Chapter 13 (pg. 107)
Principles of Pest Management

"The goal of Integrated Pest Management (IPM) is to prevent pests from reaching economically or aesthetically damaging levels with the least risk to people, property, and the environment "

Integrated Pest Management

- Does not rely just on pesticides
- Combination of chemical & nonchemical (cultural)
- Helps farmers avoid:
  - Pesticide resistance
  - Pesticide ineffectiveness
  - Pesticide misapplication
    - Wrong rate
    - Wrong timing
    - Off target

Components of IPM

- **Identify** the pest/understand it's life cycle
- **Monitor**ing or Scout for pest
- **Develop IPM program using all control options**
- **Implement** the IPM program
- **Record** activities and results

Never guess at your pest problems!

Misidentification = Mismanagement

Monitoring

- measure pest populations and crop damage
- Scouting a
- Models us activity
  pr s

Economic Threshold

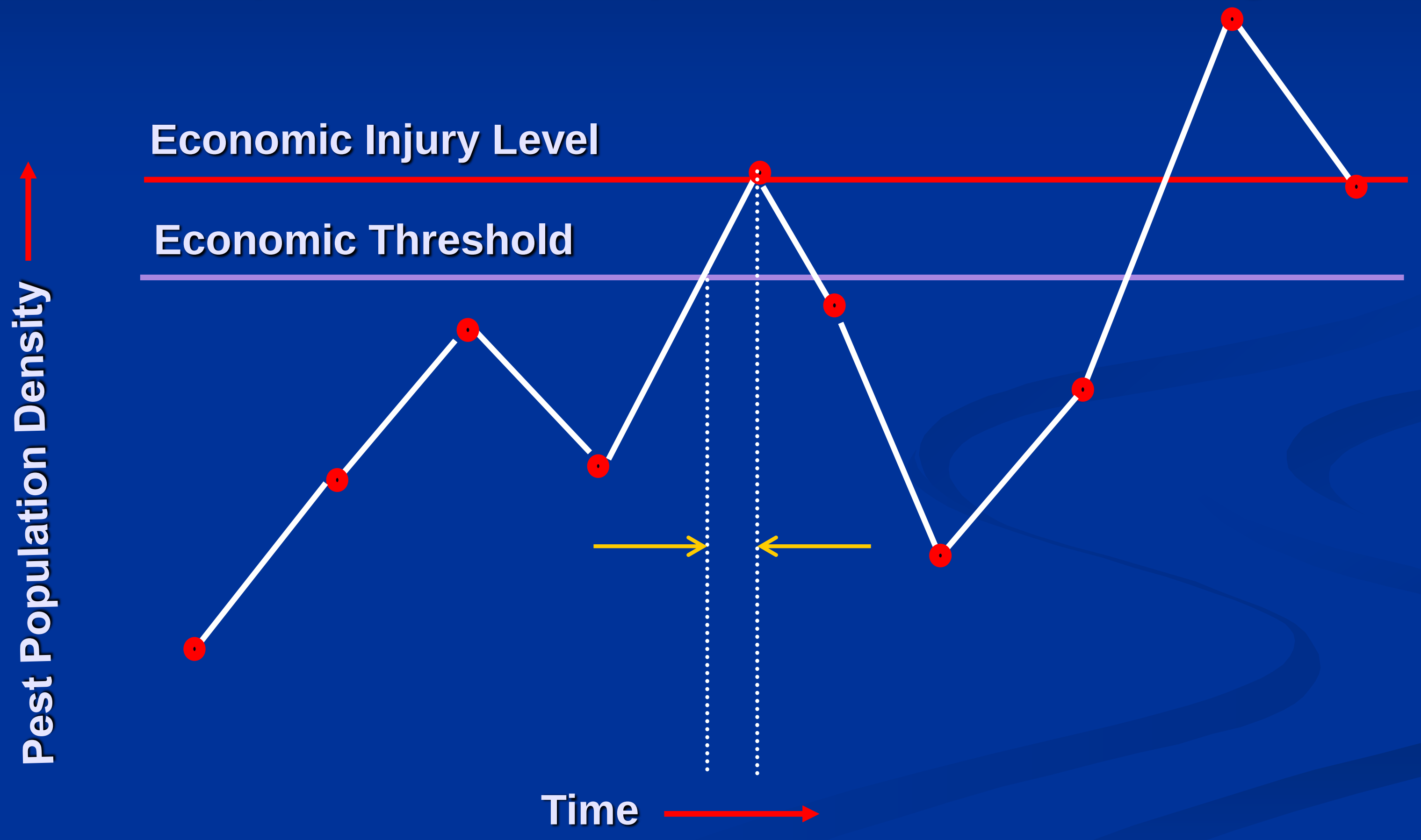
The level of pest density at which control measures are justified

