Integrated Pest Management 1: Sampling

Matthew J. Grieshop PhD

Department of Entomology

Michigan State University

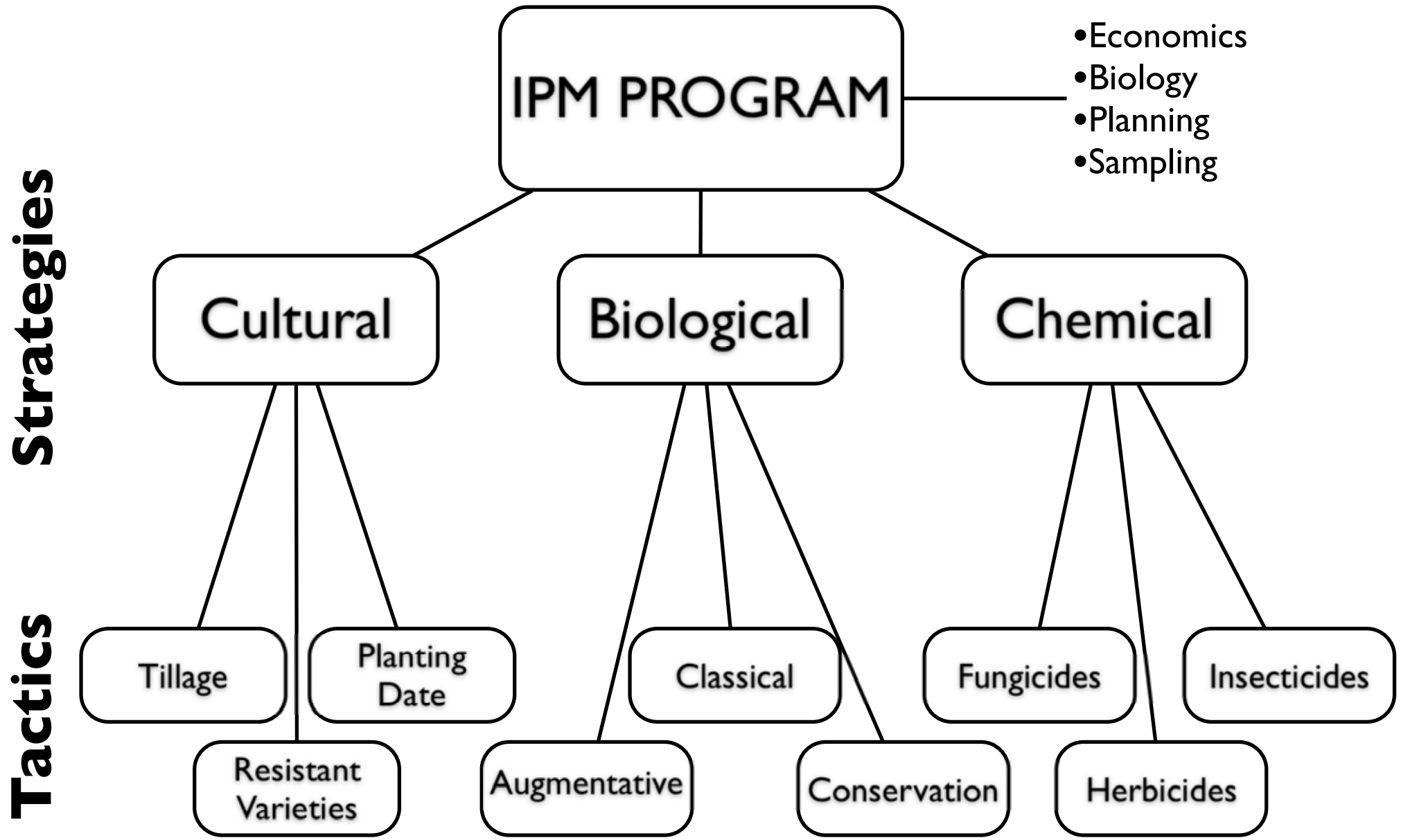
Integrated Pest Management

"A decision support system for the selection and use of pest control tactics singly or harmoniously coordinated into a management strategy, based on cost-benefit analyses that take into account the interests and impacts on producers, society, and environment. "

Key Elements of Integrated Pest

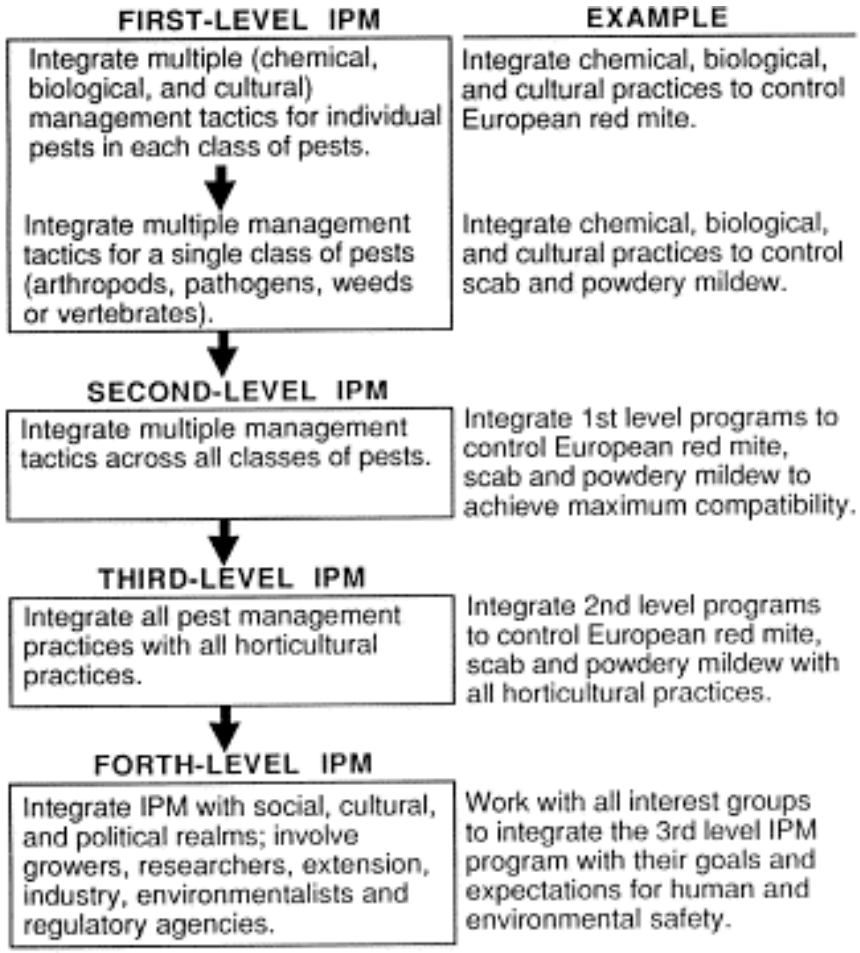
- Systems Approach
- Sampling and Monitoring: Population Ecology
- Application of Thresholds: Economic Models
- Multiple Strategies: Integration

IPM Terminology



Prokopy's Four Phases of IPM

- Single Pest Focus
- All Pest focus
- Systems focus
- Global focus

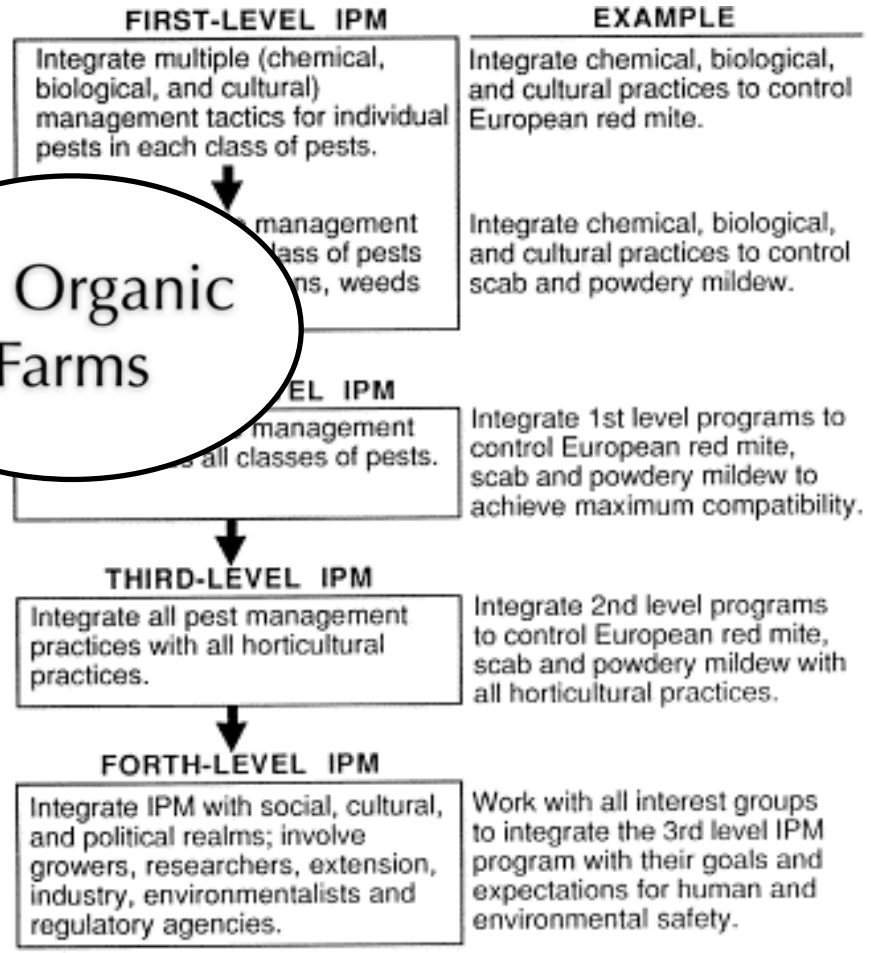


Prokopy, R. 1994. Integration in orchard pest and habitat management: A review. Agriculture, Ecosystems, and Environment 50: 1-10.

