Vegetable Gardening III

Maintaining the Garden

Presented by
Harriet Carter, Amye Foelsch, Ellen King, Thomas Bolles

Housekeeping Recap

- Evaluations
- Presentations & Handouts
  - www.mgpw.org/index.php/gardening-information/sustainable-vegetable-garden-series-class-notes
- Videos
  - www.mgpw.org/index.php/gardening-information/resources
- Companion Planting: Basic Concepts & Resources (ATTRA)
  - attra.ncat.org/attra-pub/summaries/summary.php?pub=72

Questions from Vegetable Gardening II

- **How do you deal with pests like deer and bear?**

  Harriet will be speaking to dealing with mammalian pests later in the program.

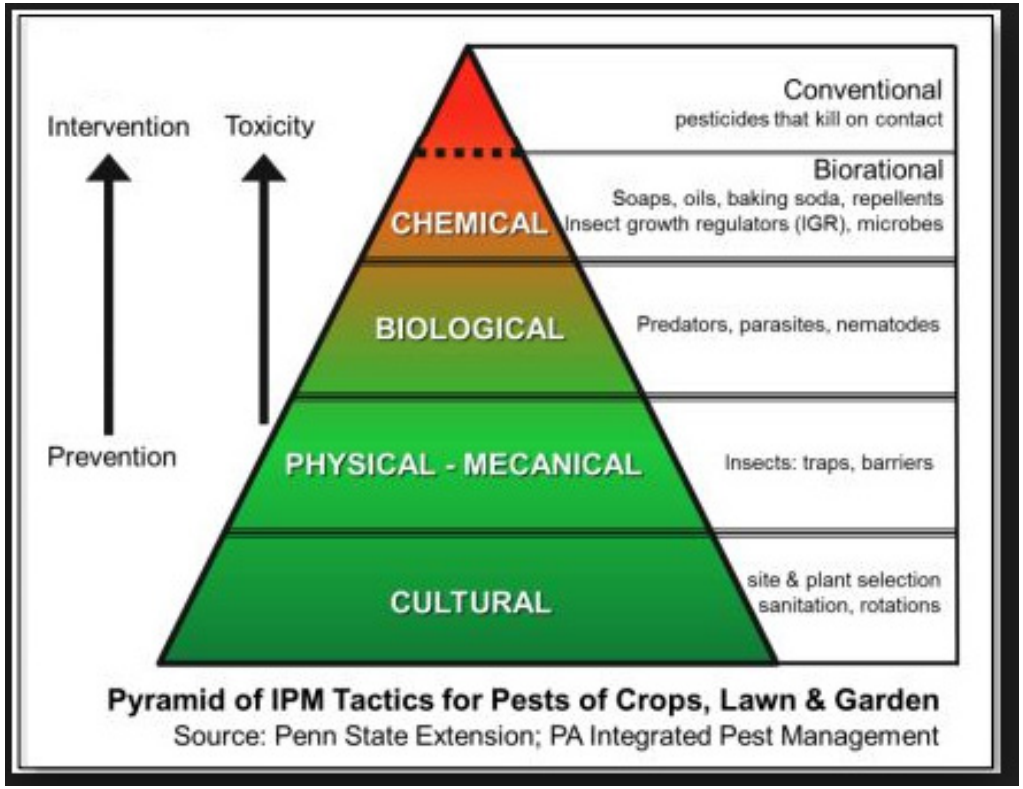
- **Is there class on blueberries?**

  Generally, we haven't had enough interest. If you are interested in growing any of the small fruits see me after class.

IPM: Integrated Pest Management

Ecosystem-based strategy that focuses on long-term prevention of pests or their damage and minimizes risks to human health, beneficial and non-target organisms and the environment.

- Use cultural practices that encourage healthy plants
- Monitor for problems
- ID pest/cause
- Determine if treatment is really needed
- Select control strategy starting with controls that minimize health and environmental risks



Pyramid of IPM Tactics for Pests of Crops, Lawn & Garden
Source: Penn State Extension; PA Integrated Pest Management

Managing Insects

Goal: Encourage the good bugs, control the bad ones, without the use of harmful insecticides.

Before planting, gain an understanding of the pest (bad bug), and the beneficial organism (good bug) associated with crop:

1. Correctly identify adult pests and beneficial insects
2. Correctly identify immature life stages such as eggs, nymphs & larvae
3. Learn and look for the signs and symptoms

Remember, pests are more effectively controlled when their numbers are low.

Recognizing Insect Damage

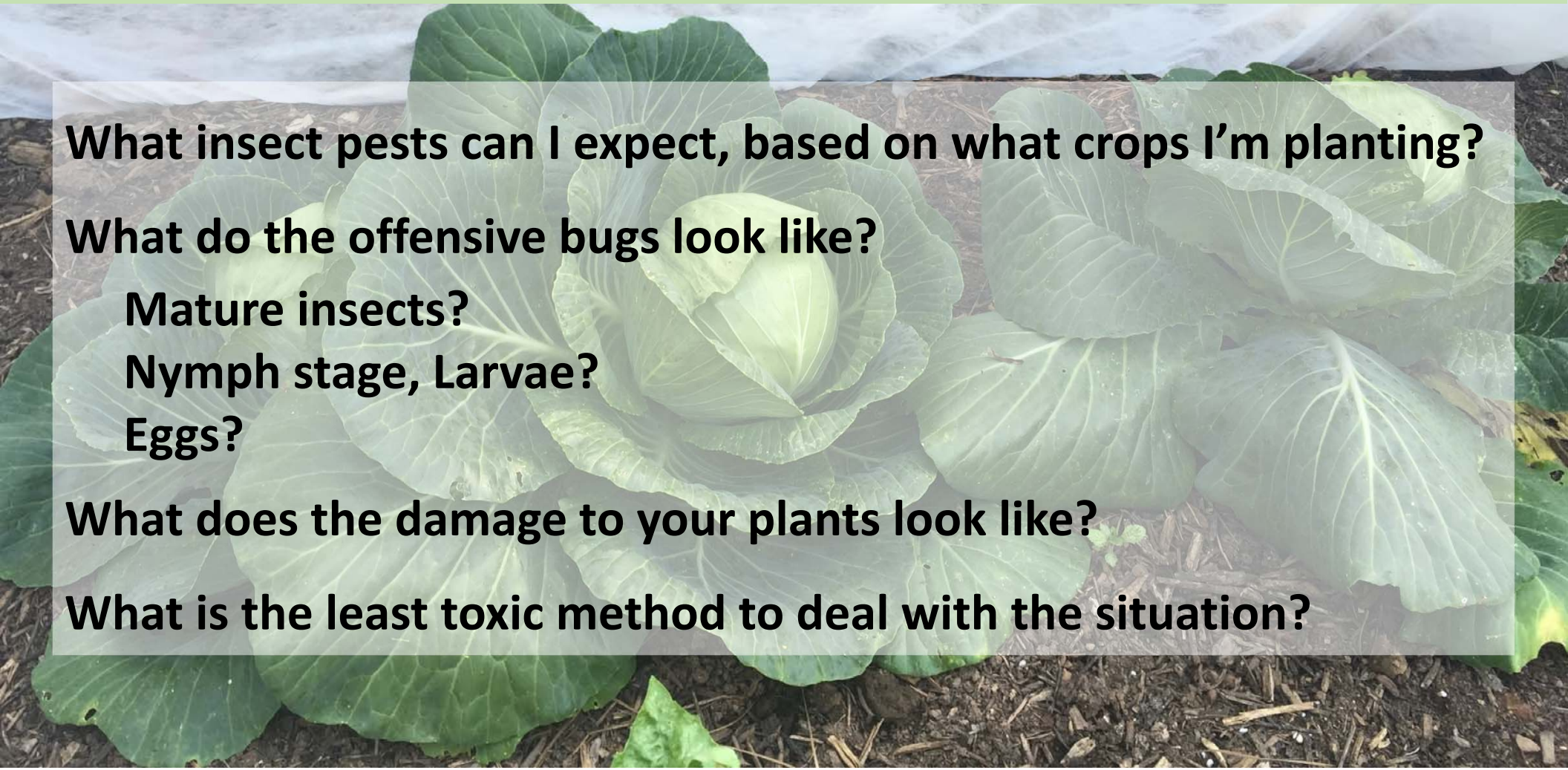
Plants are damaged by insect's mouth parts:

- Chewing mouth part
- Sucking mouth part (beak)

Which leave behind signs & symptoms:

- Chewed leaves
- Discoloration
- Distortion
- Dieback
- Insect products

Questions To Ask:



What insect pests can I expect, based on what crops I'm planting?

What do the offensive bugs look like?

- **Mature insects?**
- **Nymph stage, Larvae?**
- **Eggs?**

What does the damage to your plants look like?

What is the least toxic method to deal with the situation?

Unwelcome Garden Guests

Japanese Beetle

Bad Bug Swimming Pool

Asparagus Beetle


Gray Garden Slug


Eggs


Damage

Top Slug Predators

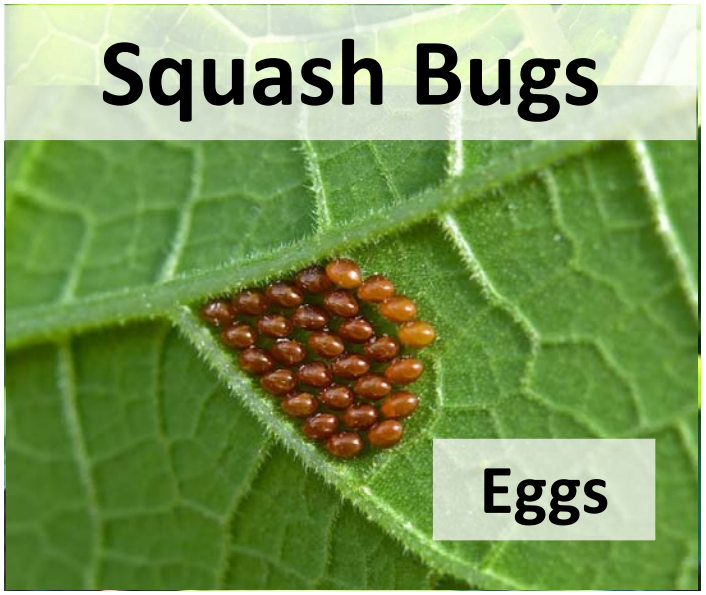
Harvestman (Daddy Longlegs)

Wolf spiders

Black ground beetle

Rove beetles
- think earwig
w/o the pincers

Firefly larvae
(multiple species)


