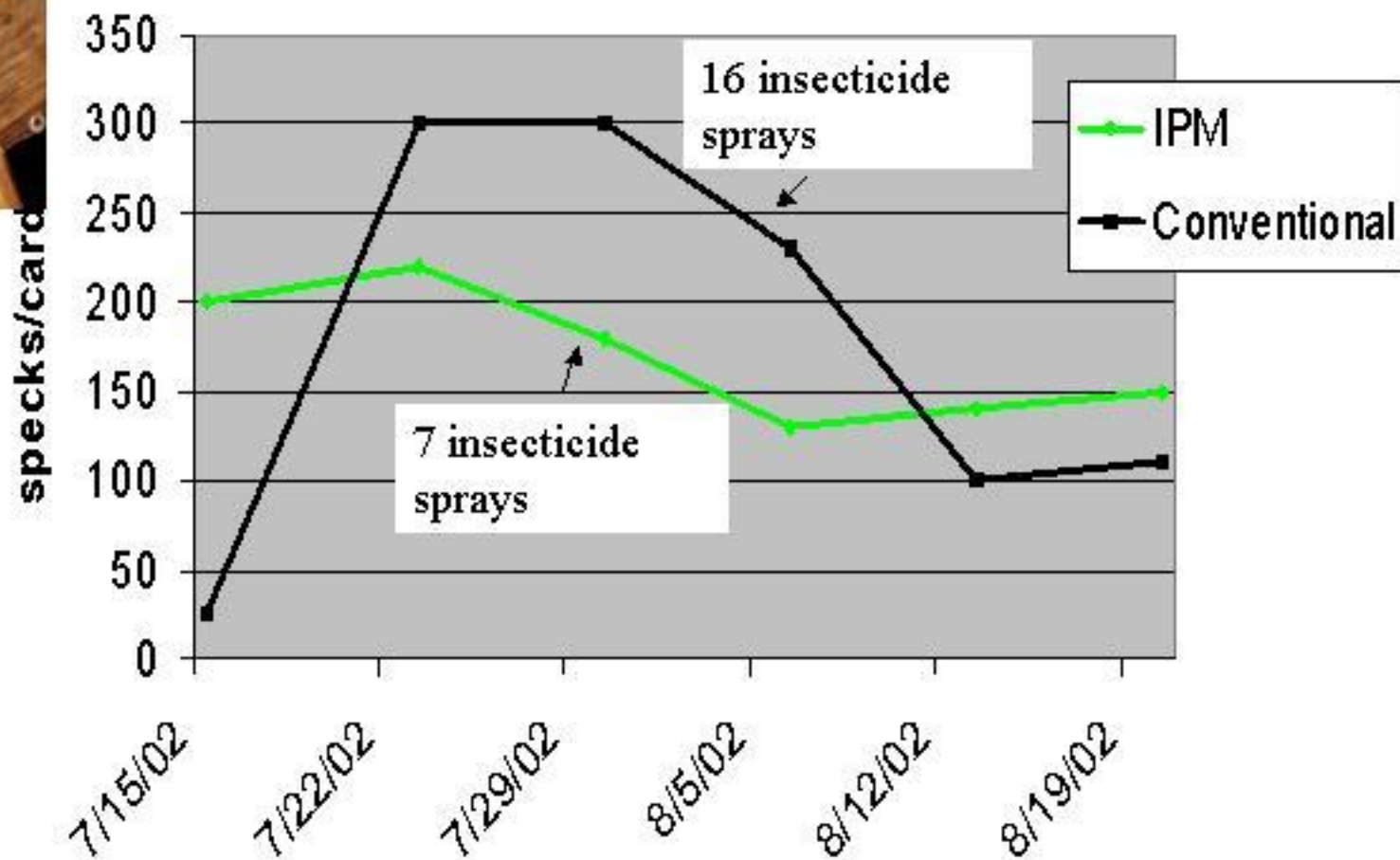
IPM Program

- Insecticides:
 - pyrethrin space sprays when needed
 - 25 bait stations
- Fly parasites
 - 1 wasp per 2 birds
 - Weekly for 10 wks