Prokopy's Four Phases of IPM

- Single Pest Focus
- All Pest focus
- Systems focus
- Global focus

On Organic Farms



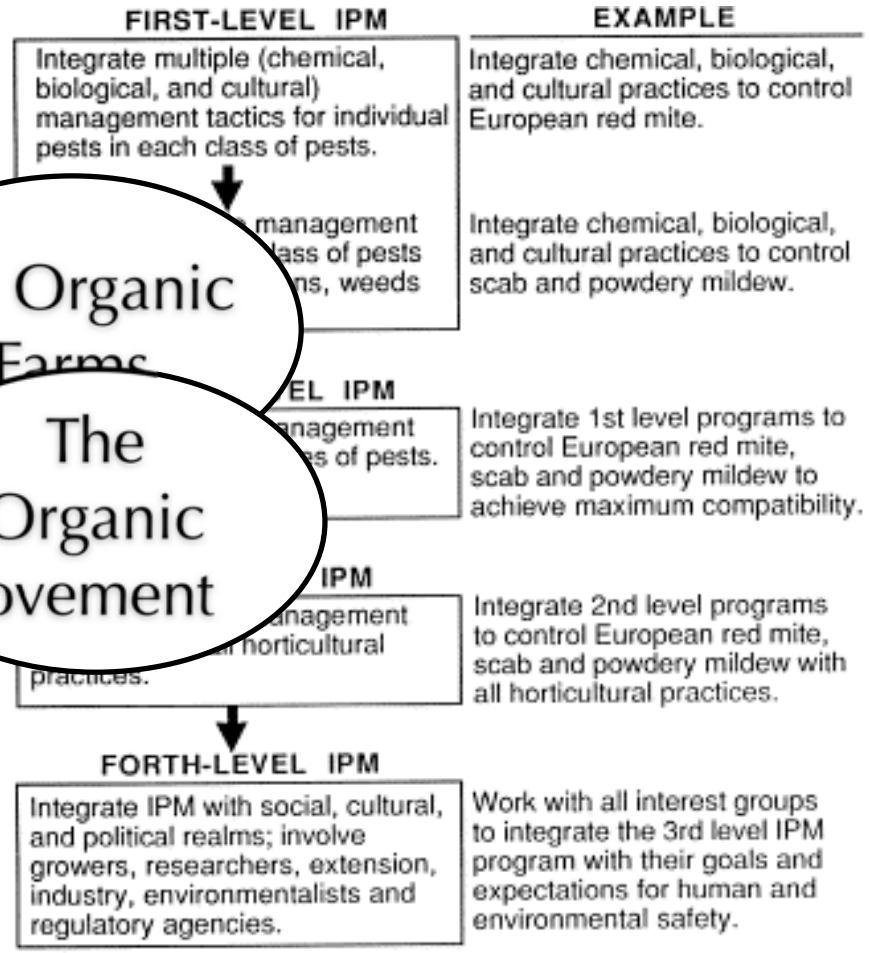
Prokopy, R. 1994. Integration in orchard pest and habitat management: A review. Agriculture, Ecosystems, and Environment 50: 1-10.

Prokopy's Four Phases of IPM

- Single Pest Focus
- All Pest focus
- Systems focus
- Global focus

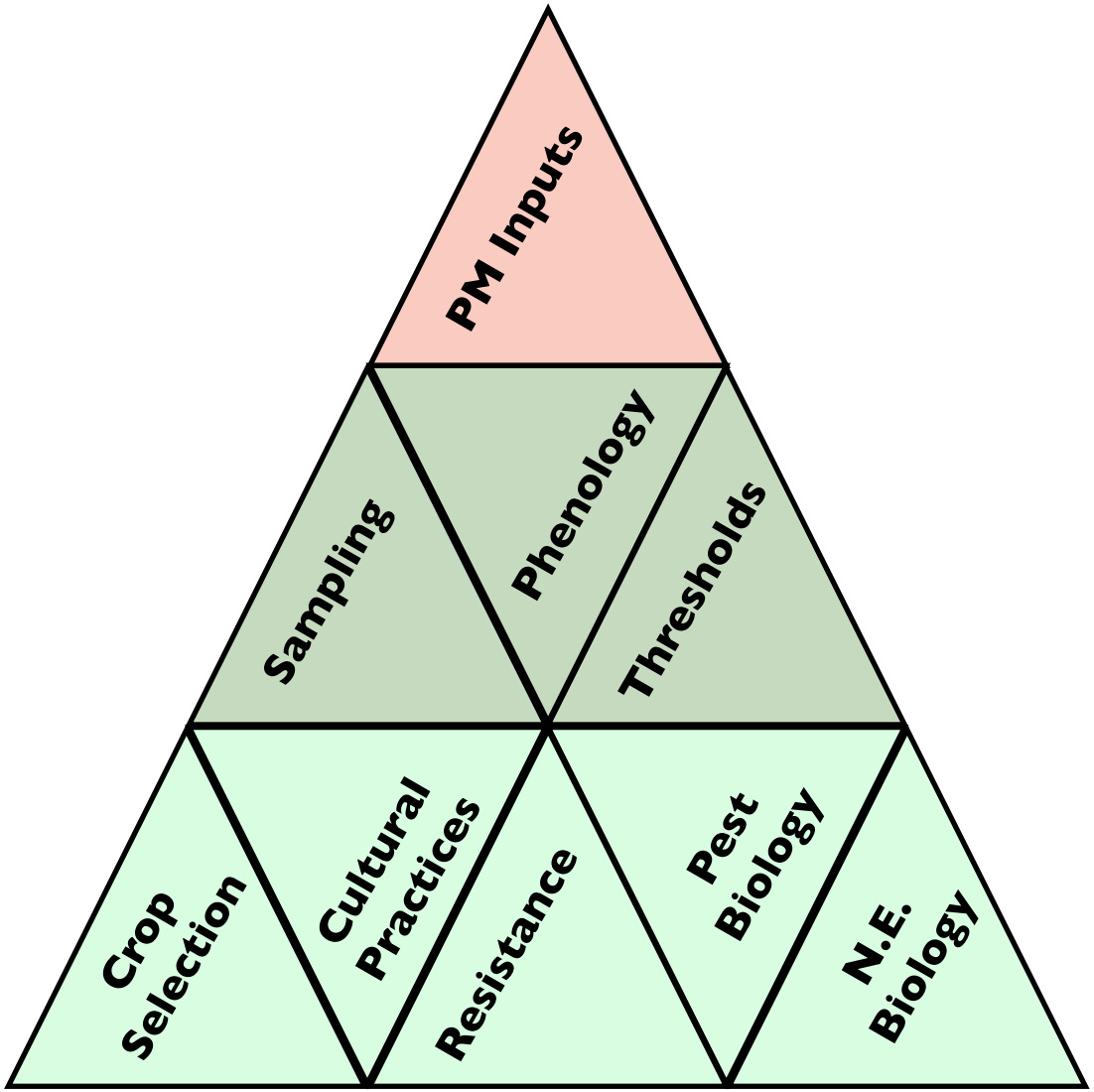
On Organic Farms

The Organic Movement

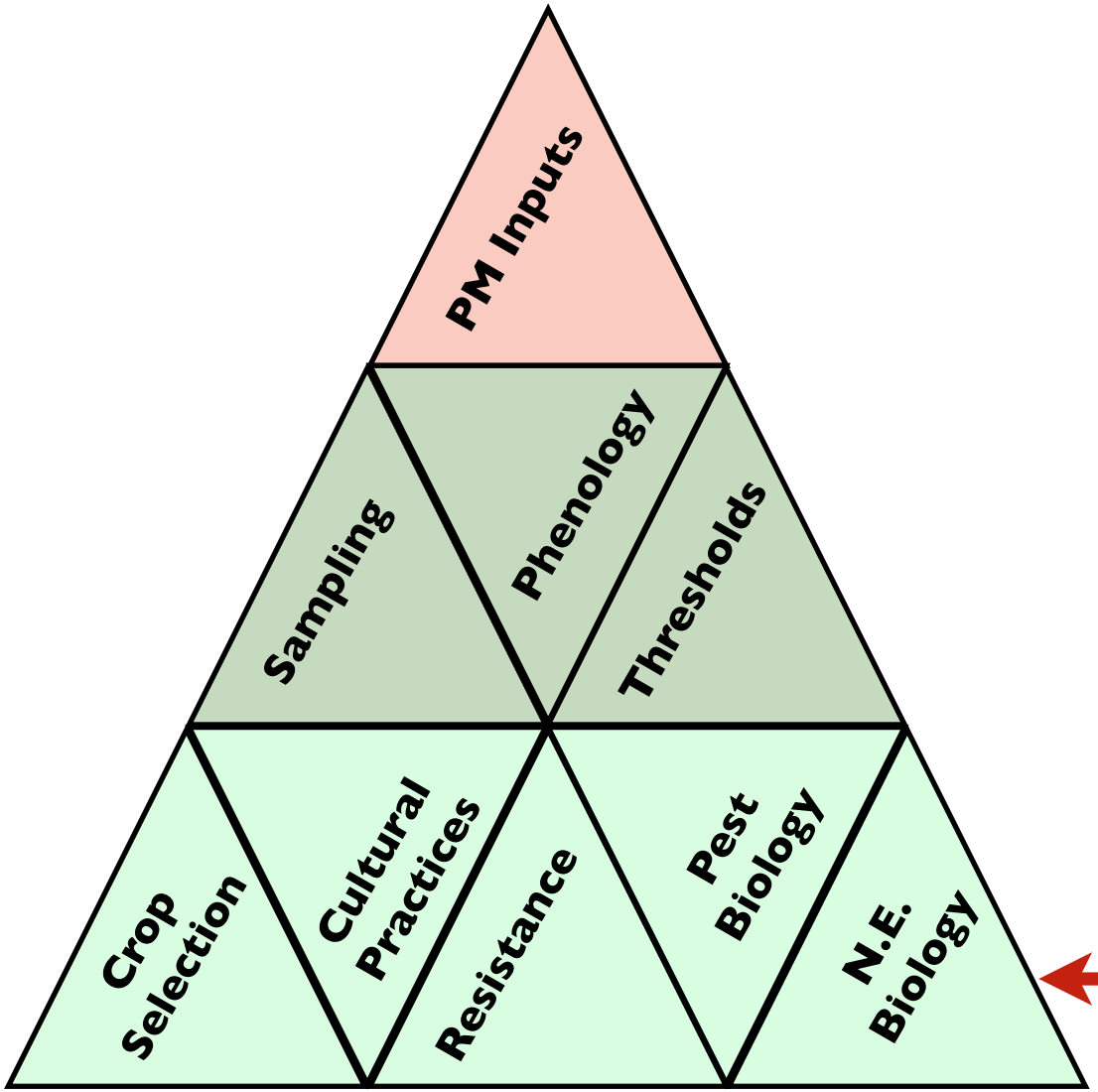


Prokopy, R. 1994. Integration in orchard pest and habitat management: A review. Agriculture, Ecosystems, and Environment 50: 1-10.