Squash Bugs
Eggs

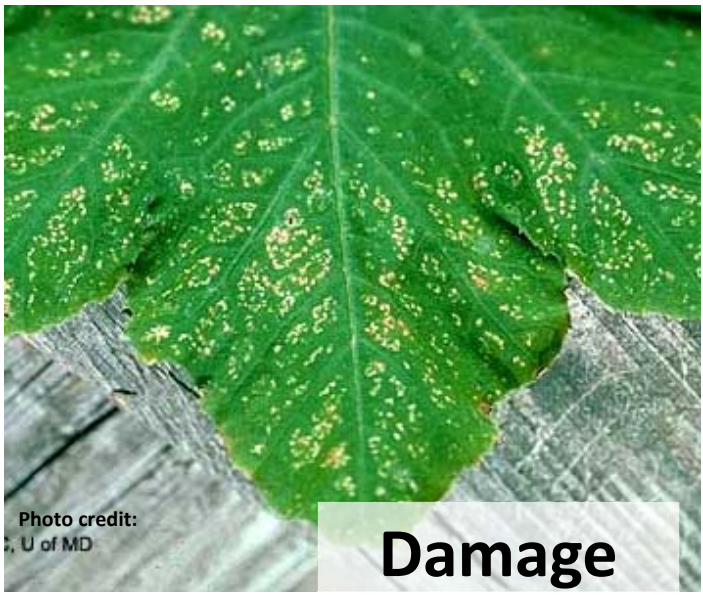
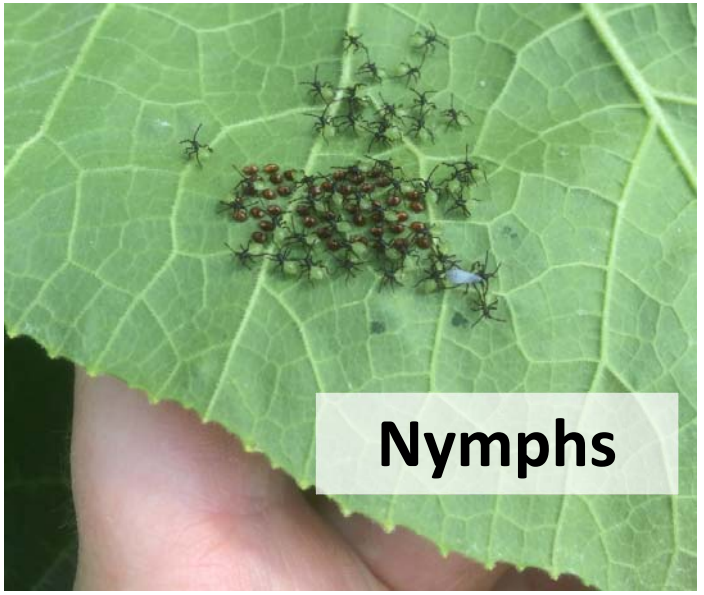


