



# Vegetable Integrated Pest Management

# About Myself

## Education:

- University of Nebraska-Lincoln
  - B.S. of Horticulture (Sustainable Food Production)
  - B.S. of Applied Science (Diversified Agriculture)

## Experiential Background:

- Soil Nutrient Management / Irrigation Research
- Vegetable Production / Organic Farming Research
- Field Scouting / Diagnostics
- Integrated Pest Management



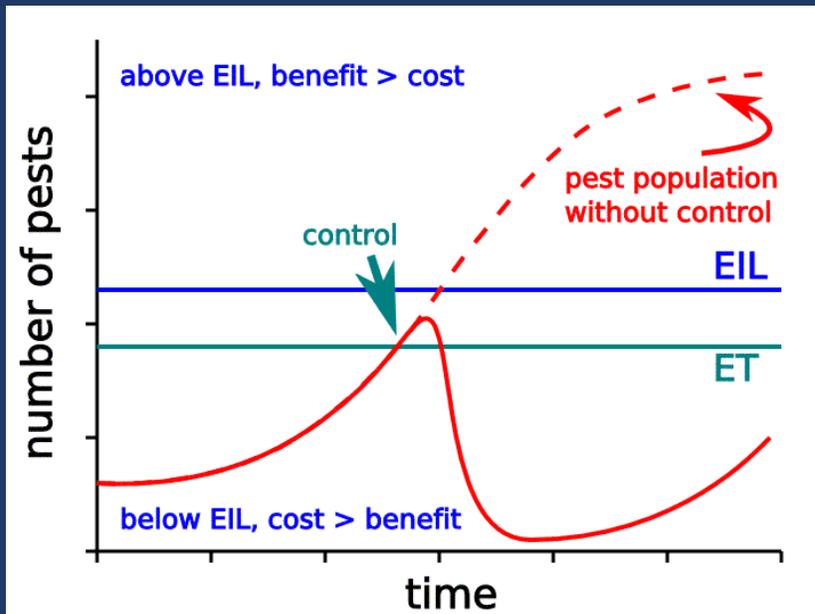
# IPM Overview

Pest Identification

Monitoring for Signs & Symptoms

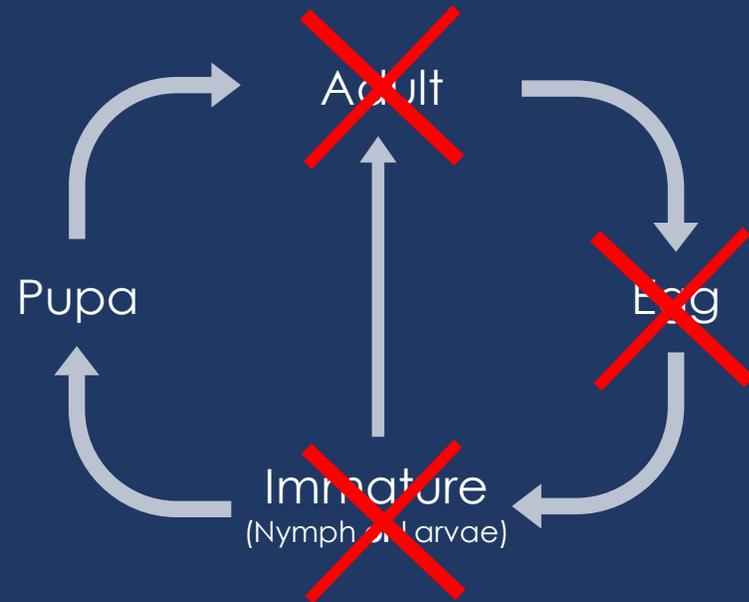
Control Action Guidelines

**Economic Injury Level** – The lowest population density of a pest that will cause economic damage; or the amount of pest injury which will justify the cost of control.