The IPM Pyramid

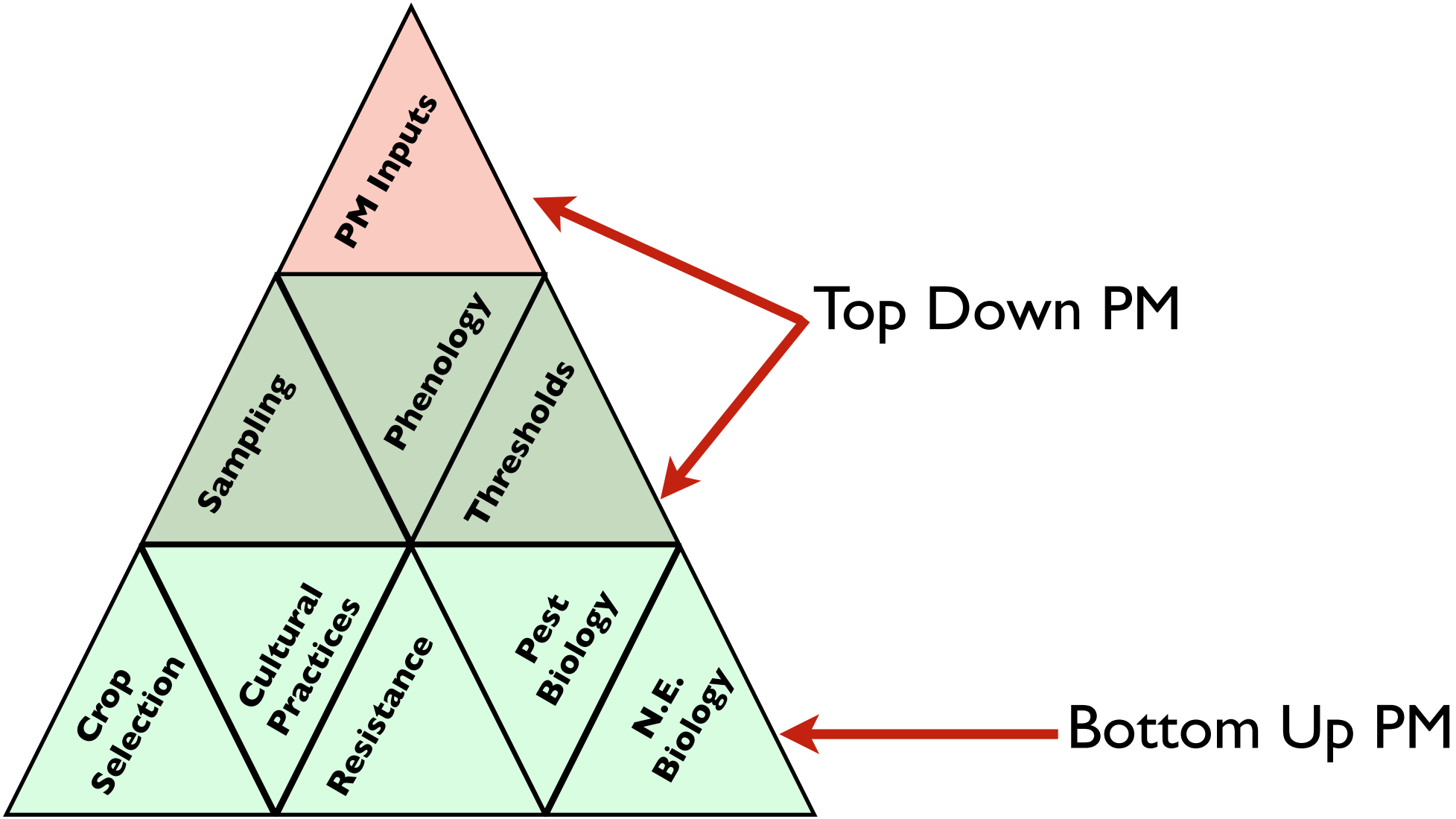


The IPM Pyramid

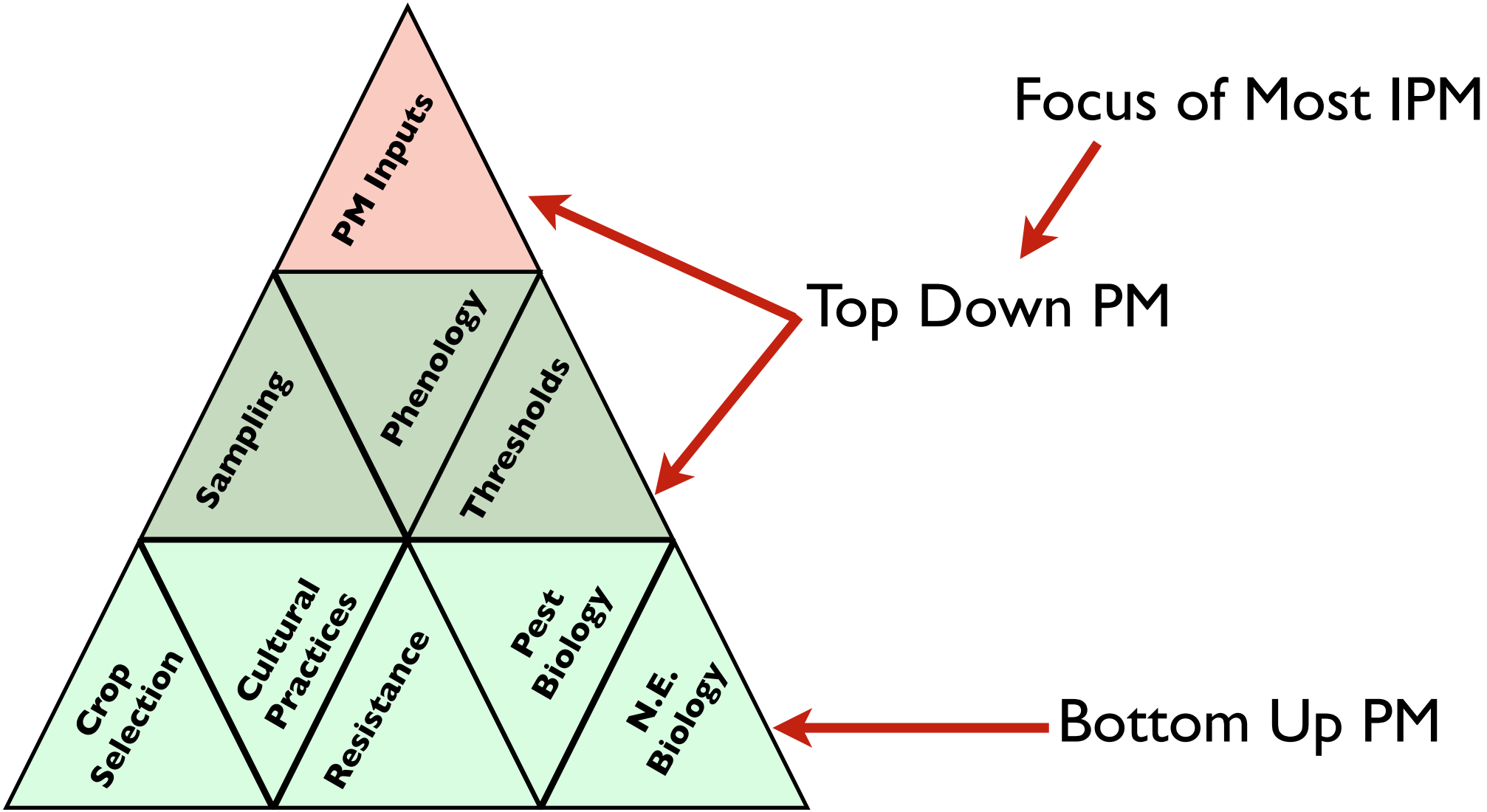


Bottom Up PM

The IPM Pyramid

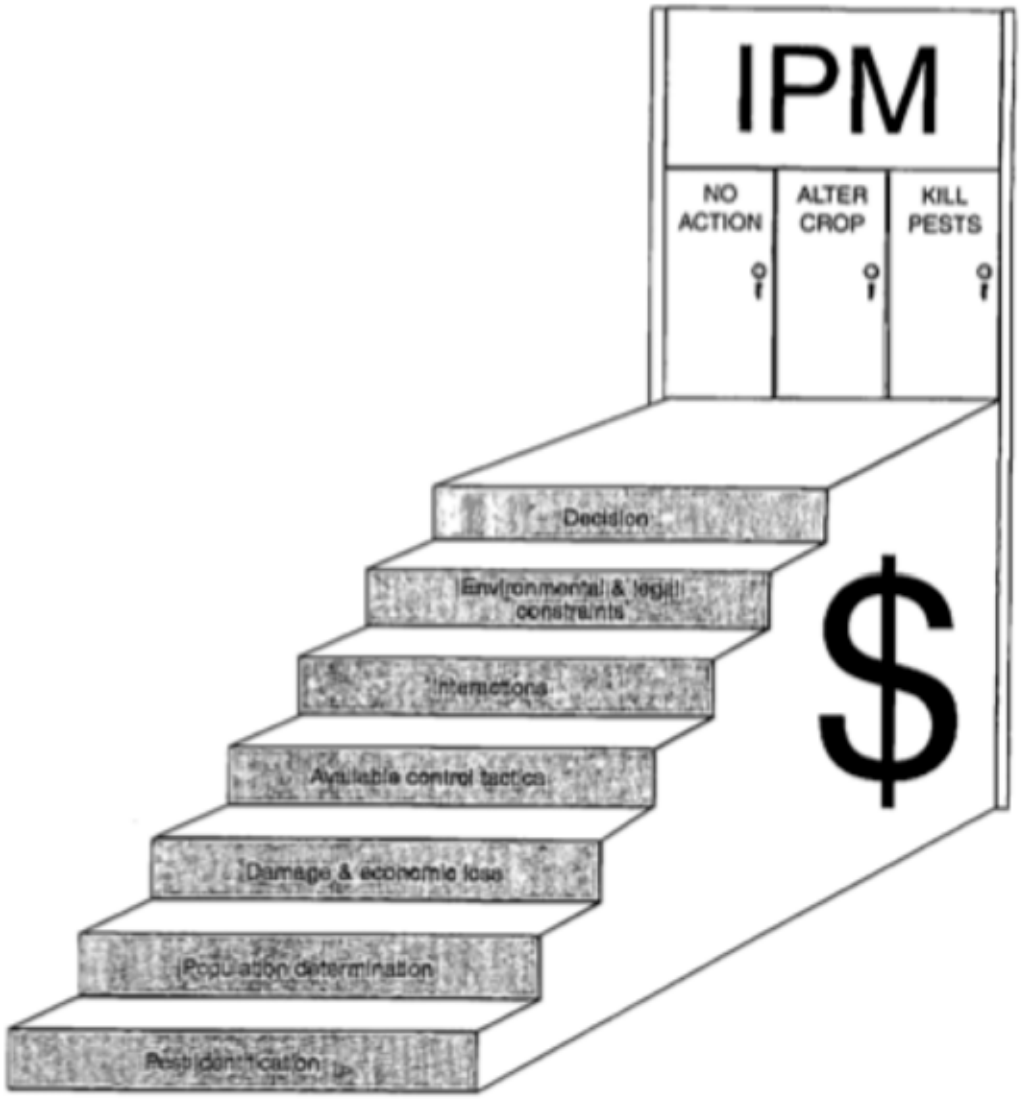


The IPM Pyramid

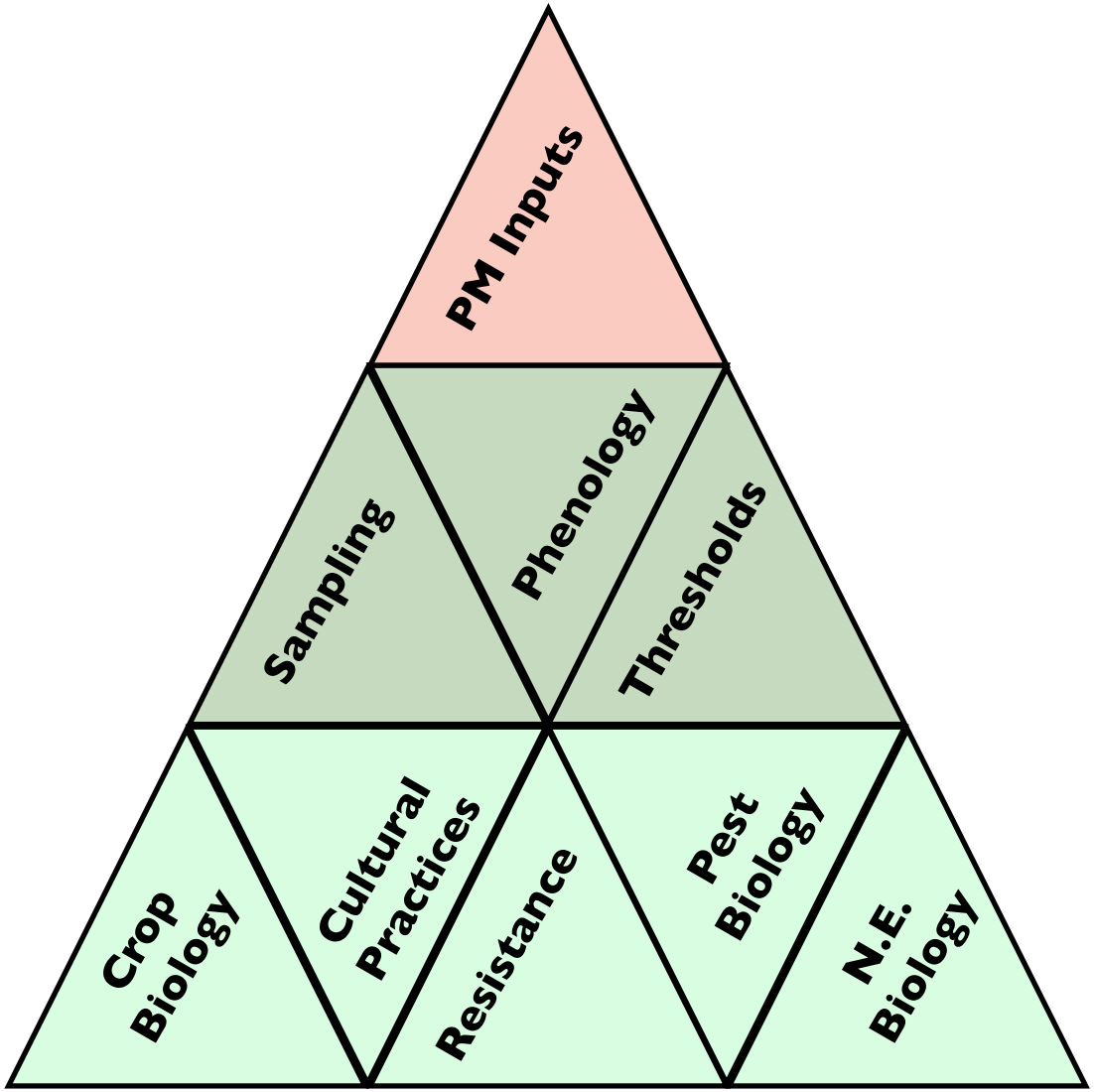


IPM Decision Support

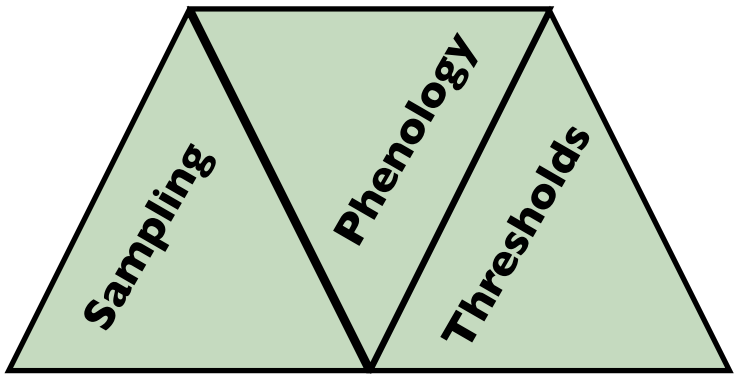
- Identification