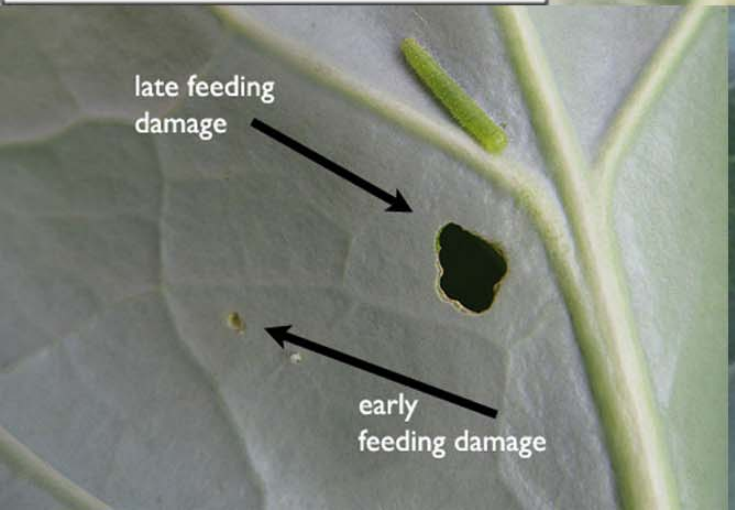
Photo credit:
, U of MD
Damage


Nymphs

Harlequin Bug

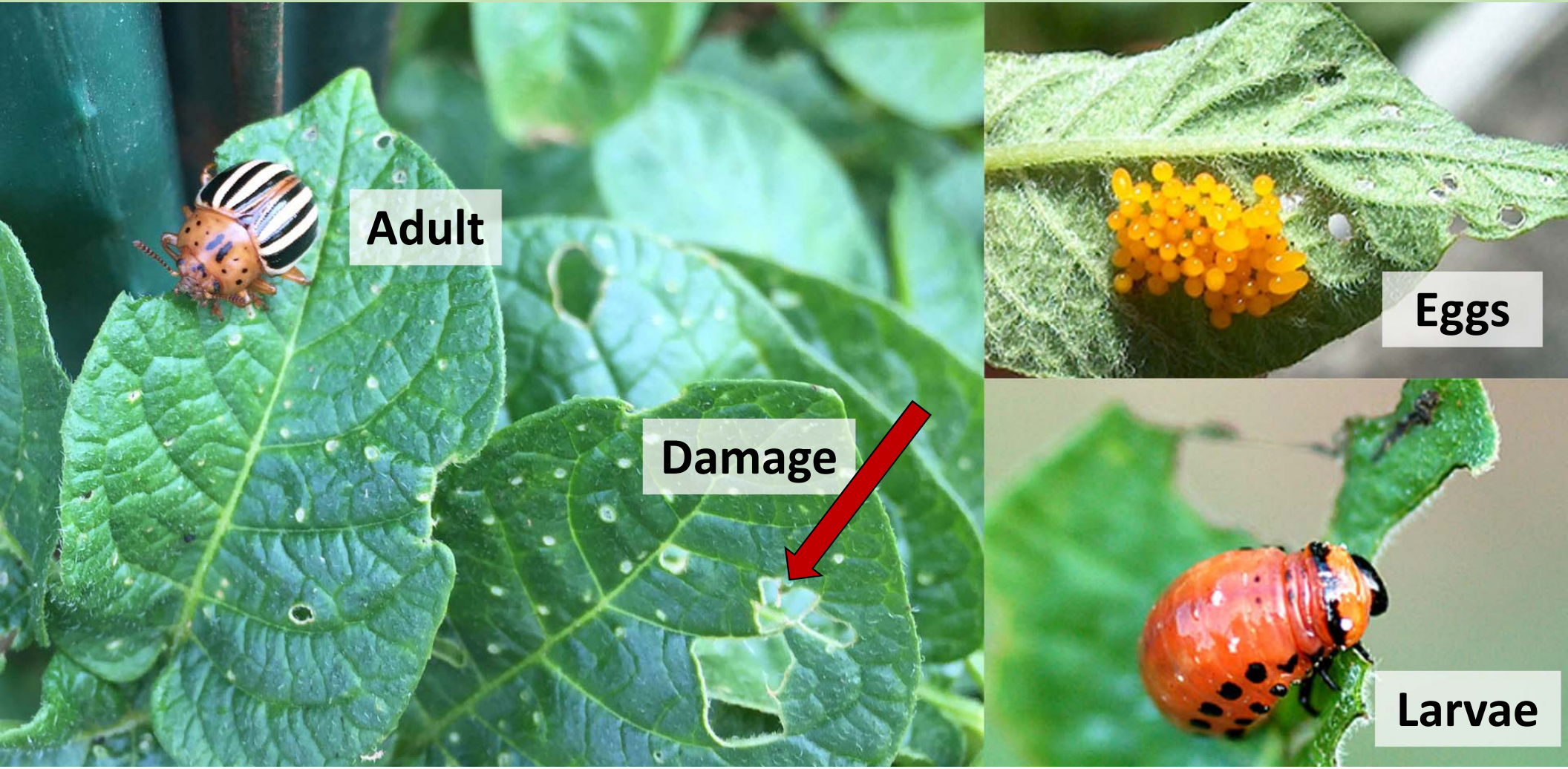

Row Cover
Trap Crop

Imported Cabbage Worm

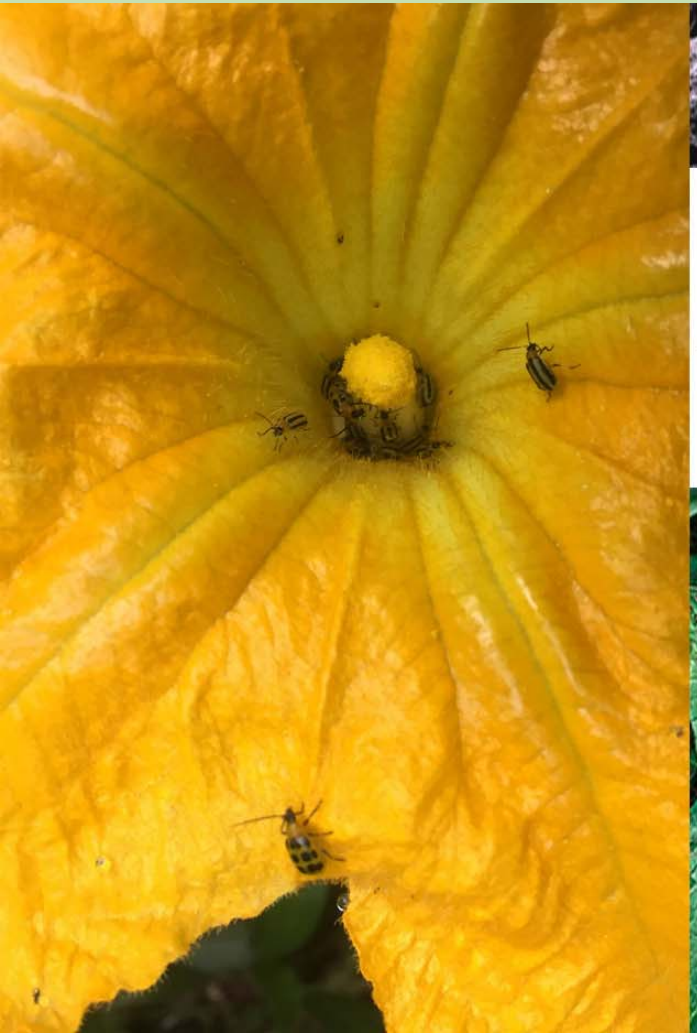


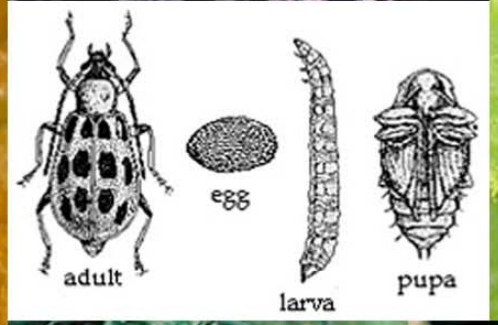
Black Army Cutworm

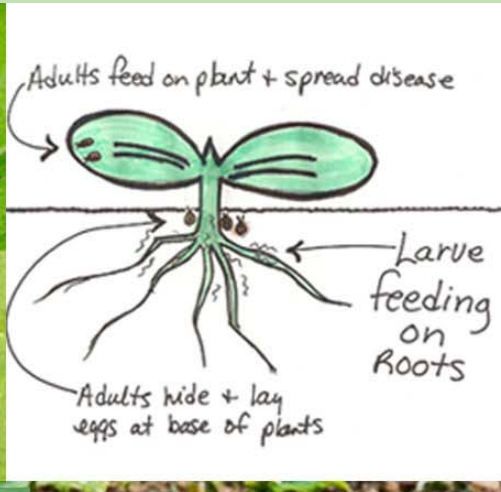
Colorado Potato Beetle



Cucumber Beetle



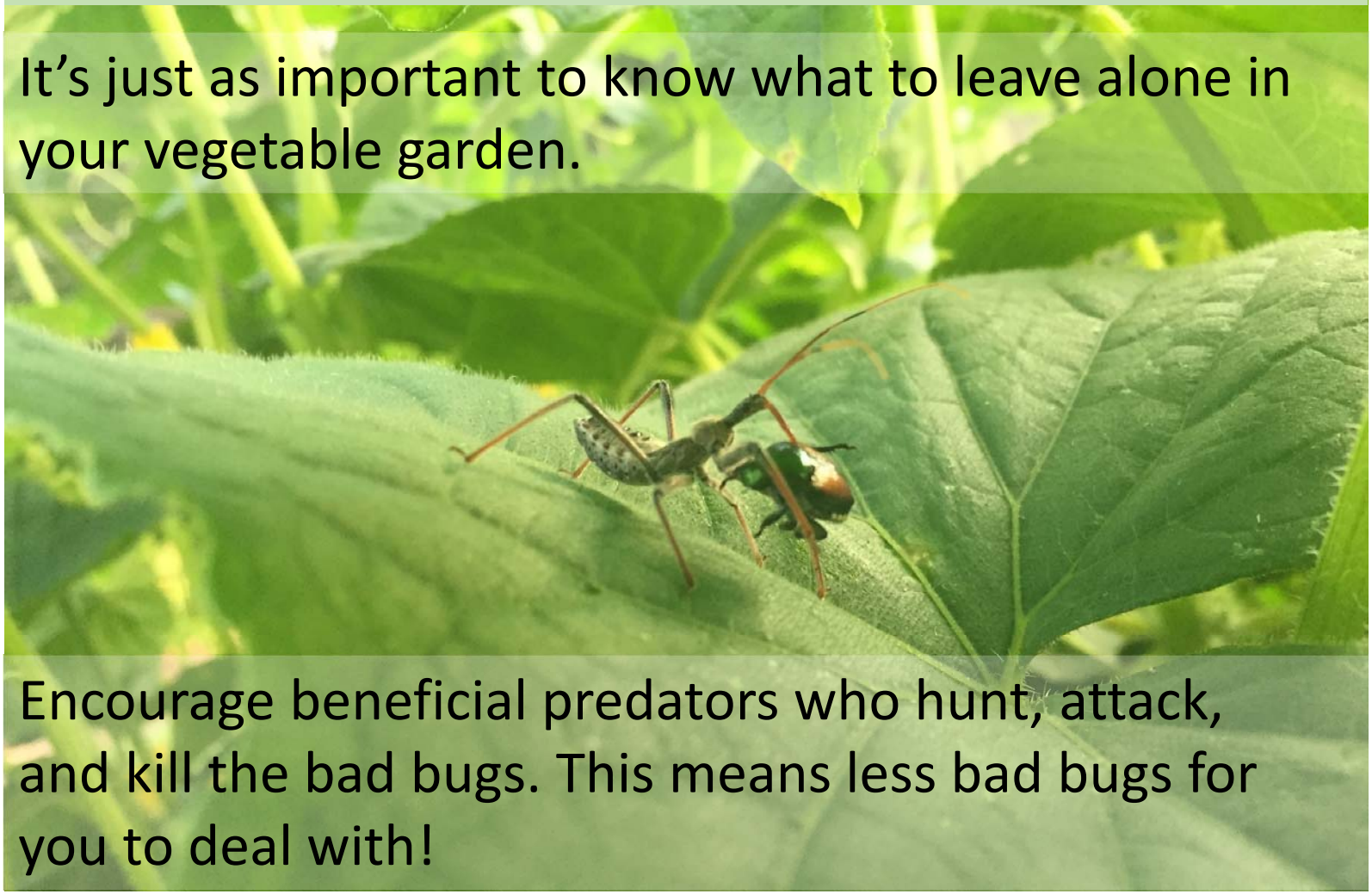




Damage

Good Bugs Can Help

It’s just as important to know what to leave alone in your vegetable garden.

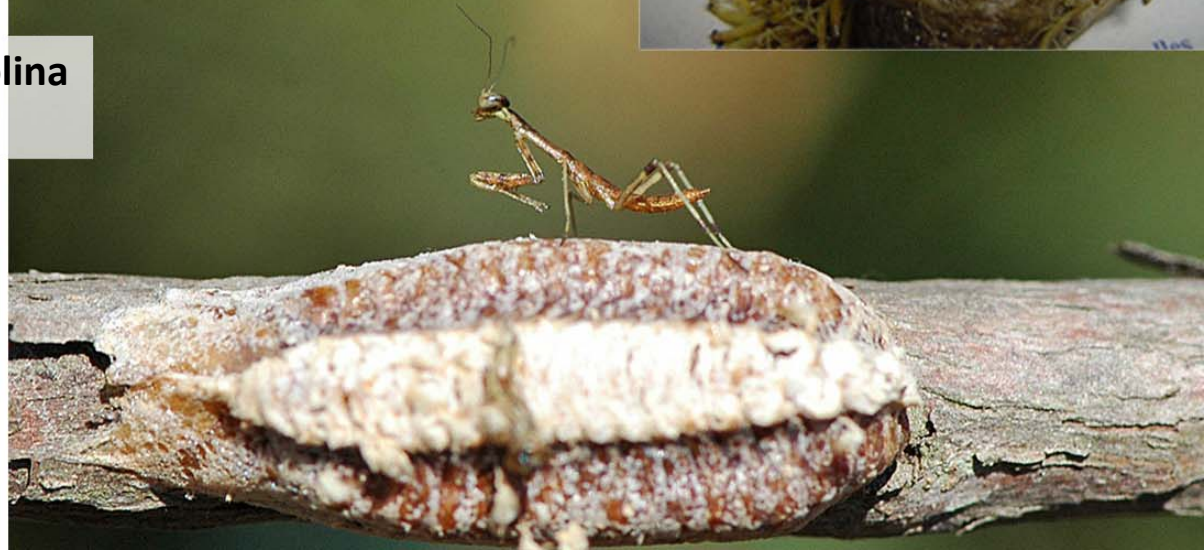


Encourage beneficial predators who hunt, attack, and kill the bad bugs. This means less bad bugs for you to deal with!