**Action Threshold** – The point at which a pest control action must be taken to prevent unacceptable damage.

# Identifying Windows of Opportunity



# Cultural Control

<b>Land + Water Management</b>	<b>Sanitation</b>	<b>Habitat Diversification</b>	<b>Tolerant Species + Cultivars</b>	<b>Soils &amp; Nutrition</b>
<ul style="list-style-type: none"><li>○ Maintain the ecosystem in a healthy state to minimize competitiveness of pests.</li><li>○ Avoid over/under watering to reduce plant stress</li><li>○ Control water levels (diseases, mosquitos, aquatic weeds, etc.).</li></ul>	<ul style="list-style-type: none"><li>○ Remove plants and debris that can serve as protective or overwintering sites for pests e.g. pruning, burning, etc.</li></ul>	<ul style="list-style-type: none"><li>○ In monoculture situations (e.g. agricultural fields, orchards, landscapes, etc.) diversification of vegetation may increase the presence of beneficial and pest organisms.</li></ul>	<ul style="list-style-type: none"><li>○ Select insect and disease resistant species and cultivars of plants whenever they are available.</li><li>○ Grow cold hardy perennials, as winter damaged plants are more susceptible to pest attacks.</li></ul>	<ul style="list-style-type: none"><li>○ Monitor soil nutrient levels.</li><li>○ Over or under fertilization can be attractive to aphids and other foliage pests.</li><li>○ Increasing organic matter of soil can improve the growth and health of plants.</li></ul>



# Mechanical Control

Hand Removal	Mowing	Traps	Physical Barriers
<ul style="list-style-type: none"><li>○ Hand pull weeds.</li><li>○ Physically remove the pest from the plant.</li></ul>	<ul style="list-style-type: none"><li>○ Mow down weeds within an area <u>before</u> they produce seeds.</li></ul>	<ul style="list-style-type: none"><li>○ Traps are primarily used to monitor and control insect and vertebrate pests.</li><li>○ Attractive traps usually use visual cues (color) and/or odors (pheromones, food baits) to attract pests to them.</li><li>○ Passive traps are placed in areas with pest activity or use wind currents to catch pest.</li></ul>	<ul style="list-style-type: none"><li>○ Floating Row Covers are used to protect row crops.</li><li>○ Sticky bands can be placed around tree trunks to prevent insects crawling up.</li></ul>