- Population Monitoring
- Damage and economic loss
- Available controls
- Interactions
- Environmental and Legal Restraints



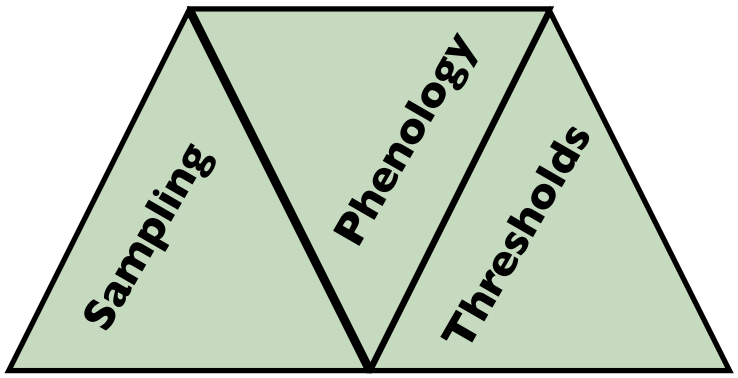
Identification



Identification



Identification

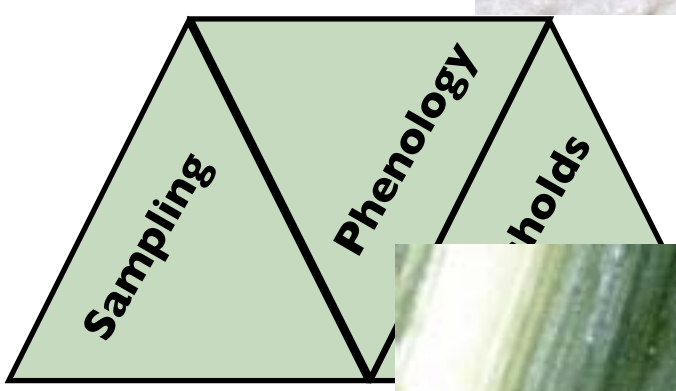


Do we have a problem?

How severe is it?

Can it be economically managed?