Economic Injury Level

The level of pest density that losses are equal to cost of control measures.

Economic Threshold

Pest density at which a control measure must be taken to prevent the pest from reaching the EIL



Action Thresholds

- More appropriate outside of agriculture
- Pest level at which control is warranted for reasons other than just economics
- Threshold may be zero
  - Bedbugs
  - Wasps and bees – allergies
  - Aesthetics in a nursery

Methods of Pest Management

- Natural Controls
  - Climate – temperature, rain
  - Topographic – rivers, lakes, mountains
  - Natural enemies – regulate pests
- Biological Controls
  - Mass releases of natural enemies
  - Directed against exotic pests
- Mechanical Control
  - Cultivation, exclusion, and trapping

Methods of Pest Management

- Cultural Controls
  - Cultural practices – mulching, cover crops
  - Sanitation – eliminate pest's necessities
- Physical Controls
  - Refrigeration, humidity, airflow
- Bred Resistance /Genetic Control
  - Resistance through crossing
  - Resistance through gene transfer, Bt

Methods of Pest Management

- Chemical Controls
  - Often play a key role
  - Effective and quick acting
  - Reasonable cost
  - Challenges with consumers/resistance/environment
- Regulatory Controls
  - Exotic pests are targeted
  - Quarantine – prevents the spread of pests
  - Eradication – total elimination

To meet the IPM Goal

- Prevention: Pest is <u>not</u> yet a problem
  - Resistant varieties, treated seed, pre-emergence herbicides
- Suppression: Reduce pest to tolerable levels
  - Goal of pesticide applications, biological control
- Eradication: Eliminating the pest
  - Small confined areas, mice/cockroaches
  - Rarely successful in the field!