**YELLOW STICKY TRAP**

**ROW COVER**

**PLASTIC "MULCH"  
WEED BARRIER**

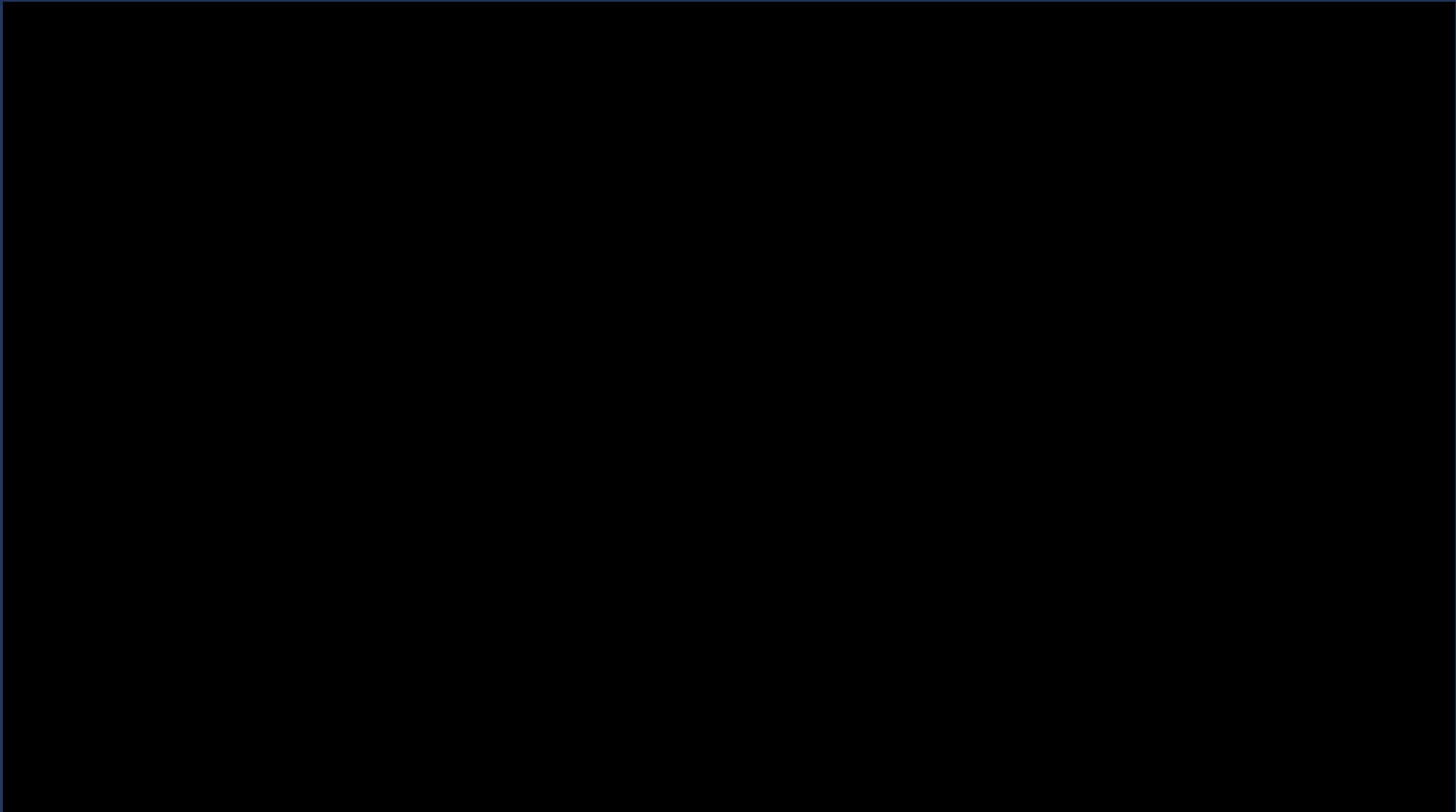
# Biological Control

<b>Predators</b>	<b>Parasites</b>	<b>Pathogens</b>	<b>Herbivorous Insects of Weeds</b>
<ul style="list-style-type: none"><li>○ Organisms that eats or kills another (e.g. predatory insects, mites, birds, mammals, reptiles, etc.).</li></ul>	<ul style="list-style-type: none"><li>○ Organism that lives in or on another and kills it while completing its life cycle (e.g., parasitoid).</li></ul>	<ul style="list-style-type: none"><li>○ Microbial agent that attacks and invades another organism (e.g. bacteria, virus, nematode).</li></ul>	<ul style="list-style-type: none"><li>○ Plant feeding insect tat attacks weeds.</li></ul>