Identification

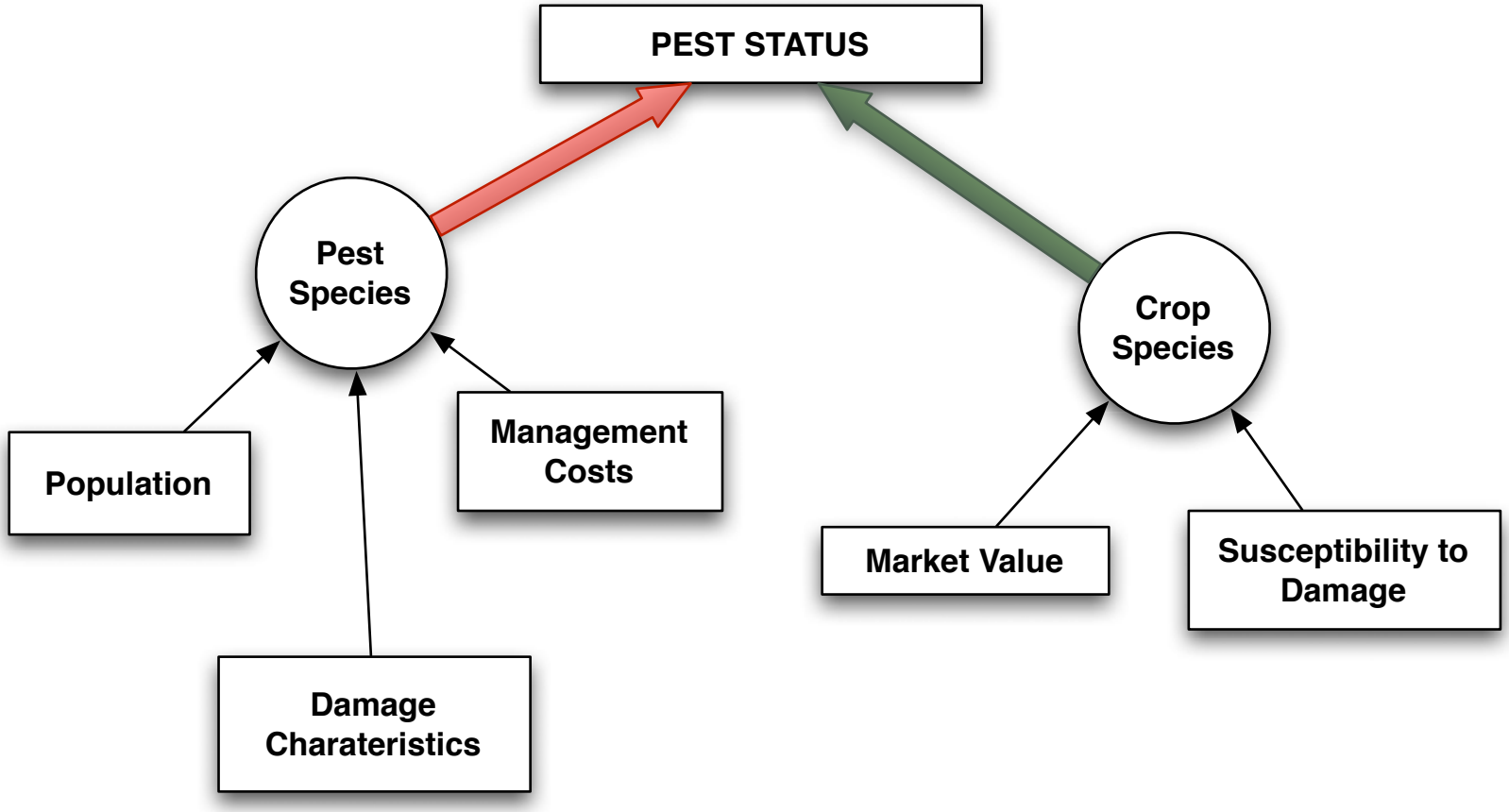


e have a
em?

vs. How severe is it?

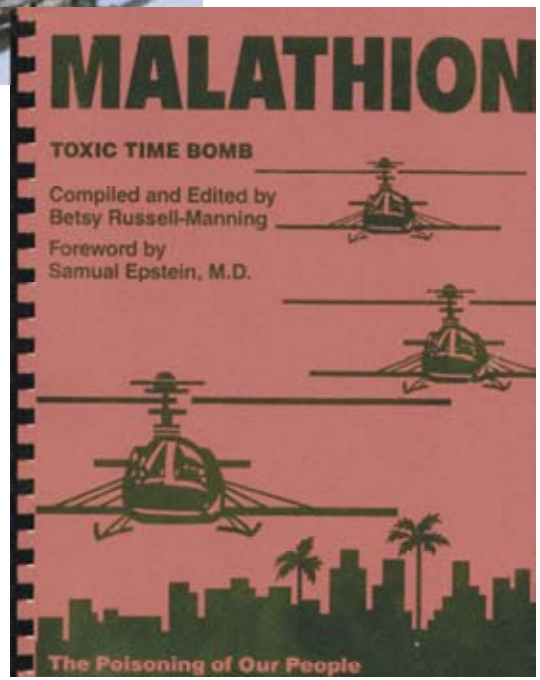
be economically
ged?

Pest Severity

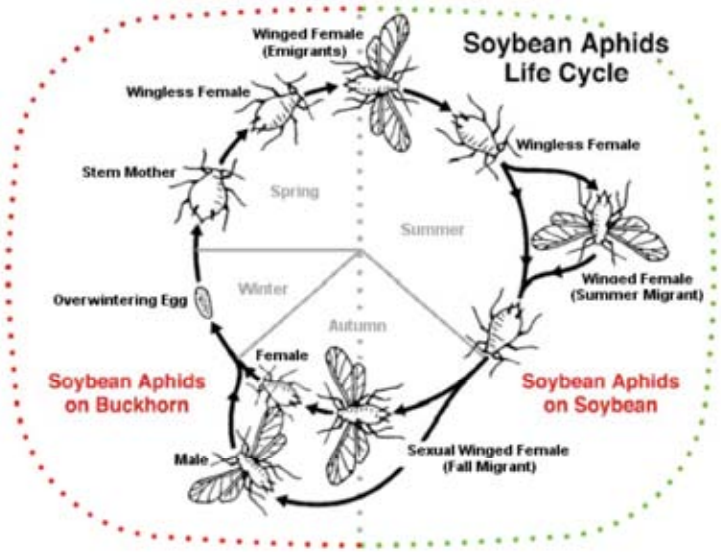


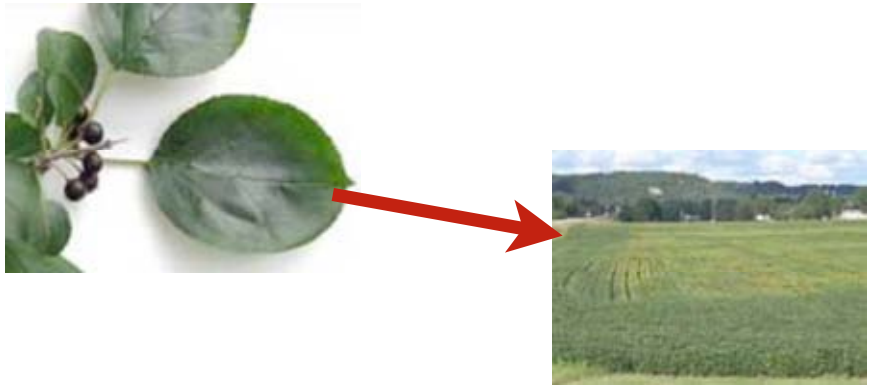
Surveillance vs. Sampling

Invasive Species



Migratory Species





Sampling

- Provides spatial data for phenological predictions
- ***Sampling Units*** and ***Habitable Space***
- ***Qualitative*** vs. ***Quantitative***
- Two types of samples: ***Absolute*** and ***Relative.***

Absolute vs. Relative Sampling

Absolute

- Direct observation
- Total census of pests within a **% *ground area***
- Discrete ***Sampling Units***

Relative

- Indirect observation
- Not tied to a % ground surface area
- Less discrete ***Sampling Units***

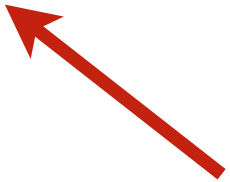
Absolute vs. Relative Sampling

Absolute

- Direct observation
- Total census of pests within a **% *ground area***
- Discrete ***Sampling Units***

Relative

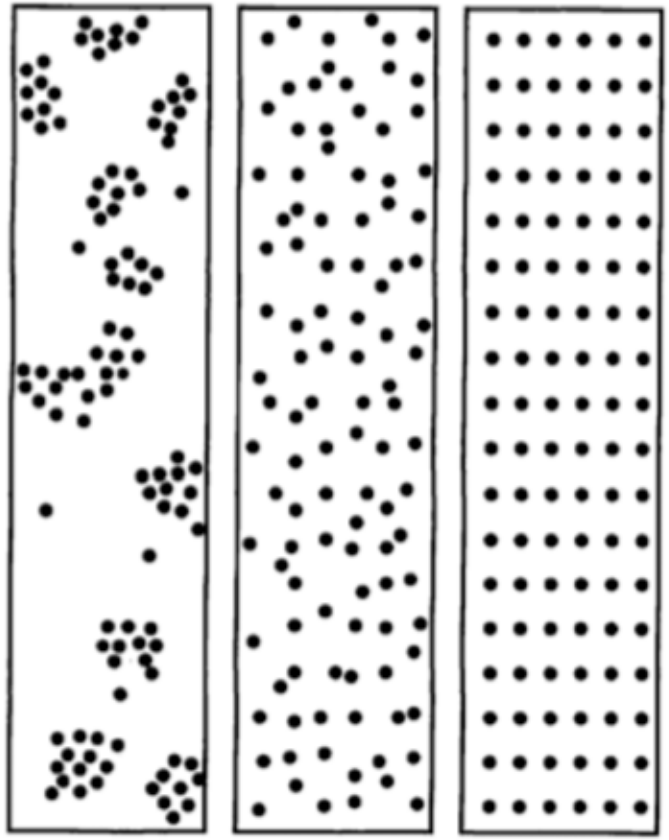
- Indirect observation
- Not tied to a % ground surface area
- Less discrete ***Sampling Units***



Can be converted

Sampling and Spatial pattern

- Random, Clumped, Uniform distributions
- Pest most typically exhibit Clumped distributions
- Direct measurements provide more useful spatial data
- Spatial distribution may change with time



Direct Sampling Methods

Quadrat Frame for Weed Counts

"Beat Sheet" for Insects

Soil Probe

Damage Evaluation

- Usually viewed as % crop with damage
- Can be of limited utility
- Why? For what types of pests?