Implement an IPM Program

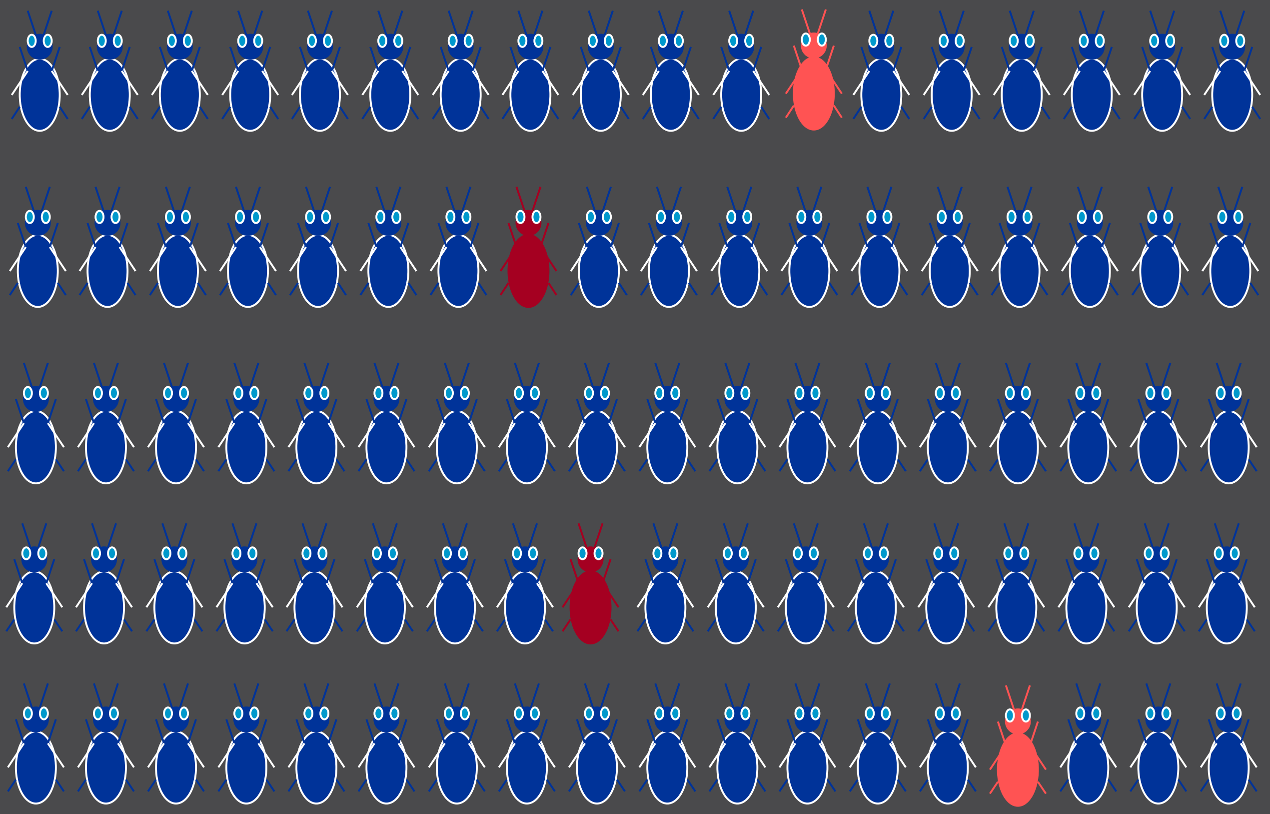
- Coordinate multiple tactics into a single integrated system
- Chemical and non-chemical
- Evaluate costs, benefits, and risks
- Most effective and least harmful

Chapter 12 (pg. 101) Pesticide Resistance

- Pesticide Resistance: Inherited ability of a pest to avoid toxic effects when exposed to a particular pesticide.
- You have lost a tool for managing the pest
- How does pesticide resistance develop?
  - Mutations
  - Passed on to offspring
  - Susceptible all die off