Welcome Garden Guests

Green Lacewing

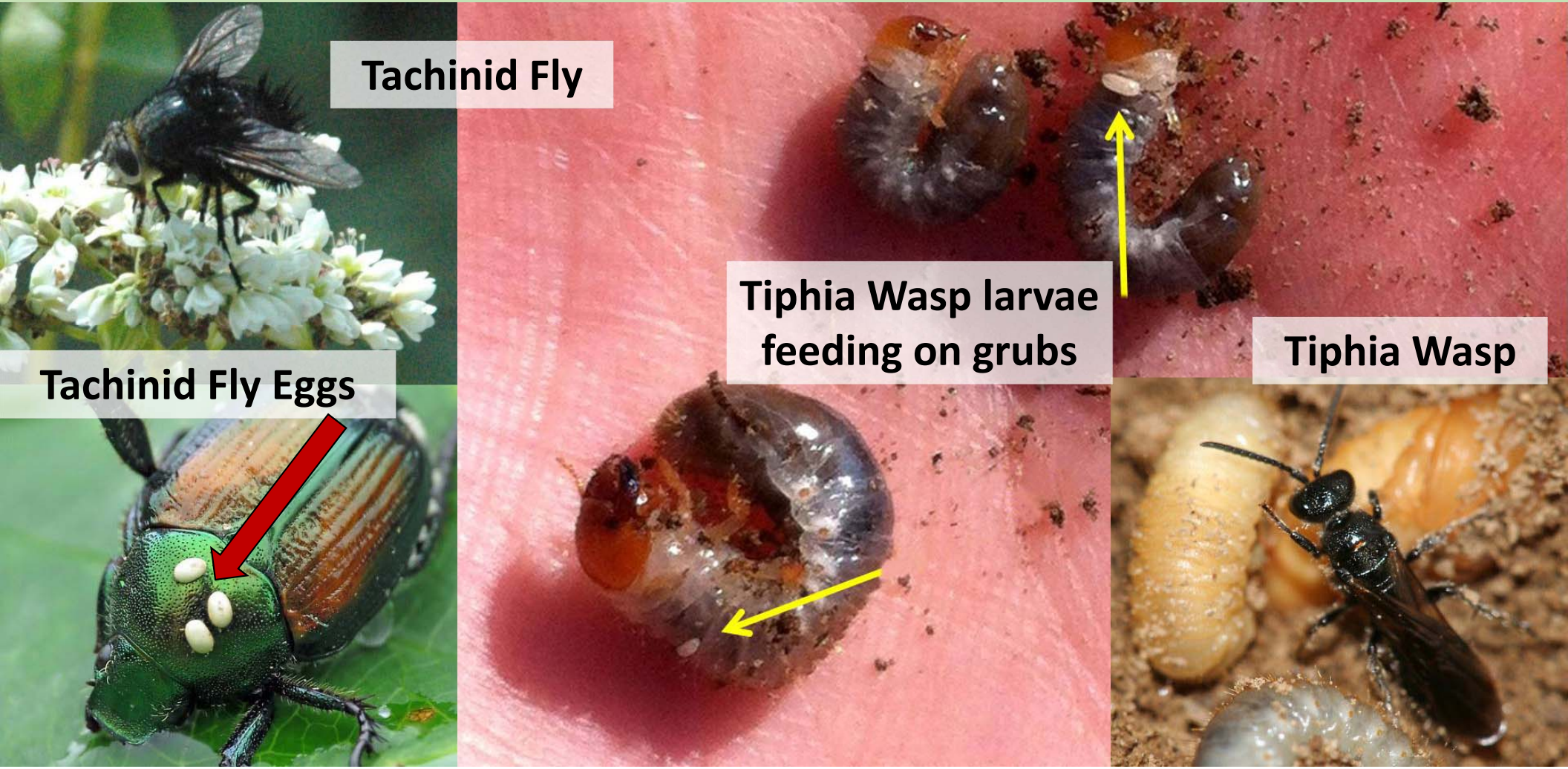
Praying Mantid



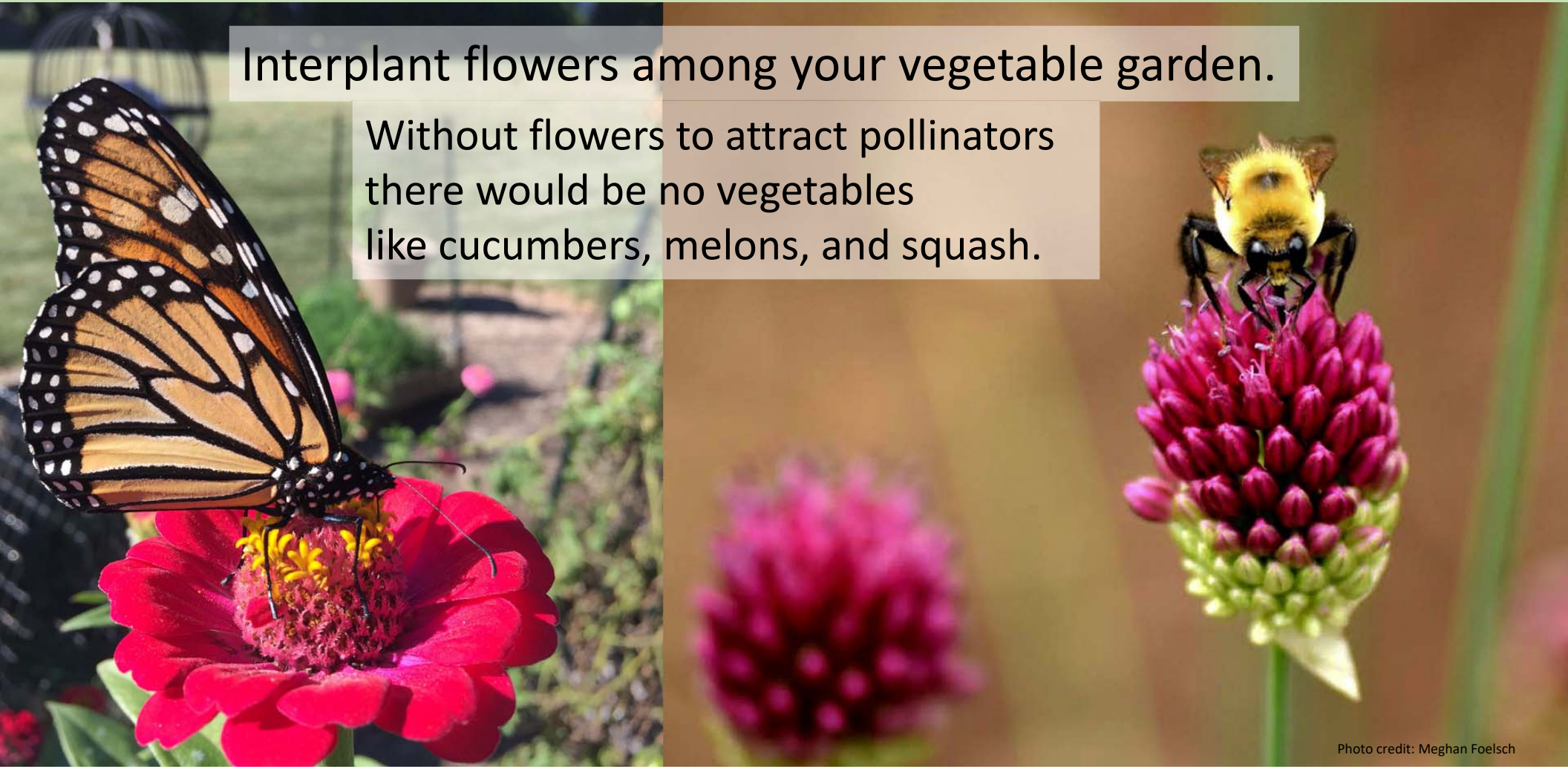
A Reason to Welcome Both the Bad the Good

Braconid Wasp vs. Hornworm

Why We Don’t Use Insecticides in the Garden



Practice Beneficial Insect Gardening



Interplant flowers among your vegetable garden.

Without flowers to attract pollinators
there would be no vegetables
like cucumbers, melons, and squash.

Photo credit: Meghan Foelsch

Resources That Can Help

http://www.ipm.ucdavis.edu/FAQ/natural-enemies-poster.pdf

https://rockingham.ext.vt.edu/content/dam/rockingham_ext_vt_edu/files/horticulture/ipminsectguide.pdf

Key Takeaways

An observant gardener is the best deterrent

- **Walk the garden everyday**
- **Take a close look for damaged leaves, egg masses, frass and bugs**
- **Research a bug's life cycle**
- **Remember pesticides do not discriminate and will kill the good bugs too**
- **Understand that no matter what there will be some damage…**

and that is okay!

The Importance of Learning a Bug's Life Cycle

Life Cycle of a LadyBug

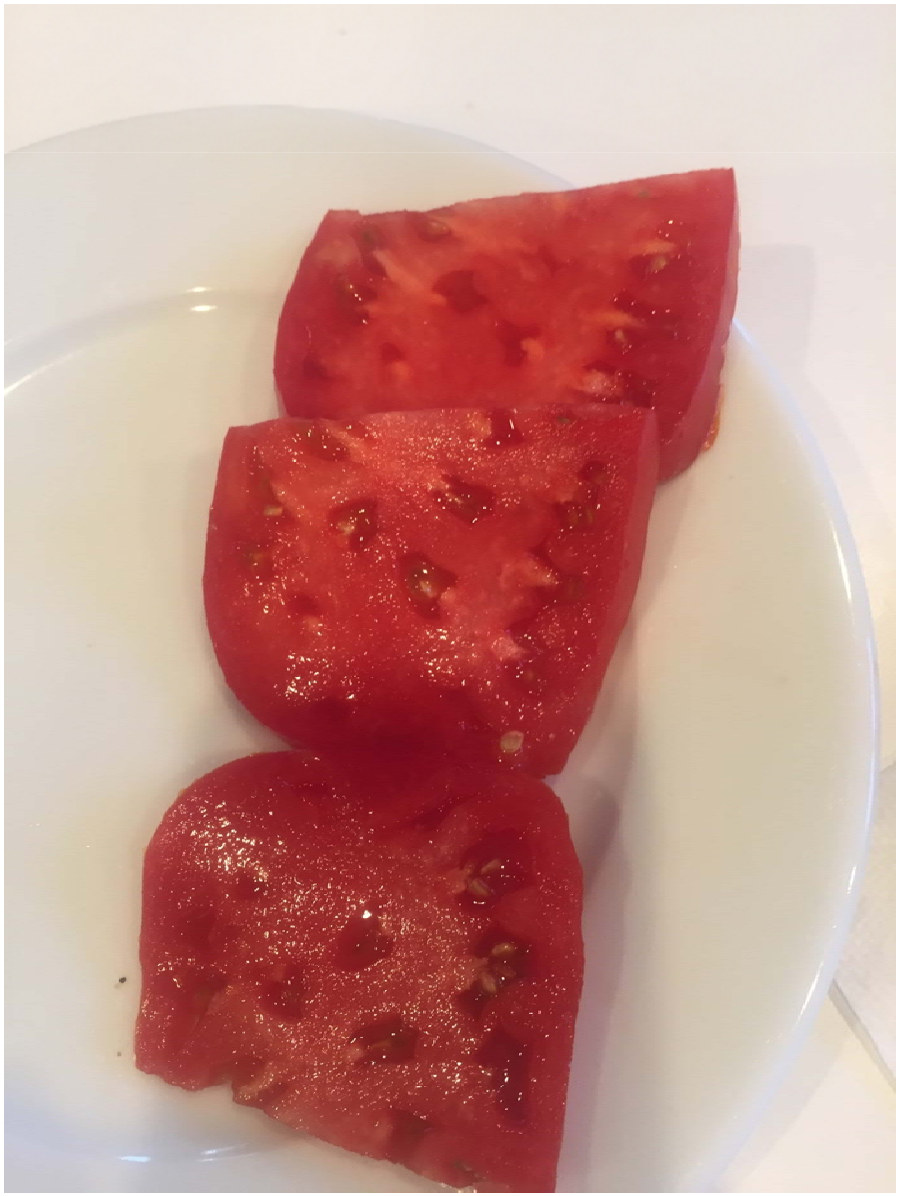
4-8 WEEKS

Egg Stage
3-5 days

Larval Stage
20-30 days

Pupa Stage
3-12 days

Adult Stage



Disease

An impairment of the **normal state of living** that interrupts, modifies or stresses vital functions.