Trapping

Intercept Trap

Suction Trap

Spore Trap

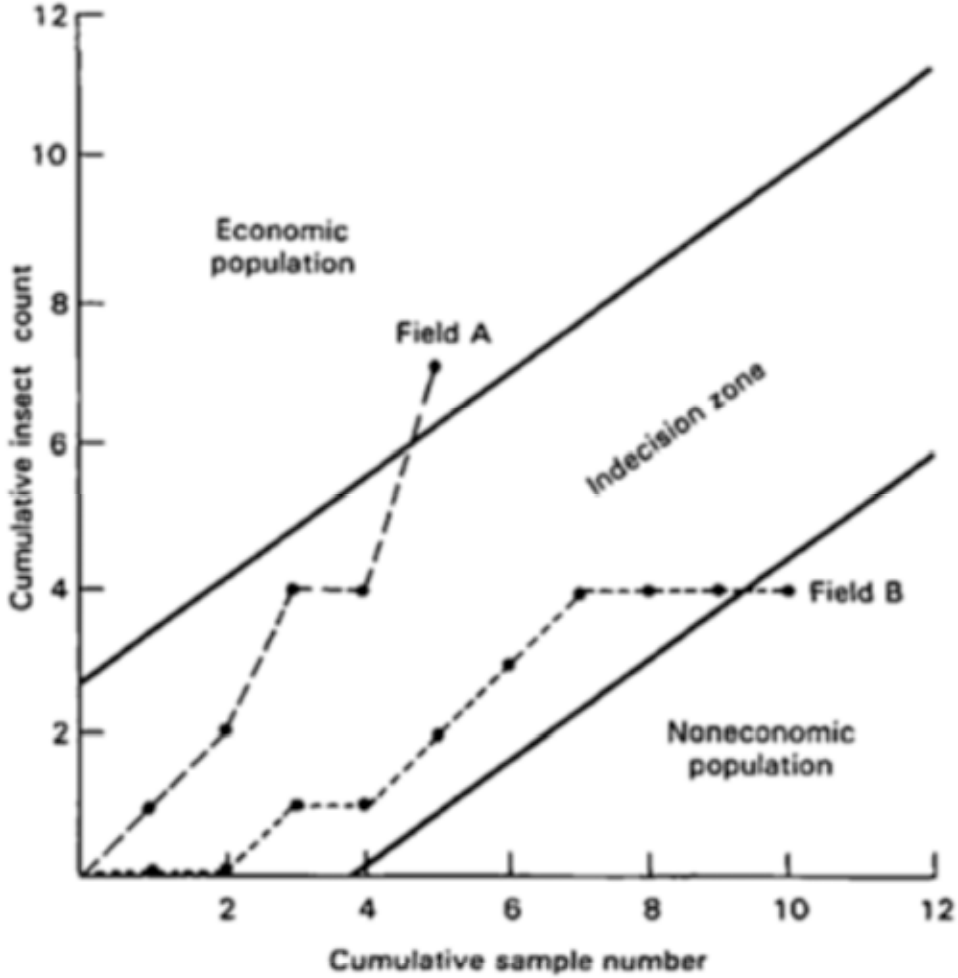
Pheromone Trap

Sequential Sampling

Table 6.3 Alfalfa Weevil Pest Management Recommendations.

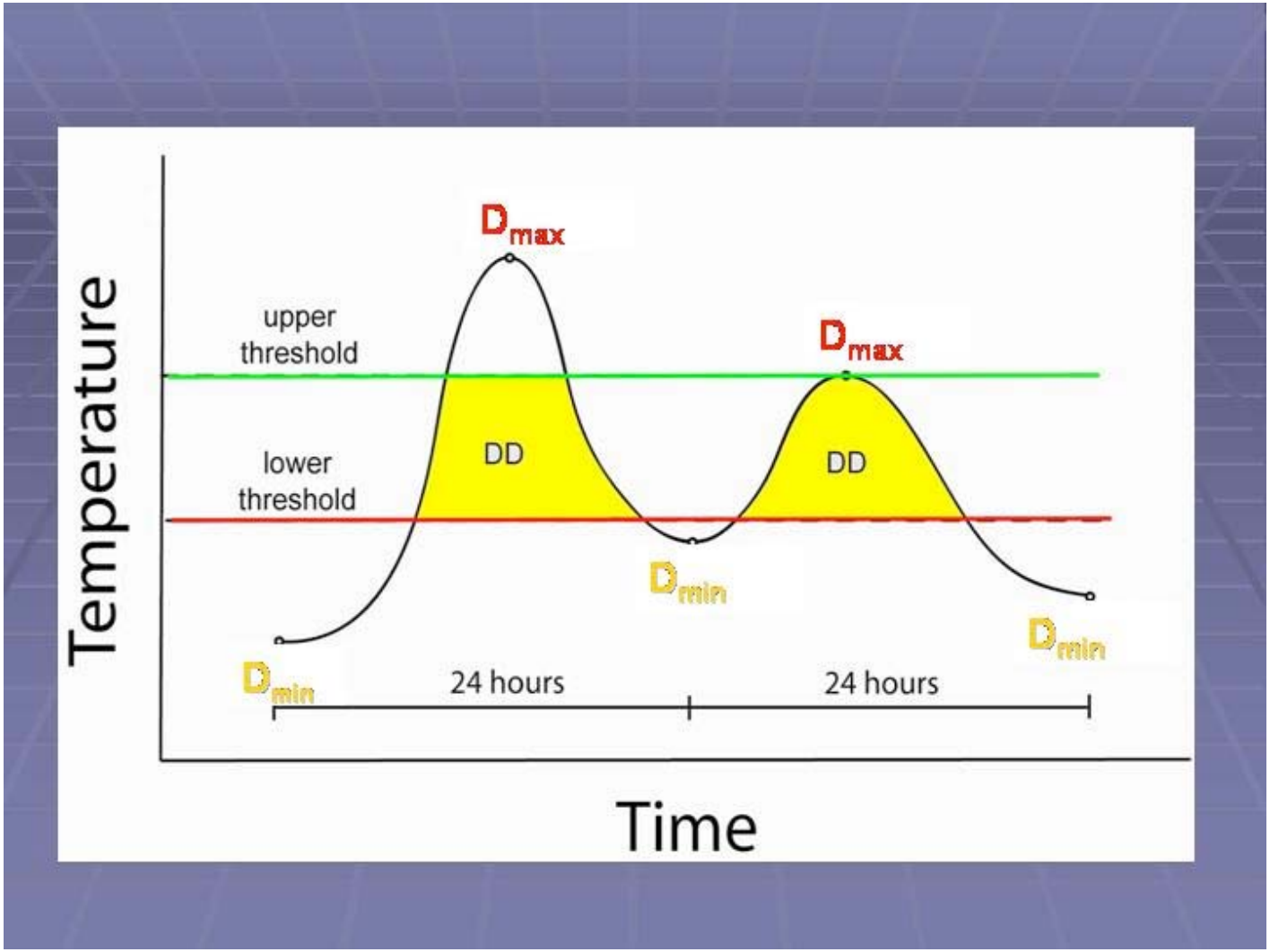
	Change in Number of Larvae Since Last Sample		
Total Degree Days (dd)	**Decreased 10 or More**	**Within 10**	**Increased 10 or More**
540 to harvest			
Spray or harvest	73	63	53
Resample in 50 dd	23–72	18–62	13–52
Resample in 100 dd*	0–22	0–17	0–12
150 or more after harvest			
Spray	78	58	48
Resample in 50 dd	28–77	18–57	0–47
Quit sampling	0–27	0–17	

*If this field was sprayed more than 7 days ago, you can wait 200 degree days to resample.



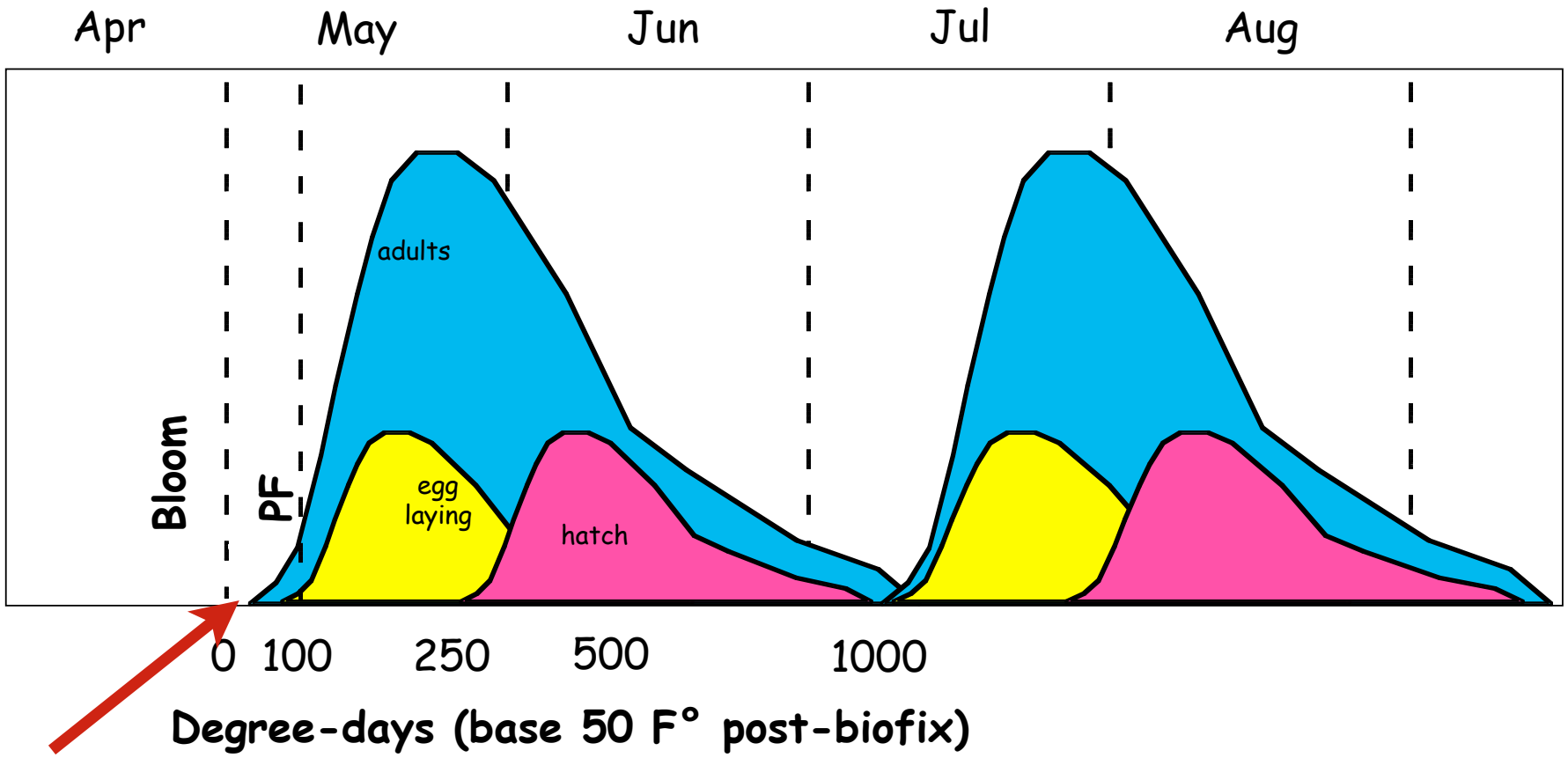
What do we do with samples??