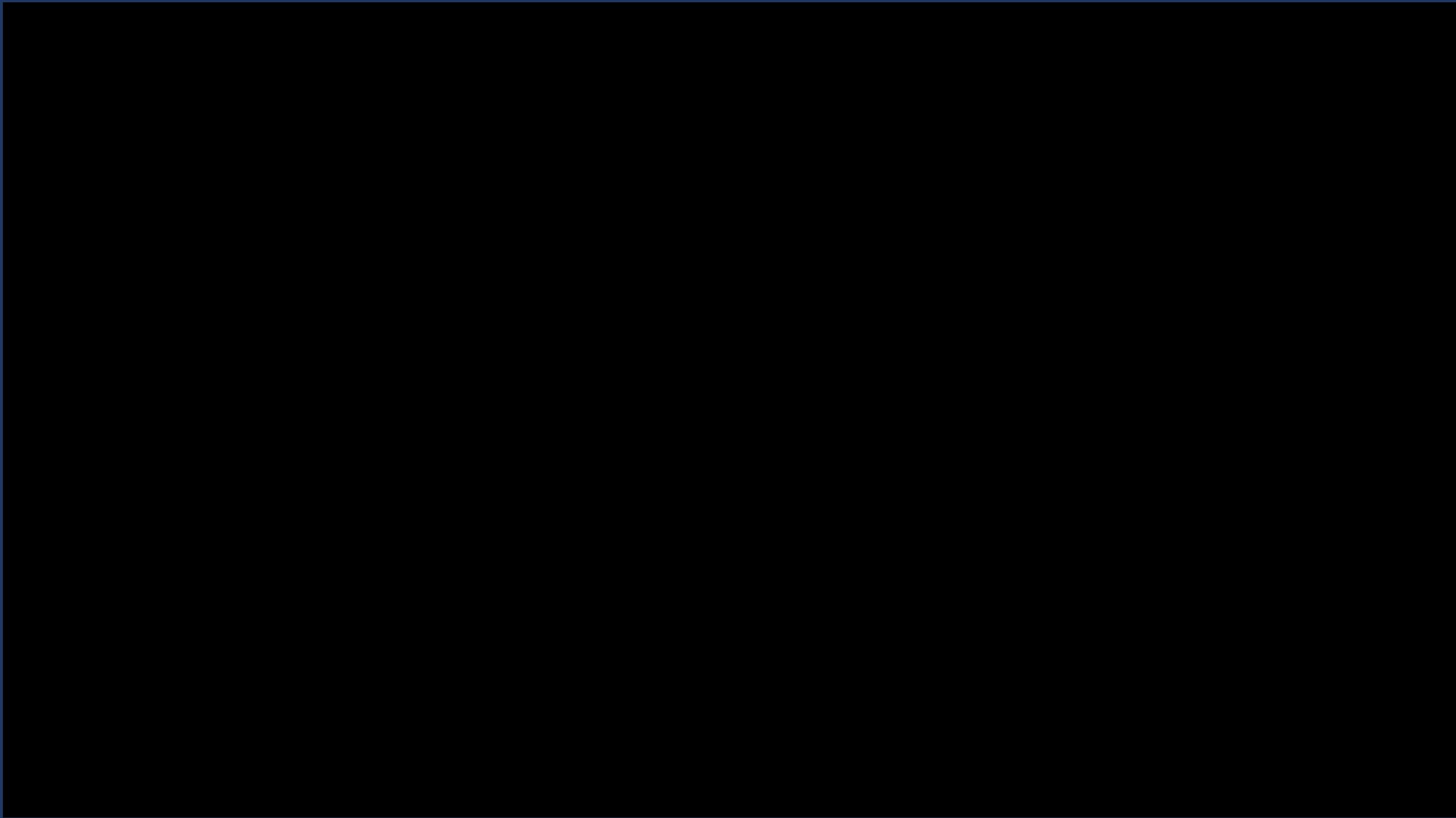


# Chemical Control

Synthetic Pesticides	Organic Pesticides	Biological Pesticides	Insect Growth Regulators
<ul style="list-style-type: none"><li>○ Human-made in a laboratory; chemically joined compounds or elements (e.g. most herbicides, diazinon, malathion, carbaryl, benomyl, streptomycin, etc.)</li></ul>	<ul style="list-style-type: none"><li>○ Derived from plant, animal, or naturally occurring rock or petroleum oil sources (e.g., rotenone, sabadilla, ryania, nicotine sulfate, pyrethrum, soaps, oils, microbial agents, lime sulfur, copper, etc.)</li></ul>	<ul style="list-style-type: none"><li>○ A subset of organics that specifically refers to products developed from naturally occurring microbial agents such as bacteria, viruses, and fungi (e.g., <i>Bacillus thuringiensis</i>, a bacterial pathogen of many insects).</li></ul>	<ul style="list-style-type: none"><li>○ Kills insects by interfering with the normal process of juvenile development; common IGRs disrupt either the insect's hormonal process or exoskeleton development.</li></ul>



<https://www.environmentalscience.bayer.us/-/media/prfuntitedstates/documents/resource-library/product-labels/sevin-sl.ashx>



# Mode of Action (MoA)

The way a pesticide works. Specifically how it affects the target site within an organism. Typically a critical protein or enzyme in the insect.