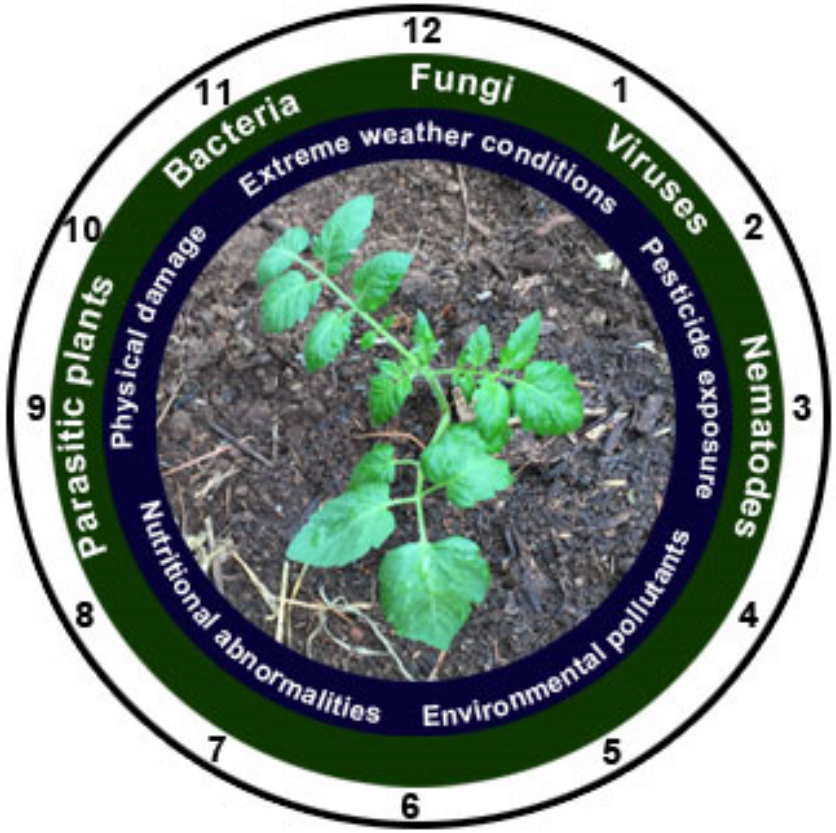
Components for Disease Development

HOST

ENVIRONMENT

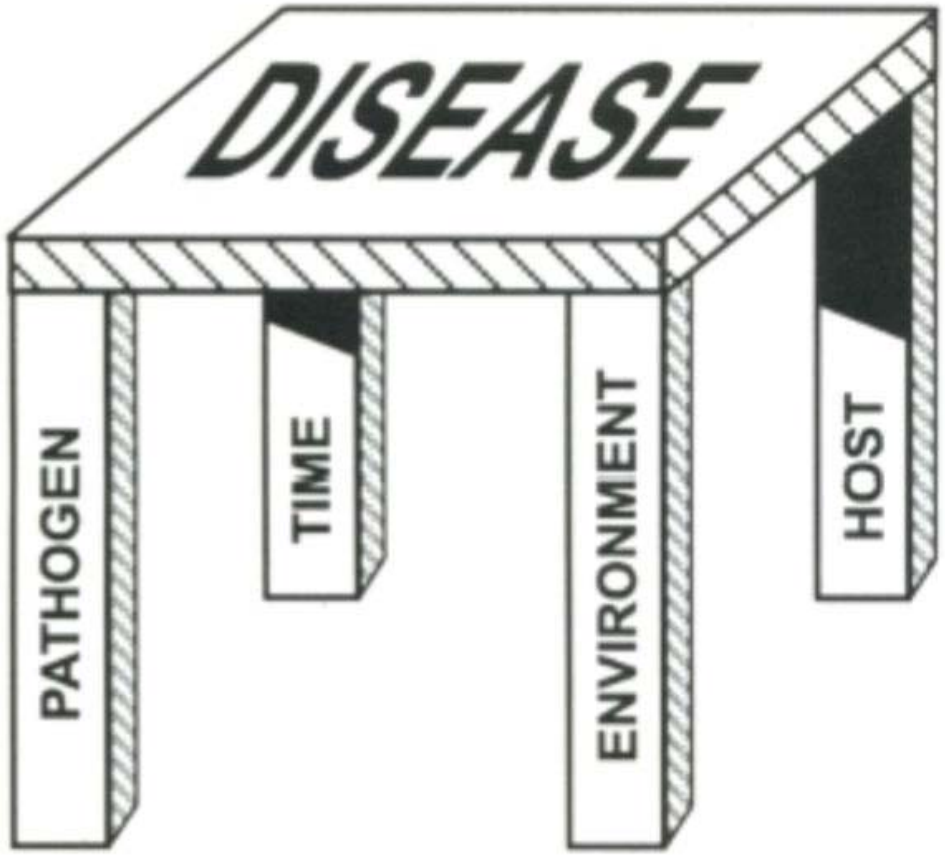
PATHOGEN

TIME



Credit: Fla. Dept. Agric. & Consumer Services/ Division of Plant Industry

How to Build a Sturdy Table for Disease



Credit: Fla. Dept. Agric. & Consumer Services/ Division of Plant Industry

Defense Against Disease

Good observational and detective skills

Location

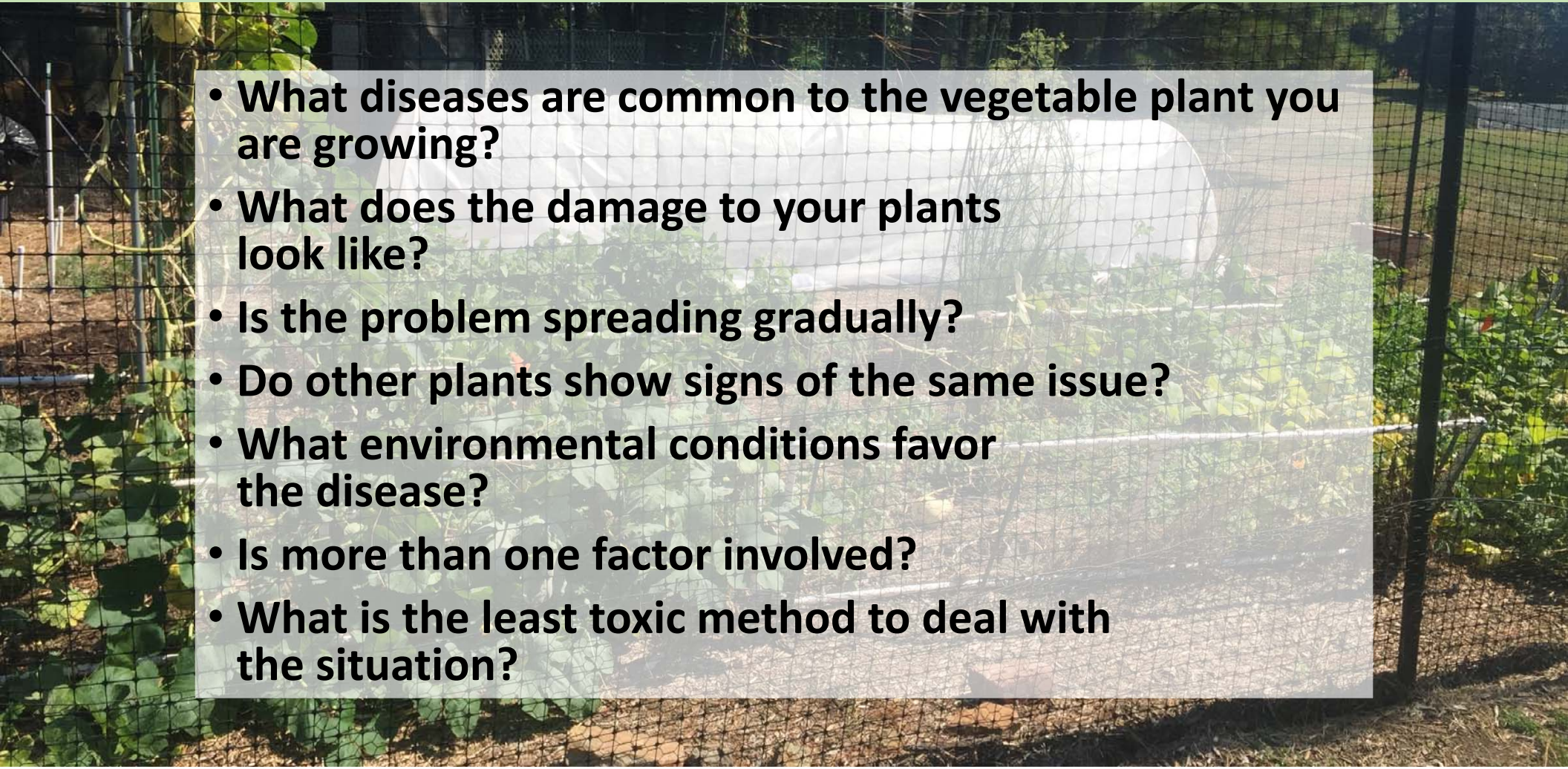
Grow the soil

Choose resistant or tolerant plant varieties

Good cultural practices

"An ounce of prevention is worth a pound of cure."

Questions to Ask:



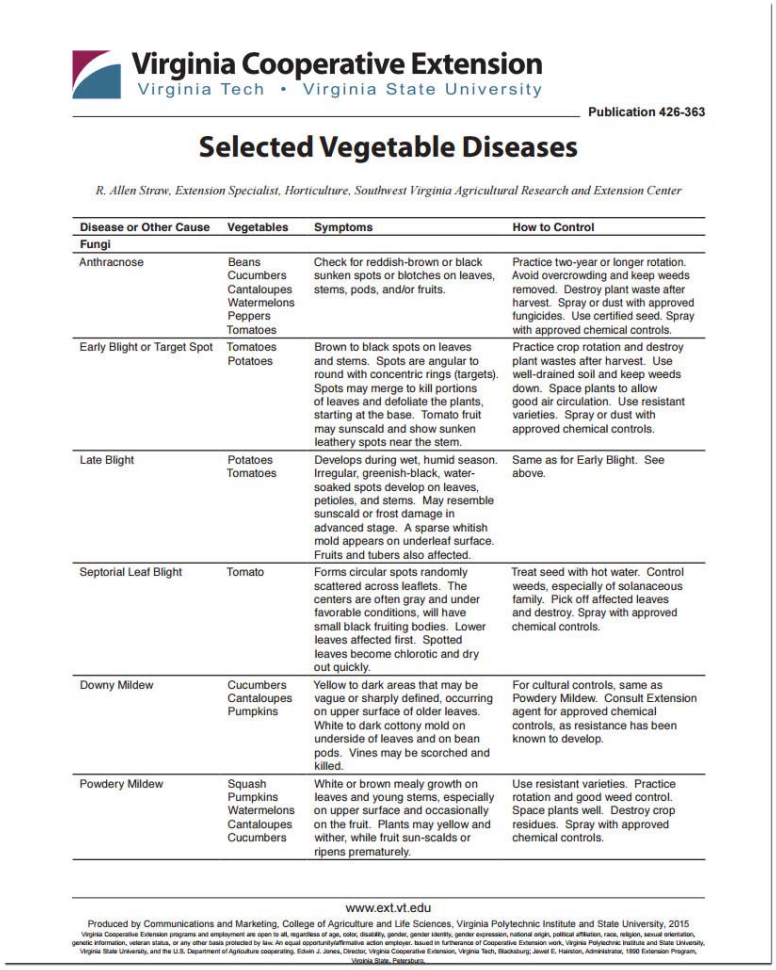
- What diseases are common to the vegetable plant you are growing?
- What does the damage to your plants look like?
- Is the problem spreading gradually?
- Do other plants show signs of the same issue?
- What environmental conditions favor the disease?
- Is more than one factor involved?
- What is the least toxic method to deal with the situation?

Early Blight

Checklist approach:

- ❑Close inspection of plant & surrounding area
  - Look for more than one factor
- ❑Take pictures
- ❑Research online:
  - Google “Common diseases on ____ plant:.edu”
- ❑Make a match
- ❑Learn & Compare:
  - Environmental conditions disease favors
  - How it spreads
  - Least toxic method to handle situation
- ❑Take action, remain vigilant & observant

Resource That Can Help



Virginia Cooperative Extension
Virginia Tech • Virginia State University

Publication 426-363

Selected Vegetable Diseases

R. Allen Straw, Extension Specialist, Horticulture, Southwest Virginia Agricultural Research and Extension Center

Disease or Other Cause	Vegetables	Symptoms	How to Control
Fungi			
Anthracnose	Beans Cucumbers Cantaloupes Watermelons Peppers Tomatoes	Check for reddish-brown or black sunken spots or blotches on leaves, stems, pods, and/or fruits.	Practice two-year or longer rotation. Avoid overcrowding and keep weeds removed. Destroy plant waste after harvest. Spray or dust with approved fungicides. Use certified seed. Spray with approved chemical controls.
Early Blight or Target Spot	Tomatoes Potatoes	Brown to black spots on leaves and stems. Spots are angular to round with concentric rings (targets). Spots may merge to kill portions of leaves and defoliate the plants, starting at the base. Tomato fruit may sunscald and show sunken leathery spots near the stem.	Practice crop rotation and destroy plant wastes after harvest. Use well-drained soil and keep weeds down. Space plants to allow good air circulation. Use resistant varieties. Spray or dust with approved chemical controls.
Late Blight	Potatoes Tomatoes	Develops during wet, humid season. Irregular, greenish-black, water-soaked spots develop on leaves, petioles, and stems. May resemble sunscald or frost damage in advanced stage. A sparse whitish mold appears on underleaf surface. Fruits and tubers also affected.	Same as for Early Blight. See above.
Septorial Leaf Blight	Tomato	Forms circular spots randomly scattered across leaflets. The centers are often gray and under favorable conditions, will have small black fruiting bodies. Lower leaves affected first. Spotted leaves become chlorotic and dry out quickly.	Treat seed with hot water. Control weeds, especially of solanaceous family. Pick off affected leaves and destroy. Spray with approved chemical controls.
Downy Mildew	Cucumbers Cantaloupes Pumpkins	Yellow to dark areas that may be vague or sharply defined, occurring on upper surface of older leaves. White to dark cottony mold on underside of leaves and on bean pods. Vines may be scorched and killed.	For cultural controls, same as Powdery Mildew. Consult Extension agent for approved chemical controls, as resistance has been known to develop.
Powdery Mildew	Squash Pumpkins Watermelons Cantaloupes Cucumbers	White or brown mealy growth on leaves and young stems, especially on upper surface and occasionally on the fruit. Plants may yellow and wither, while fruit sun-scalds or ripens prematurely.	Use resistant varieties. Practice rotation and good weed control. Space plants well. Destroy crop residues. Spray with approved chemical controls.