Phenological Models

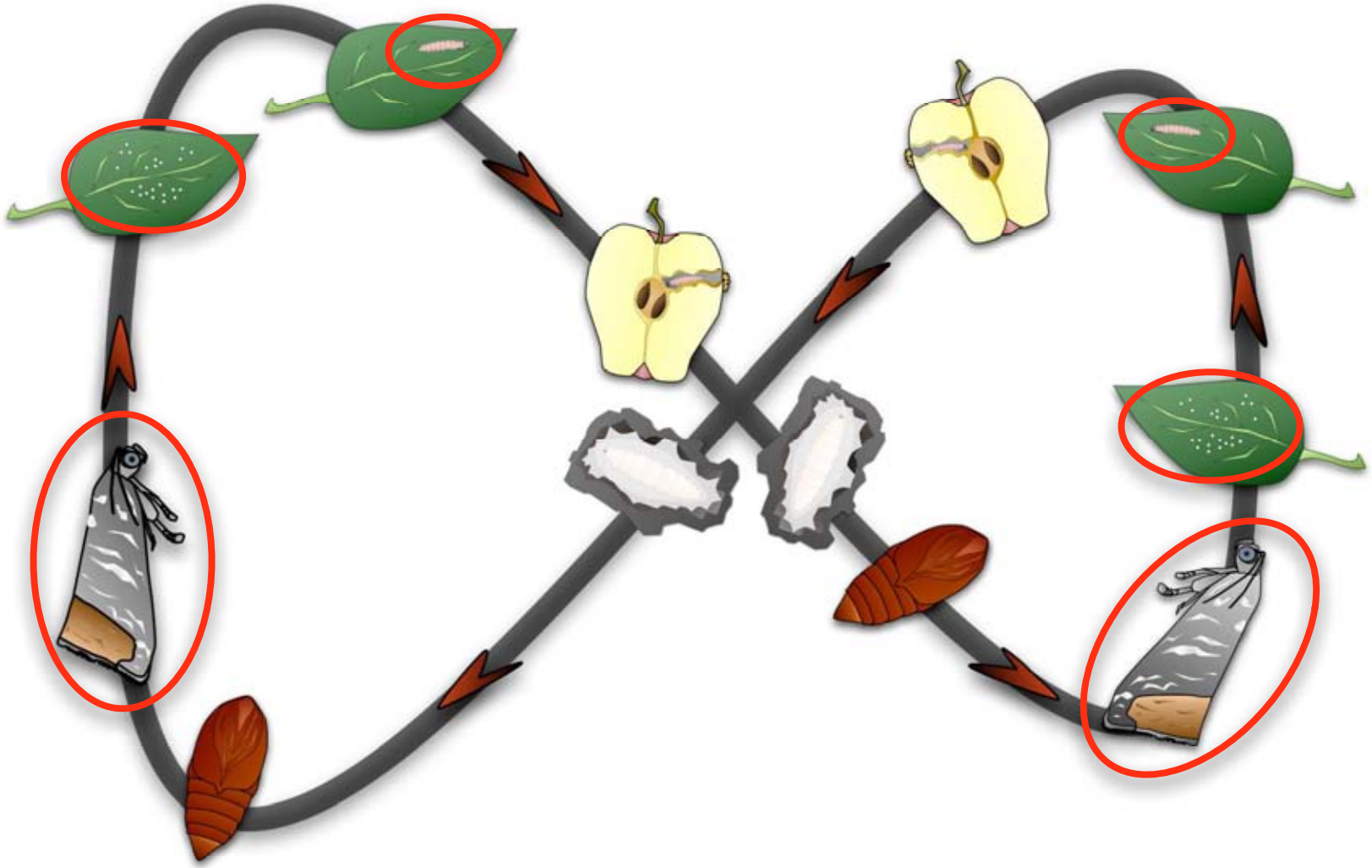


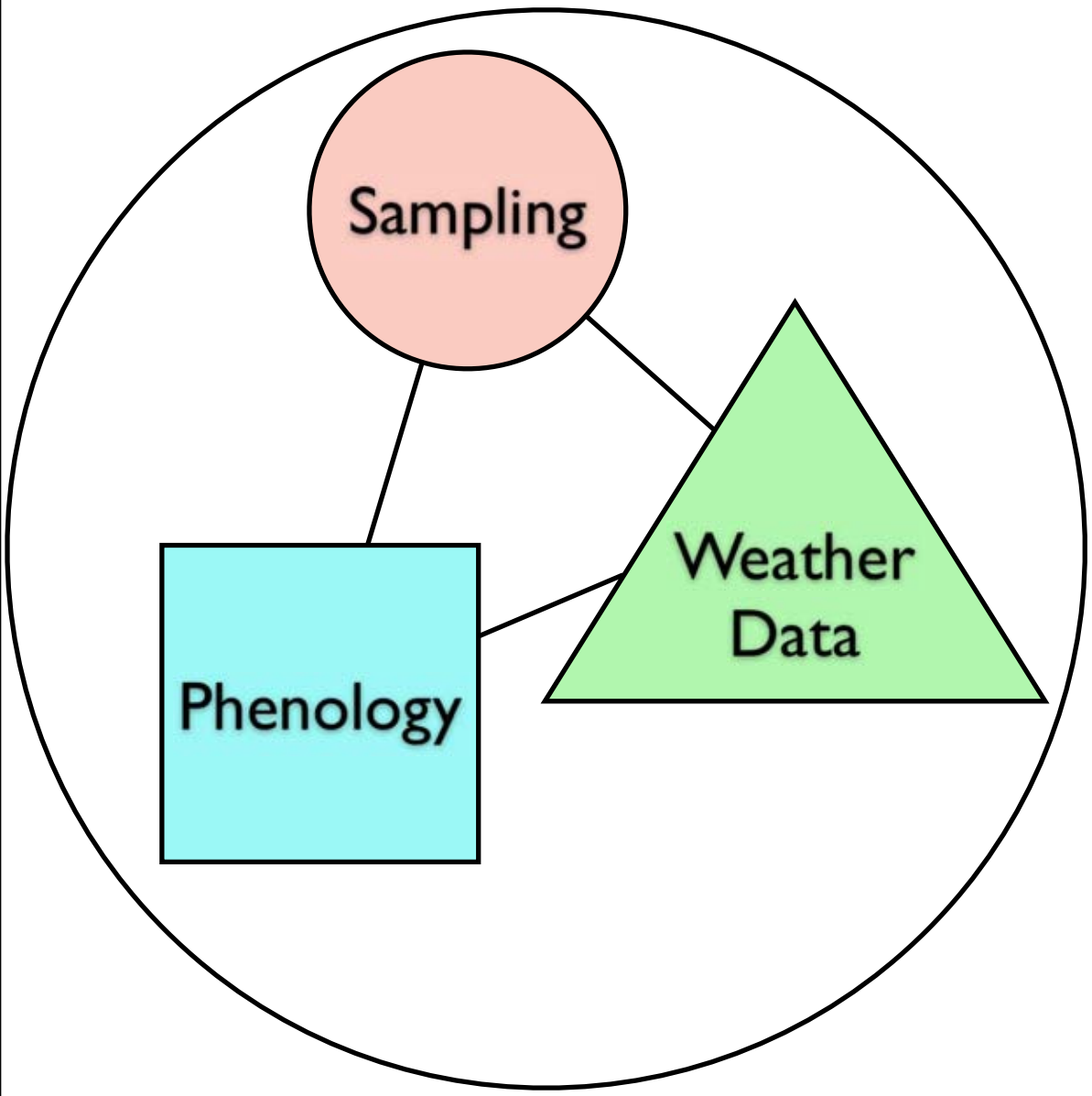
- Provide "start" times or ***biofix*** for Degree Day Models