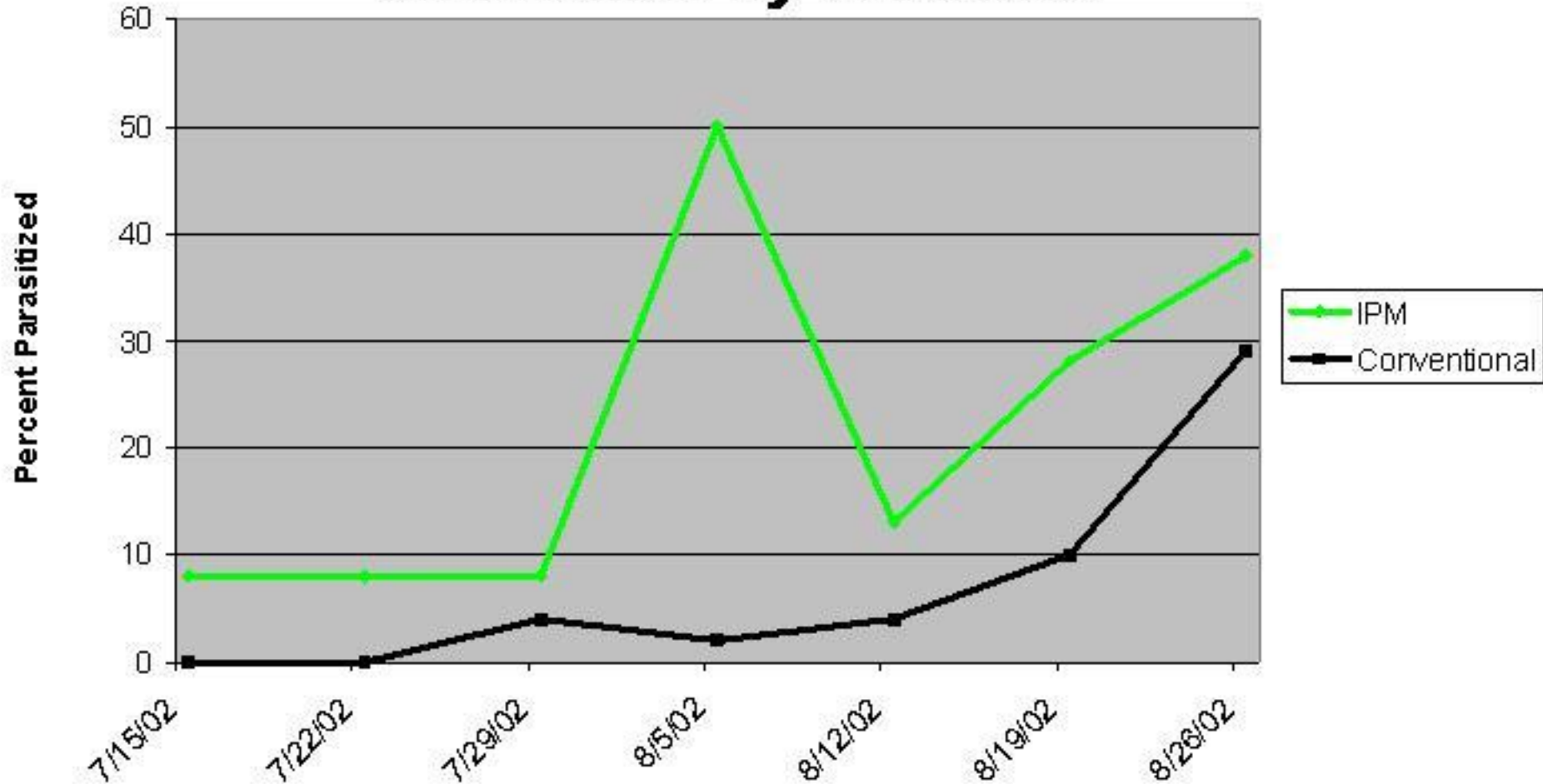
IPM vs. Conventional Fly Control Programs in Caged Layer Poultry