Nerve & Muscle	Growth
<p>Most current insecticides act on nerve and muscle targets. Insecticides that act on these targets are generally fast acting.</p>	<p>Insect development is controlled by juvenile hormone and ecdysone, by directly perturbing cuticle formation/deposition or lipid biosynthesis. Such insect growth regulators are generally slow to moderately slow acting.</p>
Respiration	Mid-Gut
<p>Several insecticides are known to interfere with mitochondrial respiration by the inhibition of electron transport and/or oxidative phosphorylation. Such insecticides are generally fast to moderately fast acting.</p>	<p>Lepidopteran-specific microbial toxins that are sprayed or expressed in transgenic crop varieties.</p>

# Field Scouting

- Scout Often (Weekly)
- Scout in areas where insects or diseases are likely to occur (Field borders, Wet areas, etc.)
- Visual observation
  - Signs (Physical damage or evidence caused by a pest)
  - Symptoms (Plants reaction to a pest)
- Sweep net
- Trap (sticky, pheromone, etc.)

# Plant Pathology

## BACTERIA



Bacteria are microscopic, single-celled prokaryotic organisms, without a defined nucleus, that reproduce asexually by binary fission (one cell splitting into two). They occur singly or in colonies of cells

## FUNGI



Fungi are eukaryotic organisms that lack chlorophyll and thus do not have the ability to photosynthesize their own food. They obtain nutrients by absorption through tiny thread-like filaments called **hyphae** that branch in all directions throughout a substrate. A collection of hyphae is referred to as mycelium (pl., mycelia).

## VIRUSES



Virus particles are extremely small and can be seen only with an electron microscope. Most plant viruses are either rod-shaped or isometric (polyhedral).

# Watermelon Mosaic Virus (WMV)

- WMV is in the genus **Potyvirus**.
- Spread non-persistently by aphids.
- Affects summer squash, winter squash, zucchini, gourds, and pumpkins.
- Virus overwinters in infected perennial weeds or alfalfa.
- Management options are very limited.



# Powdery Mildew on Cucurbits

- Caused by the fungi *Podosphaera xanthii* and *Erysiphe chicoracearum*.
- Spread by the wind blowing spores
- Affects summer squash, winter squash, zucchini, gourds, and pumpkins.
- Fungus overwinters on plant debris and produces fruiting structures that contain spores for winter survival.
- Manage by monitoring early on, plant resistant varieties, plow/remove plant residue at the end of season, increase plant spacing.



# Squash Bugs

- Squash bugs are in the Coreidae family
- Adults and nymphs feed on hosts with piercing-sucking mouth parts causing wilt
- Adults overwinter in outdoor protected sites.
- Manage by proper field sanitation, hand-removing, trellising, trap crops, crop rotation, etc.

<https://www.facebook.com/utahpests/videos/2332808870314267/>



# Fusarium Wilt

- Caused by the fungi *Fusarium oxysporum*
- Soil-borne
- Fungus infects roots causing damping-off in seedlings or wilting and plant death in older plants
- Fungus overwinters in the soil as chlamydospores (thick-walled modifications of the mycelium)
- Manage by crop rotation



# Early Blight in Tomatoes

- Caused by the fungi *Alternaria solani*
- Infections are common during warm periods (78-84 degrees F)
- Prefers wet conditions (standing water, overhead irrigation)
- Spores develop on lesions then dispersed by wind.
- Manage by growing resistant varieties, source pathogen-free seed, apply crop rotation, keep plants vigorous, use fungicides