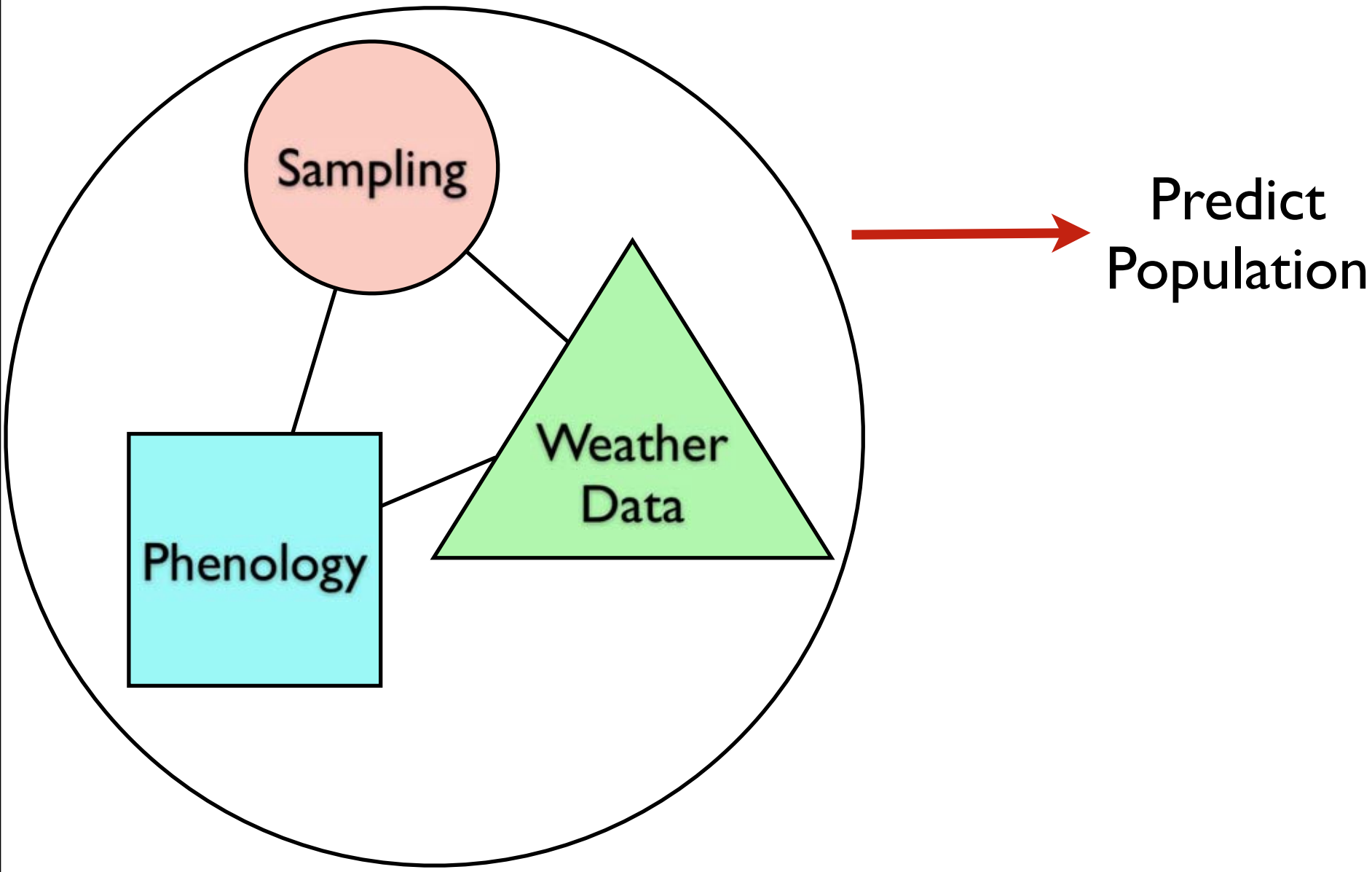
Codling Moth

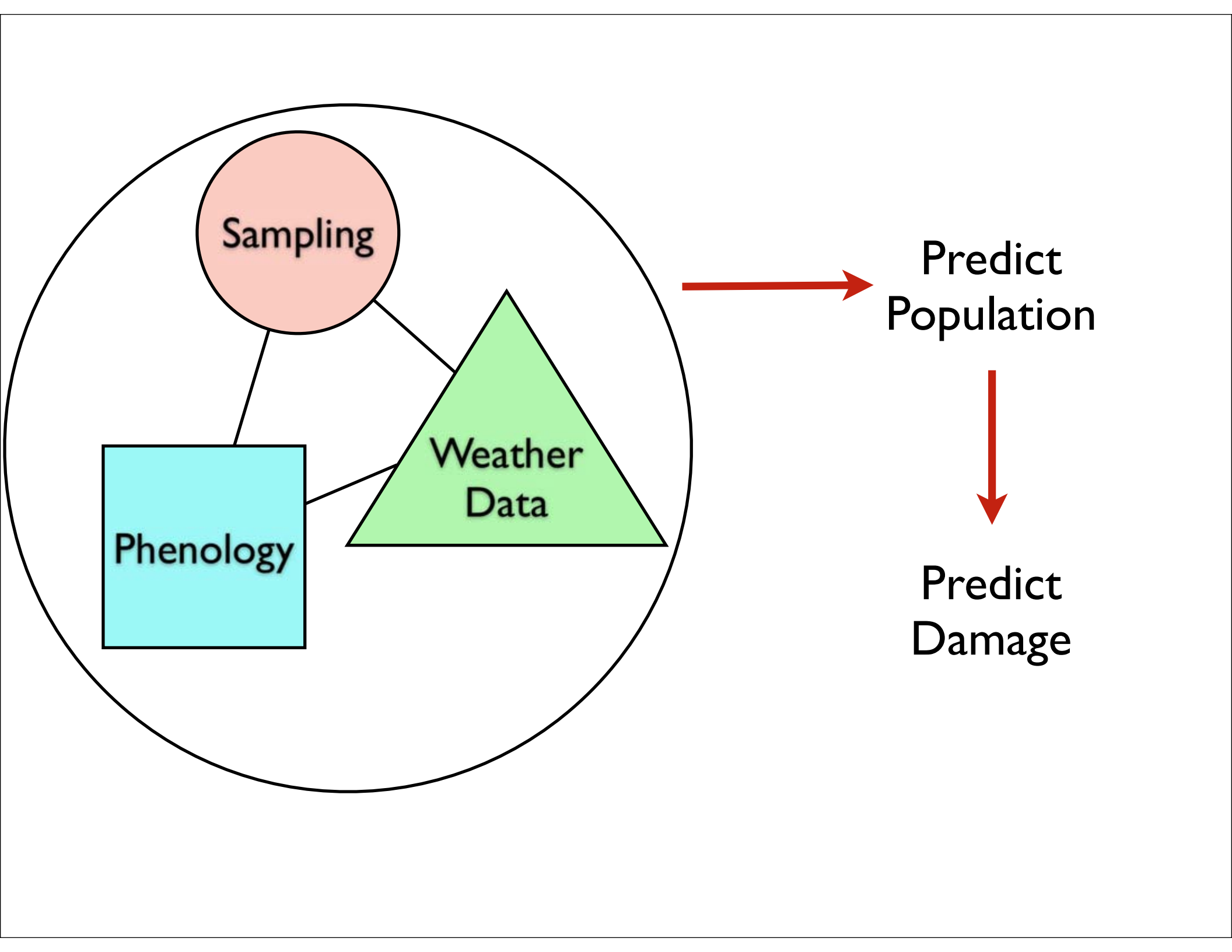


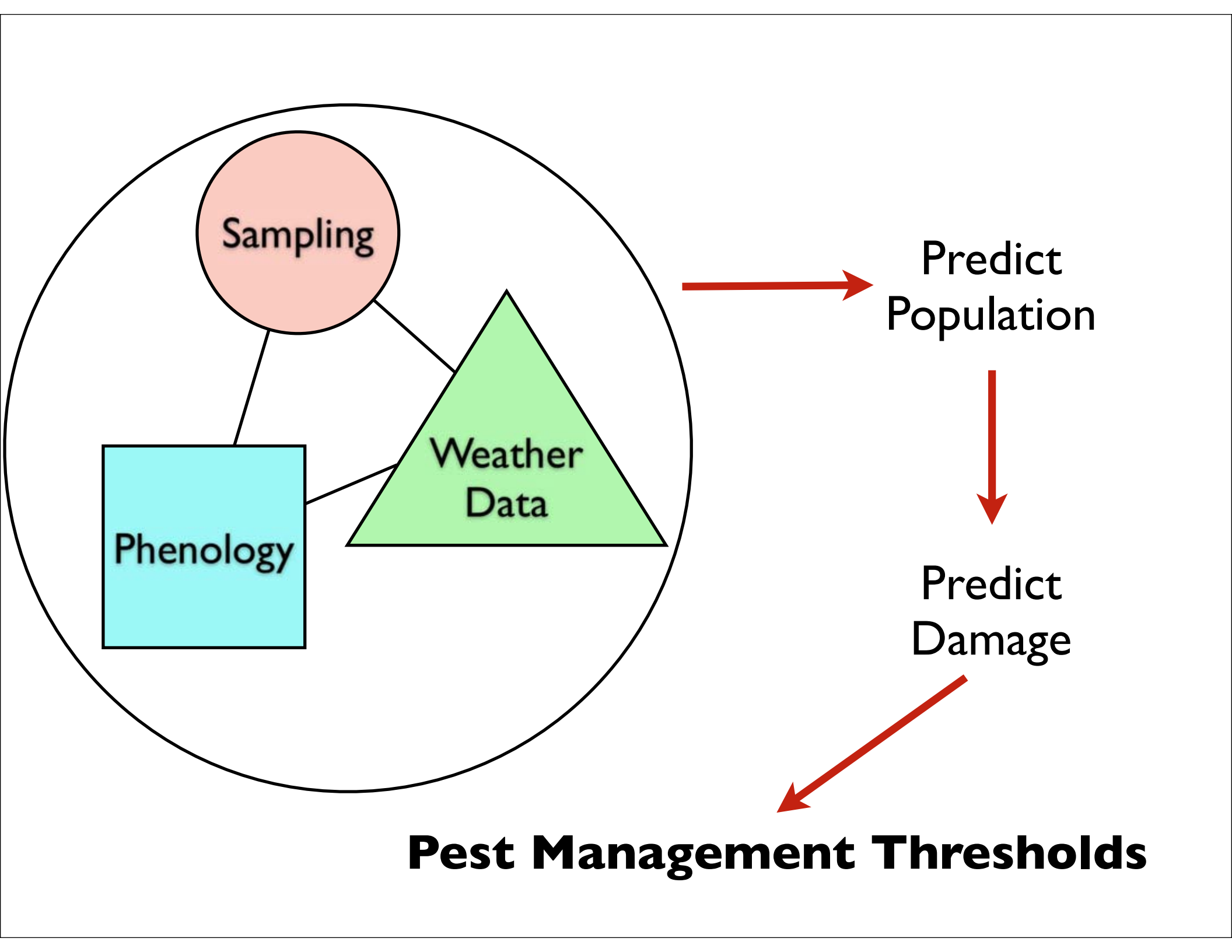
Targeting Pest Management




Sampling
Weather
Data
Phenology


Sampling
Weather
Data
Phenology
Predict
Population


Sampling
Weather Data
Phenology
Predict Population
Predict Damage


Sampling
Weather Data
Phenology
Predict Population
Predict Damage
Pest Management Thresholds