Winthrop, ME 1999



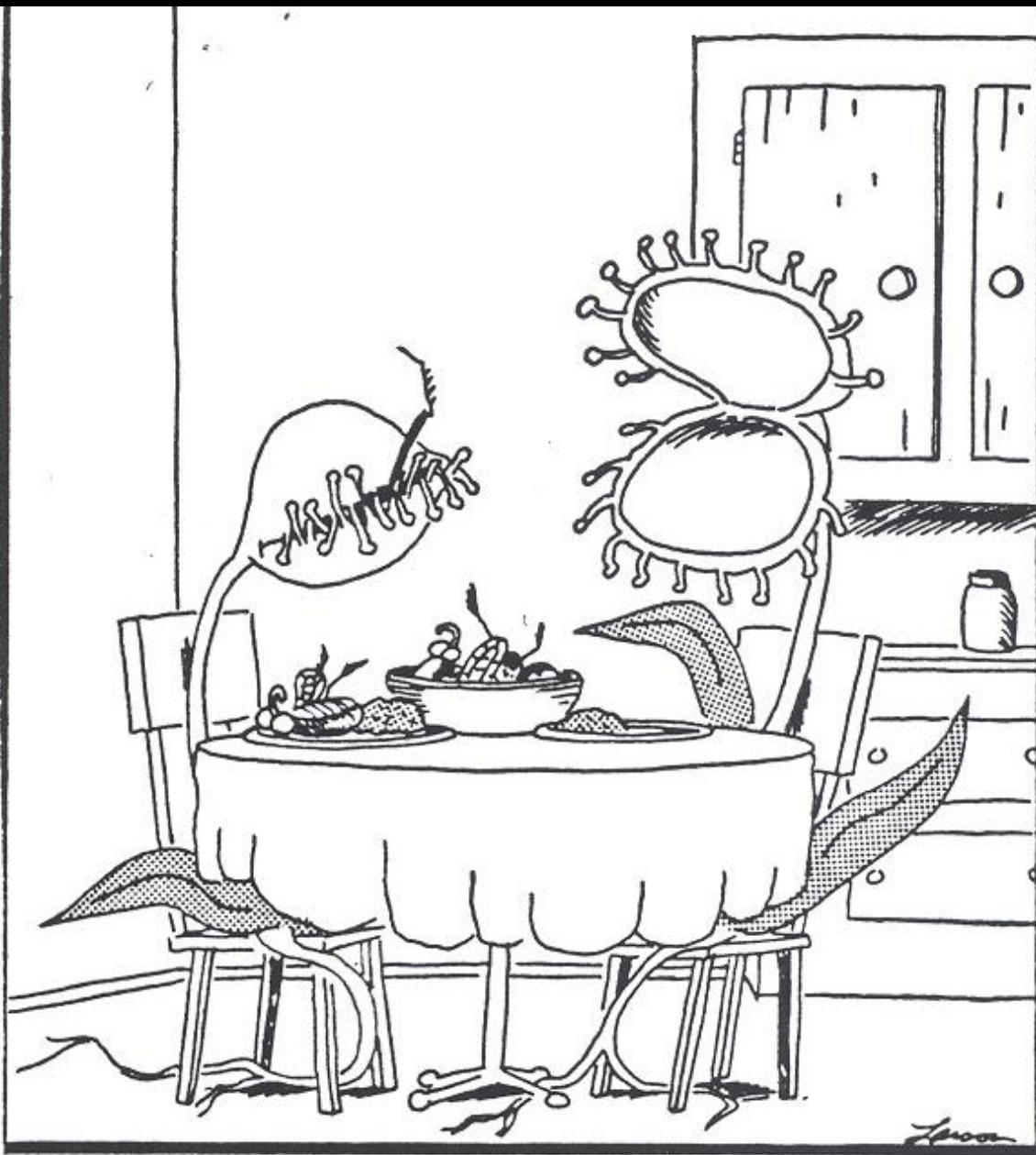
IPM vs Conventional Fly Control Program Caged Layer Poultry 1999

Flies Killed by Parasites



IPM Approach

- Maintain knowledge base
- Use of preventive measures
- Avoid reliance on only one tactic
- Integration of control tactics



"No more flies, Arnold, until you've eaten some of your fertilizer."

The Far Side
by G. Larson