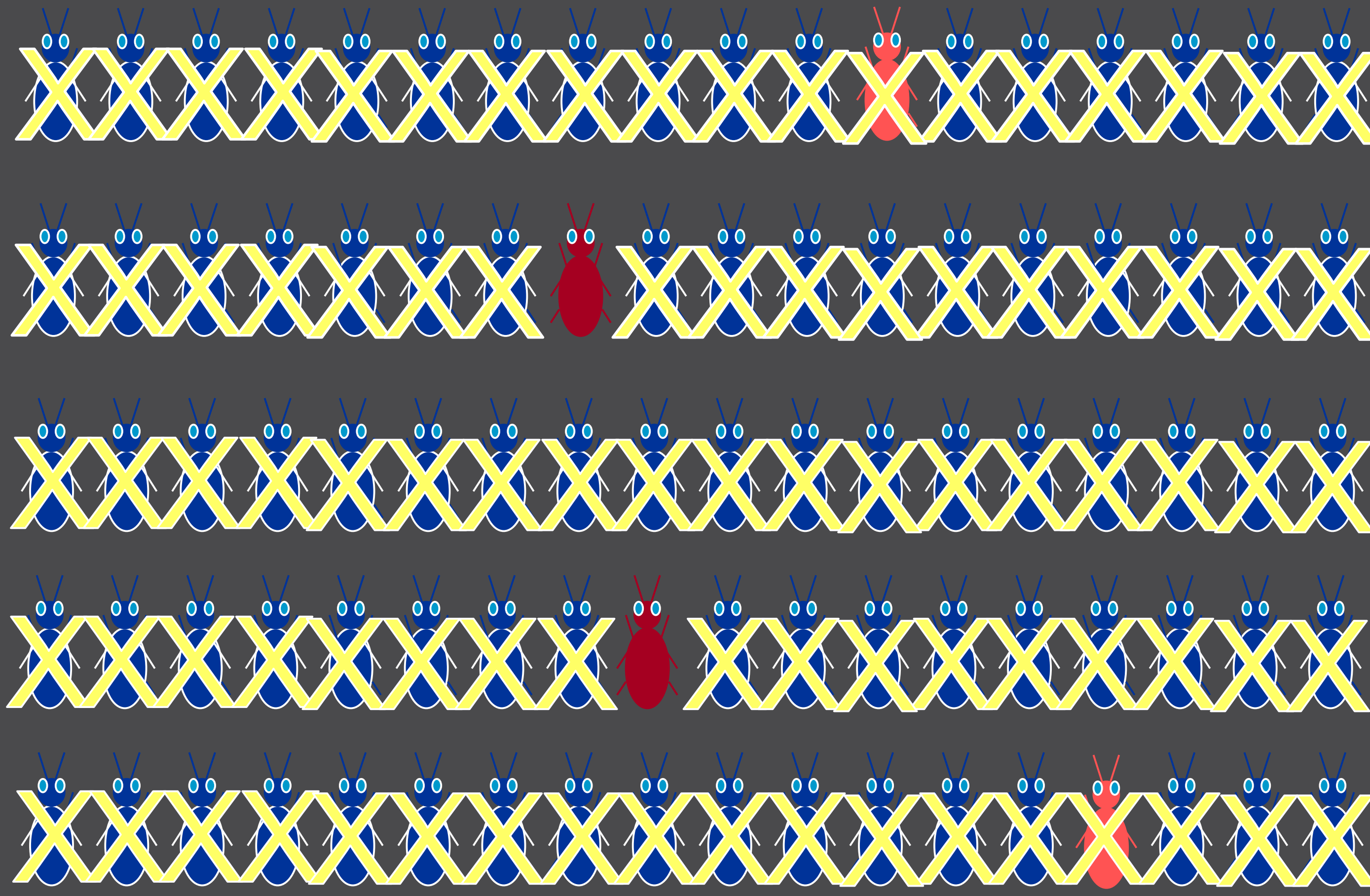
Natural pest population

- Some individuals have genes that make them less sensitive to a pesticide



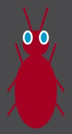
Pesticide application

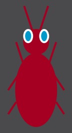
- Individuals that are susceptible die



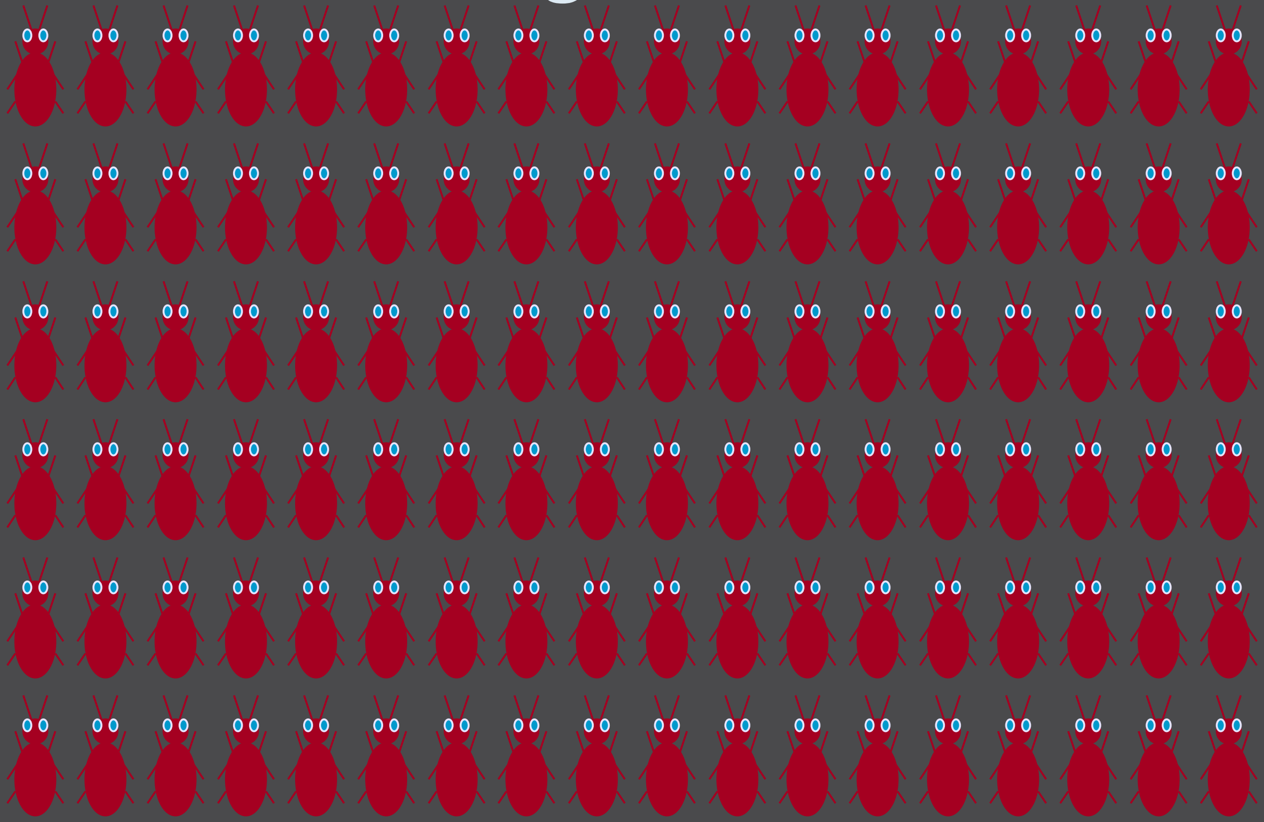
Pesticide application

- Individuals with naturally occurring genes that make them less sensitive to a pesticide survive…





- Eventually, the population is mostly made up of resistant individuals.
- Under permanent selection pressure, resistant insects outnumber susceptible ones and the insecticide is no longer effective.



Mechanisms of Pesticide Resistance

1. Reduced uptake
2. Metabolic resistance
3. Target site insensitivity
4. Behavioral change

Factors that Influence Resistance

1. Number of resistant individuals in population
2. Proportion of the population exposed to the pesticide More = faster resistance
3. Pest’s life cycle. More generations per year = faster resistance (insects vs. weeds)
4. Diversity of pesticides you use
5. Mode of action: specificity = quicker
6. Persistence and frequency of use

Foundations of Resistance Management

- Use an IPM program: multiple control methods = slow resistance development
- Use pesticides only when needed
- Apply pesticides at the labeled rate
- Rotate different modes of action
  - Group number listed on front of label