# Flea Beetles

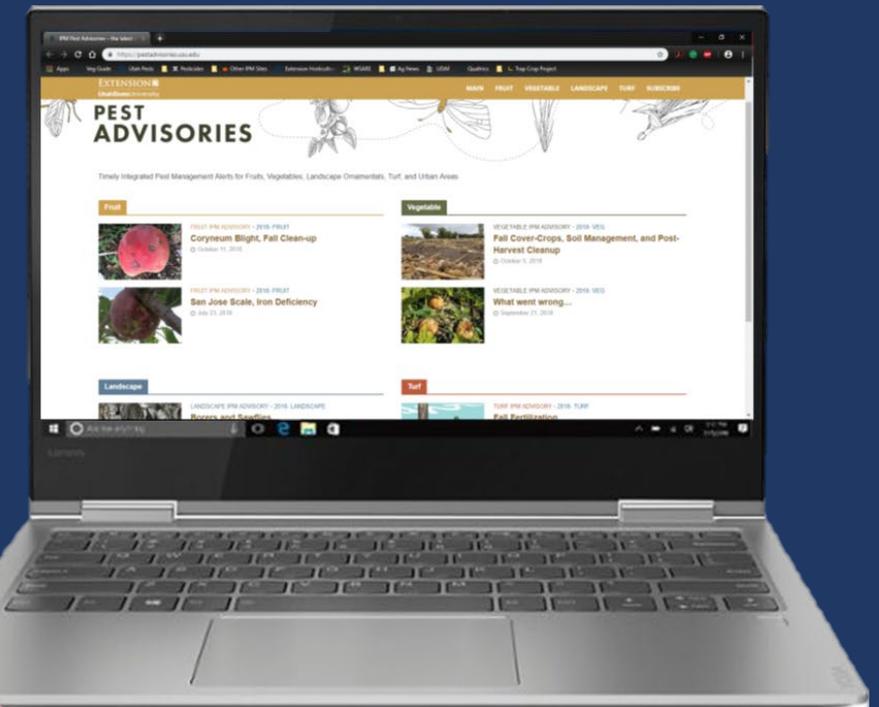
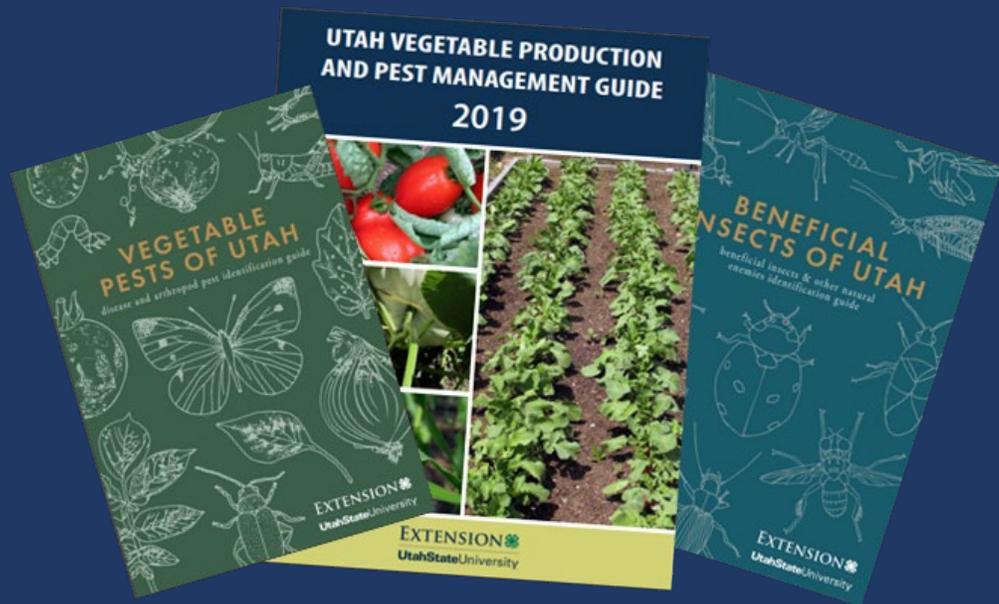
- Flea beetles are in the family *Chrysomellidae*
- Flea beetles overwinter as adults under soil clods, plant debris, and weeds.
- Adults chew shallow pits and small irregular holes in the stems and foliage of the plants.
- Monitor by using sticky traps, row covers, and removing old plant debris.



# Resources

[usuextensionstore.com/gardening/](http://usuextensionstore.com/gardening/)

[pestadvisories.usu.edu/subscribe](http://pestadvisories.usu.edu/subscribe)



# Resources



[www.facebook.com/groups/utgardeningexperts](https://www.facebook.com/groups/utgardeningexperts)

**Utah's Gardening Experts**



# Contact Me

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