www.ext.vt.edu

Produced by Communications and Marketing, College of Agriculture and Life Sciences, Virginia Polytechnic Institute and State University, 2015

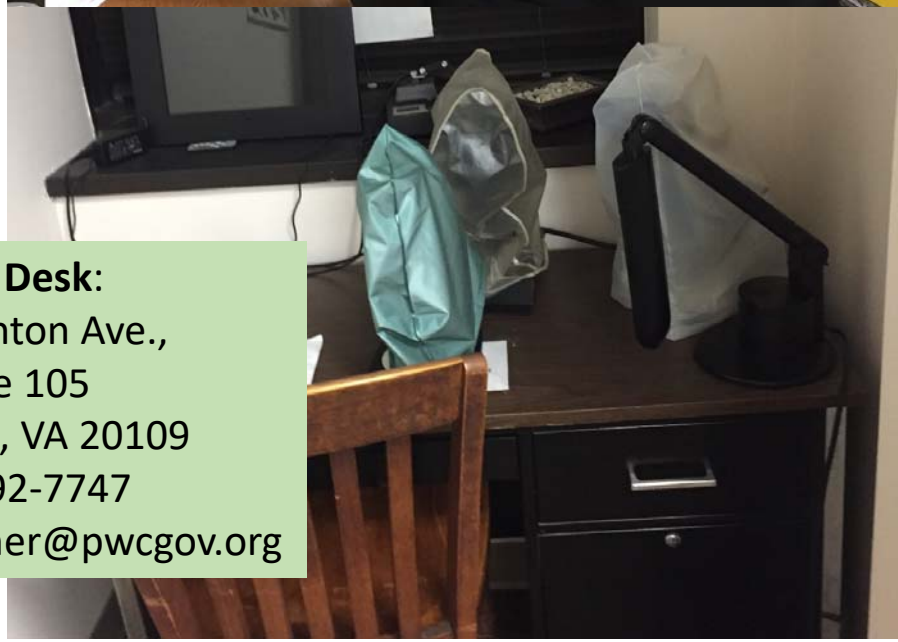
https://pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/426/426-363/426-363_pdf.pdf

Provide a Sample

How to collect and provide a sample:

- Call the office ahead of time
  (Monday and Tuesday's are the best days to bring in a sample, Hours 8 am – 5 pm)
- Obtain a fresh sample in the morning
  (Include disease area, but also the margin between healthy tissues and diseased tissue)
- Include as much of the plant as practical
- Place in a clean paper bag, left open, and bring to office ASAP
  (protect from crushing, freezing or heat)
- Label
  (Date of collection, variety, statement of problem, your name and contact information)

Providing your observations, background information on management practices, environmental conditions, and rate of disease development is a beneficial!



Help Desk:
8033 Ashton Ave.,
Suite 105
Manassas, VA 20109
703-792-7747
Master_gardener@pwcgov.org

Key Takeaways

An observant gardener is the best defense

- **Know the normal growth pattern of the plant**
- **Practice prevention**
- **Ask questions & document**
  - Living factors: start in one area, progress over time, random, one plant species
  - Non-living factors: appear suddenly, no progression, different plant species
- **Look for more than one cause**
- **Turn to resources that can help**

Wildlife in Your Garden

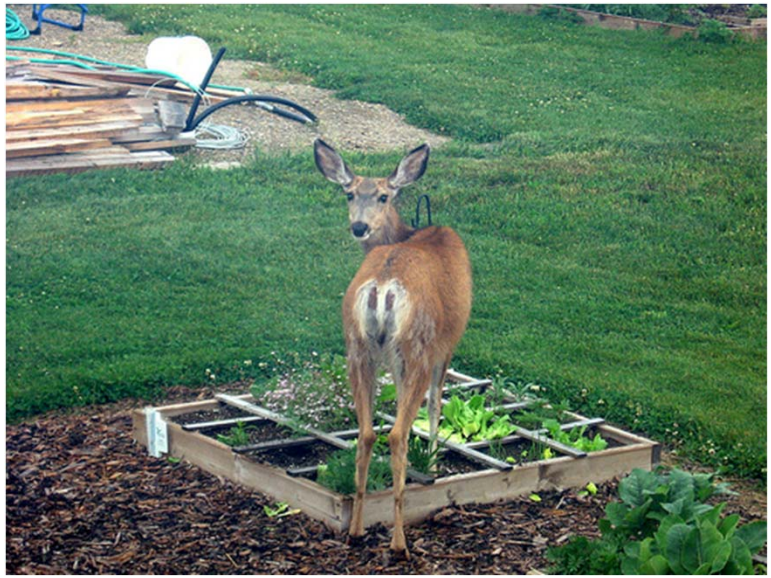
How to Control Unwanted Critters

IPM for Wildlife

- Identify species before you choose a control, look for signs
- Don’t treat wild animals as pets or entertainment
- Keep wild animals wild, don’t feed them around your home
- Make your property less hospitable to the offenders
- Use the least toxic or hazardous approach

The Worst Offenders

- Rabbits
- Deer
- Groundhogs
- Squirrels
- Voles



Controlling Wildlife

- Habitat Modification
  - Mow tall grass and remove brush piles
- Repellents
  - Combination provides most effective repellent solution
  - Most are sprayed on plants. Some sprays can’t be used on edible crops or vegetable gardens.
  - Read and follow all label restrictions.
- Exclusion
  - Fencing – deer fencing, chicken wire, mesh
  - Netting
  - Cages for gardens or plants

Nuisance Wildlife

- Under state law, nuisance species can be killed at anytime and in any manner that is legal under state and local laws

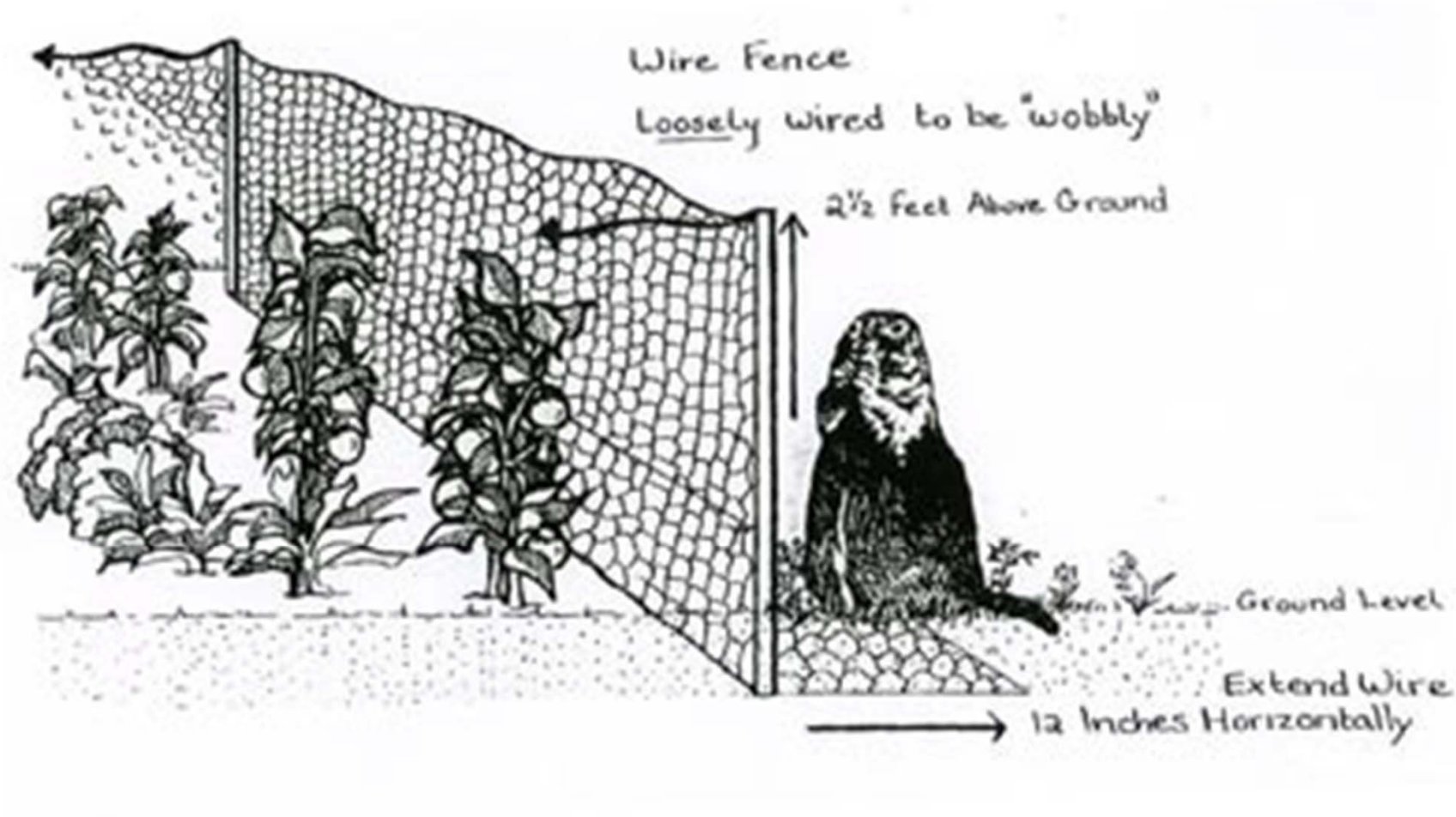
- It is NOT legal to trap live wildlife and move it to another location.

- Permit or hunting license is required to use lethal methods on ***other*** wildlife that becomes a nuisance.