Insecticides - IRAC codes

Based on site of action

IRAC MoA Classification Version 8.1, April 2016 *See section 7.4 for further information on sub-groups. See section 7.3 for criteria for descriptors of the quality of MoA information.*		
Main Group and Primary Site of Action	Chemical Sub-group or exemplifying Active Ingredient	Active Ingredients
1 **Acetylcholinesterase (AChE) inhibitors** Nerve action {Strong evidence that action at this protein is responsible for insecticidal effects}	**1A** Carbamates	Alanycarb, Aldicarb, Bendiocarb, Benfuracarb, Butocarboxim, Butoxycarboxim, Carbaryl, Carbofuran, Carbosulfan, Ethiofencarb, Fenobucarb, Formetanate, Furathiocarb, Isoprocarb, Methiocarb, Methomyl, Metolcarb, Oxamyl, Pirimicarb, Propoxur, Thiodicarb, Thiofanox, Triazamate,Trimethacarb, XMC, Xylylcarb
	1B Organophosphates	Acephate, Azamethiphos, Azinphos-ethyl, Azinphos-methyl, Cadusafos, Chlorethoxyfos, Chlorfenvinphos, Chlormephos, Chlorpyrifos, Chlorpyrifos-methyl, Coumaphos, Cyanophos, Demeton-S-methyl, Diazinon, Dichlorvos/ DDVP, Dicrotophos, Dimethoate, Dimethylvinphos, Disulfoton, EPN, Ethion, Ethoprophos, Famphur, Fenamiphos, Fenitrothion, Fenthion, Fosthiazate, Heptenophos, Imicyafos, Isofenphos, Isopropyl O-(methoxyaminothio-phosphoryl) salicylate, Isoxathion, Malathion, Mecarbam, Methamidophos, Methidathion, Mevinphos, Monocrotophos, Naled, Omethoate, Oxydemeton-methyl, Parathion, Parathion-methyl, Phenthoate, Phorate, Phosalone, Phosmet, Phosphamidon, Phoxim, Pirimiphos- methyl, Profenofos, Propetamphos, Prothiofos, Pyraclofos, Pyridaphenthion, Quinalphos, Sulfotep, Tebupirimfos, Temephos, Terbufos, Tetrachlorvinphos, Thiometon, Triazophos, Trichlorfon, Vamidothion
	ene chlorines	Chlordane, Endosulfan
Nerve action {Strong evidence that action at this protein is	**2B** Phenylpyrazoles (Fiproles)	Ethiprole, Fipronil

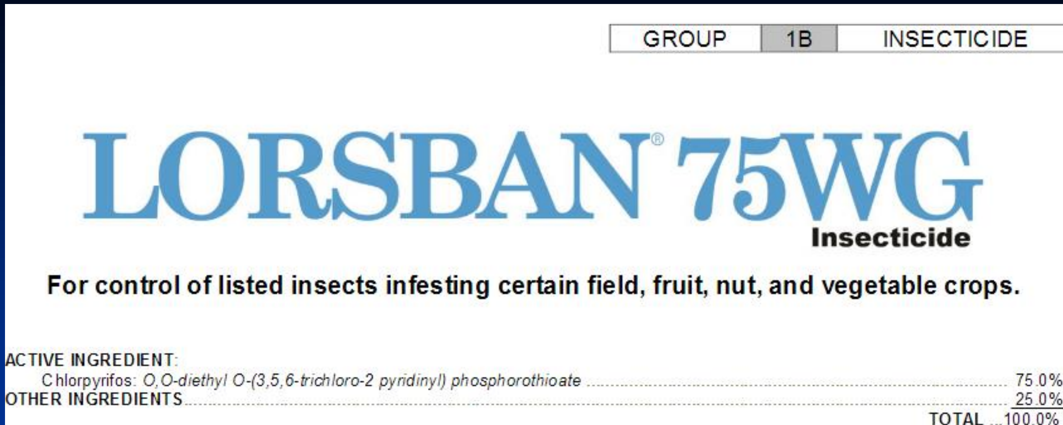
GROUP	1B	INSECTICIDE

LORSBAN® 75WG

Insecticide

For control of listed insects infesting certain field, fruit, nut, and vegetable crops.

ACTIVE INGREDIENT:
Chlorpyrifos: *O,O-diethyl O-(3,5,6-trichloro-2 pyridinyl) phosphorothioate* 75.0%
OTHER INGREDIENTS 25.0%
TOTAL ...100.0%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