Groundhogs

- Nuisance species…
- Favorite Hobbies
  - Digging many, many holes
  - Climbing ***sturdy*** fences
  - Eating Vegetables
  - Building a home under yours
- How to prevent damage?
  - Human activity is a deterrent
  - Groundhog fence

Groundhog Fence



Floppy Top to Deter Climbers

Groundhog Hotel

Examples of Exclusion

Sweet Potato Protection

See MGPW video link for more info on this design

Voles

Runways

A few words about snakes (Reptiles)

Garter Snake

Black Rat Snake

Eastern Copperhead (venomous snake)

Eastern Copperhead

Facts about Snakes in Virginia

- Snakes are generally shy
- They are beneficial because they eat mice, slugs, grubs, and insects.
- Given an opportunity they will go after baby birds or eggs
- They are food for other wildlife such as hawks
- Most species are harmless, however there are few venomous species that can be harmful to people and pets
- It is illegal to kill snakes in Virginia

- Virginia Wildlife information
  http://www.dgif.virginia.gov/wildlife/
- Nuisance Wildlife Control Operators—Virginia
  www.dgif.virginia.gov/wildlife/nuisance/trappers
- Wildlife Rehabilitators (injured)
  www.dgif.virginia.gov/wildlife/injured/rehabilitators
- State Endangered Species issues
  www.dgif.state.va.us.wildlife

Additional Resources

- Center for Human-Wildlife Conflict Resolution (VT-DGIF-FWS)
  https://www.hmanwildlife.cmi.vt.edu
- Prevention and Control of Wildlife Damage Online handbook details ID, control and management of over 90 species of wildlife
  http://www.icwdm.org/handbook/index.asp
- Federal Endangered Species issues
  www.fws.gov/endangered
- Animal tracks and profiles www.enature.com

Vegetable Spotlights

- Next slides highlight “most commonly” grown plants
- Amended soil
- Typically full sun
- Water source and water dependent on plant requirements
- Wind protection
- Newer gardeners consider buying plants rather than starting seeds indoors
  - (See planting calendar)
  - Mulch to control weeds and disease, soil temp, water retention

Tomatoes

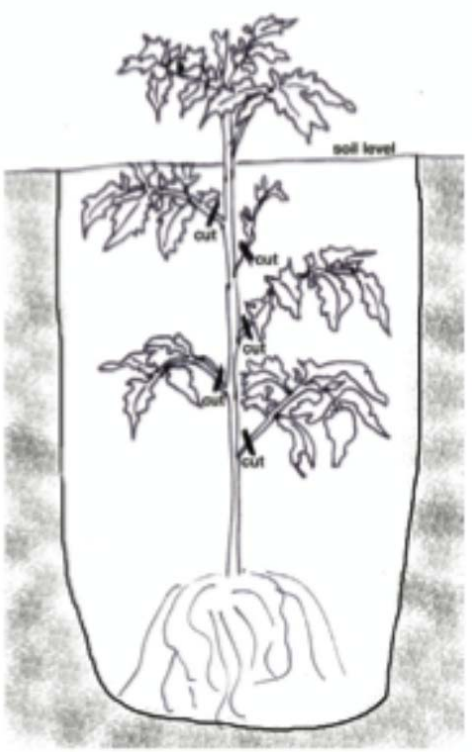
- Family – Solanaceous
- Warm season crop (generally around Mothers' day)
- Planting Methods:
  - Indoor
    - Start 6-8 weeks before planting date
    - Harden off
    - Transplant outside
  - Outdoor
    - Plant in full sun (8+ hours)
    - Plant deeply to encourage strong roots
    - Trim off bottom leaves
    - Mulch to control weeds and disease, soil temp, water retention
    - Plant near a convenient water source and water regularly
      - Keep them at the limit of water/drought stress to enhance flavor

Space 18-36 inches by 36 inches if staked or caged

Can be grown in containers

Tomatoes

- Growth Habits
  - Vine vs. bush
  - Cage
  - Determinate vs. Indeterminate
  - Heirlooms vs. hybrids
  - Choose the variety best suited to your area
- Common Pests
  - Hornworm
  - Stink bugs
  - Japanese beetles
- Harvesting
  - First ready in approximately 60 days, variety dependent, up to 105 days
  - Continue picking until frost
  - Harvest mature green tomatoes fall before killing frost is expected
- Companions
  - Onions, asparagus, carrot, cucumber, marigolds, basil, parsley, garlic



Peppers

- Family – Solanaceous
- Warm season crop
- Planting Methods:
  - Indoor
    - Start 6-8 weeks before planting date
    - Harden off
    - Transplant outside
  - Outdoor
    - Plant in full sun
    - Space 18-24 inches apart in rows 30-26 inches apart
    - Mulch to control weeds, soil temp, water retention
    - Water regularly
    - Can be grown in containers
- Growth Habits
  - Typically grow upright – use cages
  - Hot and banana are better performers in our area than sweet peppers

Peppers

- Common Pests
  - Colorado potato beetles
  - Flea beetles
  - Leaf hoppers
  - Note: these are more common to other plants
- Harvesting
  - 100-120 days from seed
    - Peppers start green and turn color
  - 70-85 days from transplants
  - Harvest sweet peppers when they reach desired size
- Companions
  - Asparagus, basil, garlic, marigolds, parsley

Cucumbers

- Family – Cucurbit
- Warm season crop
- Planting Methods:
  - Indoor
    - Start 3-4 weeks before planting date
    - Harden off
    - Transplant outside
  - Outdoor
    - Plant in full sun
    - Heavy feeders
      - Need well amended soil and significant watering
    - Space 12-18 inches by 48-72 inches in rows, 24-36 inches by 48-72 inches in hills; closer if trellised
- Growth Habits
  - Generally vines, but some bush
  - Ideally trellised

Cucumbers

- Common Pests
  - Cucumber beetles
  - Aphids
- Harvesting
  - 50-70 days
  - After at least 2 inches in length
    - Know mature length for variety
  - Before turning yellow
  - Yellow varieties pick before fruit turns gold
- Companions
  - Beans, cabbage family, corn, peas, radishes, sunflowers, nasturtiums, marigolds

Sweet Potatoes

- Family - Convolvulaceae
- Warm Season Crop
- Planting Methods
  - Indoor
    - Plants can be started from tuber
    - 4 weeks before planting date
    - Harden off
  - Outdoor
    - Plant slips in full sun 8+ hours/day
    - Slightly acidic soil (6.0-6.5 ph)
    - Prefers loamy or sandy soil
    - Space 3 feet apart

Sweet Potatoes

- Growth Habits
  - Tubers grow below soil level
  - Leaves spread profusely above ground
- Common Pests
  - Wireworm and root-knot nematodes
- Harvesting
  - About 90-120 days after planting
  - Tops begin to die back as it gets close to harvest time
  - Should be harvested before the first frost
  - Air dry then move to storage
- Companions
  - Okra, peppers, sunflowers

Lettuce

- Family – Composite
- Cool season crop
- Planting Methods:
  - Lettuce seeds should be chilled in refrigerator for two weeks before planting
  - Indoor
    - Start 3 weeks before planting date
    - Harden off
    - Transplant outside
  - Outdoor
    - Sow seeds in early spring as soon as soil can be worked and in late summer
    - Plant in sun in cooler weather; shade in hot weather
      - Does not enjoy “full sun”
    - Space leaf lettuce 2-4 inches in rows 12-18 inches apart
    - Space Romaine or Butterhead: 4-10 inches in rows at least 12 inches apart; Crisphead:12-15 inches apart in rows at least 18 inches apart
    - Can be grown in containers

Lettuce

- Growth Habits
  - Head or leaf lettuce available
    - Leaf lettuce is easier to grow
  - Cut and come again
  - Bolts
- Common Pests
  - Slugs
  - Aphids

Lettuce

- Harvesting
  - 40-80 days
  - As soon as plants are 5-6 inches tall
  - Harvest every other “head” of the largest plants to thin
- Companions
  - Carrots, cucumbers, onions, radishes, strawberries, garlic, chives

Crucifer Family

- Includes: Brussel sprouts, radish, broccoli, cabbage, kale, rutabagas, bok choy, turnips
- Cool season crops
- Planting Methods:
  - Indoor
    - Start 4-6 weeks before planting date
    - Harden off
    - Transplant outside
  - Outdoor
    - Best grown under row covers for insect protection
    - Most can be grown in both spring and fall
      - Brussel sprouts and turnips better suited to fall
    - Spacing varies among this group
    - Some can be grown in containers
- Growth Habits
  - Varies

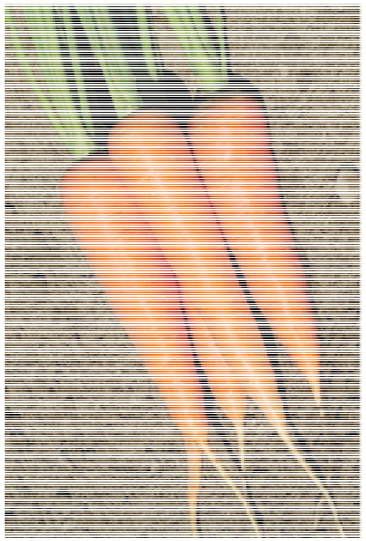
Crucifer Family

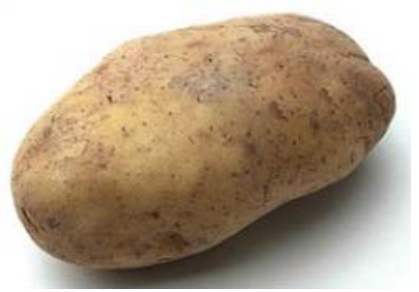
- Common Pests
  - Harlequin bugs
  - Cabbage worms
  - Cutworms
- Harvesting
  - Leaves can be harvested separately prior to fruit
    - Radishes, turnips, broccoli
- Companions
  - Beets, celery, corn, dill, nasturtiums, onions, sage, sunflowers

Vegetable Visuals and Food Safety

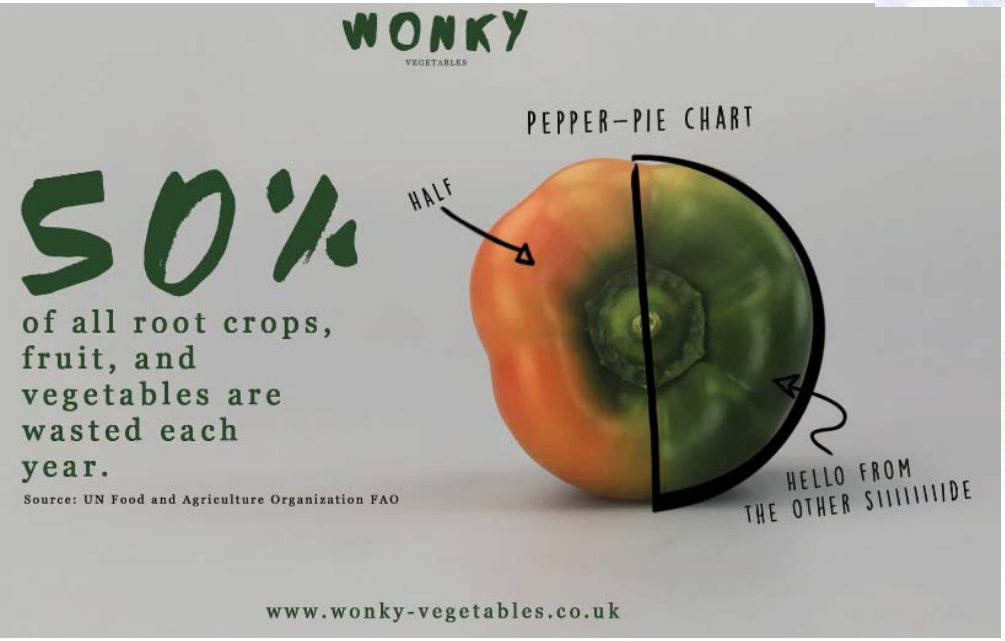
Grocery Store Veg is Not Home Grown Veg

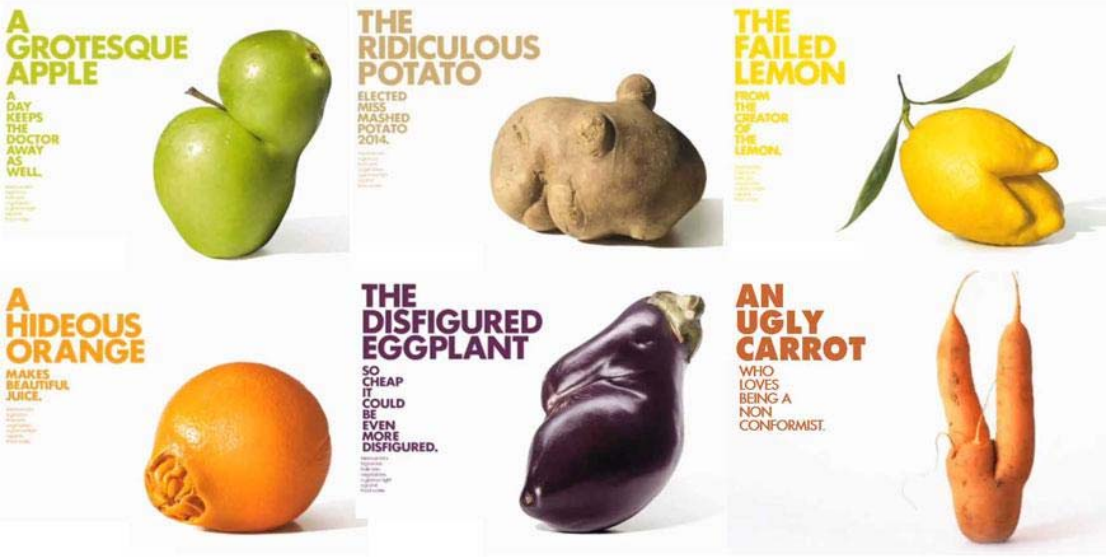
- Can be picked before ripe
- Can be bred for ease of harvest, uniformity, harvest time, color, disease resistance, storage life, etc. [Usually at the expense of taste]
- Sorted by size, color and quality
- Less than perfect specimens are discarded or used in processed products





Veg Isn't Always Pretty





Can You Still Eat These? Yes







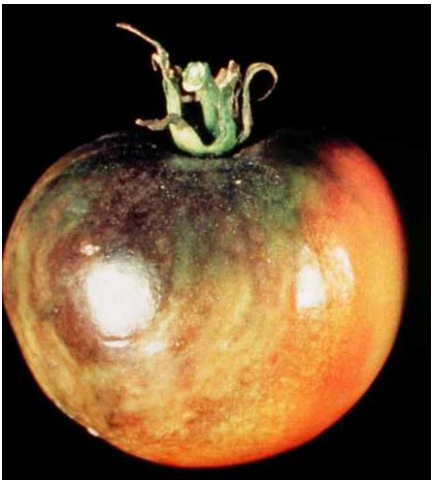

Can You Still Eat These? Maybe








Can You Still Eat These? Maybe








Safe Handling of Fresh Produce

- Microorganisms are difficult to completely wash off produce
  - Keep pets/wildlife out of the garden
  - Minimize the risk of contamination by using clean equipment
  - Be careful to avoid damaging produce
  - Keep out of direct sunlight
  - Get produce to their storage temperature as soon as possible
  - Discard produce that has not been refrigerated within 4 hours of being cut, peeled or cooked

- If using damaged produce, cut out damage
  - Cut at least 1 inch away from damaged area
  - Clean knife after each cut

Cleaning Fresh Produce

- Wait until you are going to use or process before rinsing
  - Excessive moisture during storage can increase microbial growth
- Use a clean brush to scrub the exterior of produce with hard/firm rinds
  - If there are pathogens on the exterior of a vegetable, your knife will pick that up when you cut into it
- Rinse with clean running water
  - Don't soak in water as it can cause cross contamination
  - Pat dry with paper towels
- Don't use soaps or other chemicals to wash produce
  - Produce can absorb these and give off flavors and smells
- CSU Extension's *Washing Fresh Produce* Videos
  - http://farmtotable.colostate.edu/videos.php

Short Term Storage of Fresh Produce

Table Source:
pubs.ext.vt.edu/FST/FST-234/FST-234.html

Many fruits and vegetables that can be held at room temperature while whole, should be refrigerated once cut.

Table 1. Recommended storage temperature and shelf life of common produce items. The storage times listed in this chart are helpful guidelines, not set rules.

Storage location	Fruits	Shelf life	Vegetables, herbs, spices	Shelf life	Vegetables, herbs, spices	Shelf life
Store in refrigerator (set at 41 F or lower)	Apples	>7 days	Artichokes	1-2 weeks	Green onions	1-2 weeks
	Apricots	2-3 days	Asparagus	3-4 days	Herbs	1 week
	Blackberries	1-2 days	Beets	7-10 days	Leeks	1-2 weeks
	Blueberries	1-2 days	Broccoli	3-5 days	Lettuce	1 week
	Cherries	1-2 days	Cabbage	1-2 weeks	Lima beans	3-5 days
	Citrus fruits	1-2 weeks	Carrots	3 weeks	Mushrooms	2 days
	Cut fruits	2-4 days	Cauliflower	3-5 days	Peas	3-5 days
	Grapes	3-4 days	Celery	1-2 weeks	Peppers	4-5 days
	Mango	1 week	Cucumbers	4-5 days	Radishes	10-14 days
	Raspberries	1-2 days	Eggplant	3-4 days	Spinach	3-7 days
	Strawberries	1-2 days	Ginger	1-2 weeks	Summer squash	4-5 days
			Green beans	1 week	Sweet corn	1-2 days
Ripen, then store in refrigerator	Avocados	3-5 days				
	Kiwifruit	3-4 days				
	Nectarines	3-4 days				
	Peaches	3-4 days				
	Pears	3-4 days				
	Plums	3-4 days				
Store out of direct sunlight and at room temperature	Apples	<7 days	Basil	1 week	Sweet potatoes	2-3 weeks
	Bananas	Until ripe	Dry onions*	2-4 weeks	Winter squash	1 week
	Citrus fruit	10 days	Garlic*	1 month		
	Mangoes	3-5 days	Potatoes	1-2 months		
	Melons	1-2 days	Pumpkins	2-3 months		
	Pineapple	5-7 days	Tomatoes	Until ripe		

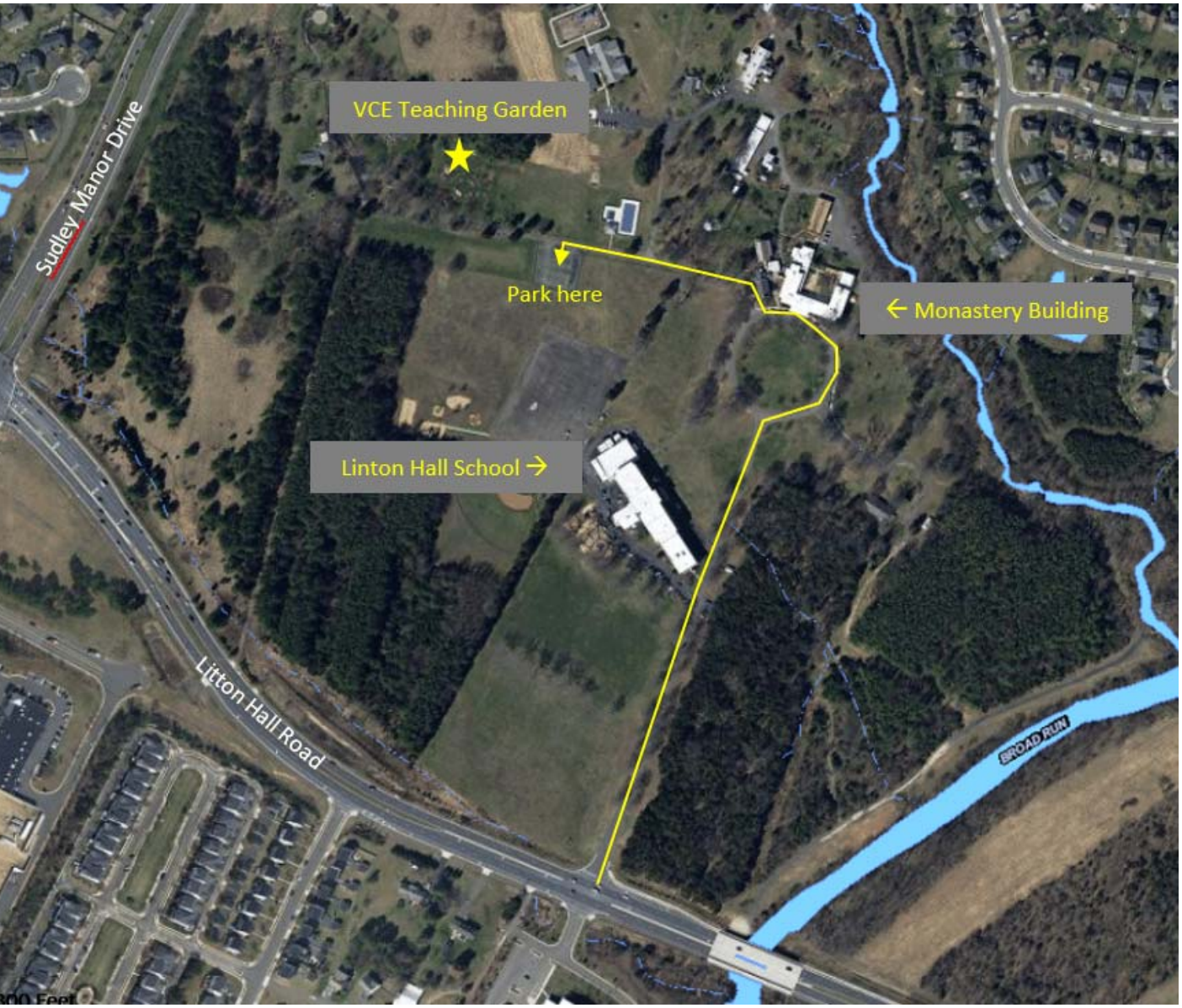
Sources: Kader et al. (2012); McCurdy, Peutz, and Wittman (2009).
*Potatoes, onions, and garlic should be stored in a cool, well-ventilated location, such as a pantry.

Long Term Food Storage

- **Use Modern Recipes From Reputable Sources**
  - Extension web sites
  - Current Ball and Kerr publications
  - National Center for Food Preservation (nchfp.uga.edu)

- Some helpful resources
  - USDA Complete Guide to Home Canning, 2015 revision
    nchfp.uga.edu/publications/publications_usda.html
  - Can It Safely
    pubs.ext.vt.edu/FST/FST-114/FST-114.html
  - Pressure Canning
    pubs.ext.vt.edu/348/348-585/348-585.html
  - Boiling Water Bath Canning
    pubs.ext.vt.edu/348/348-594/348-594.html

  Freezing Fruits and Vegetables
    pubs.ext.vt.edu/348/348-596/348-596.html



VCE Teaching Garden
9535 Linton Hall Road
Bristow, VA 20136

<u>2019 Saturday in the Garden</u>
<u>9am-noon</u>
13 April
11 May
8 June
13 July
10 August
7 September
5 October

<u>Garden Workdays</u>
Tuesdays 9am-noon
starting in April

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