Integrated Pest Management (IPM) 2016

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Master Gardener Program

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Pesticide Use Statistics

- USA: 74-90% of households utilize pesticides on an annual basis (Whitmore et al. 1994; Landrigran et al. 1999, Fishel 2007)
- Oregon: 46% of households used pesticides in 2007 (PURS 2008)
- Portland Metro: 29% of households used lawn and garden pesticides, and 17% used indoor pesticides (Peters et al. 2007)

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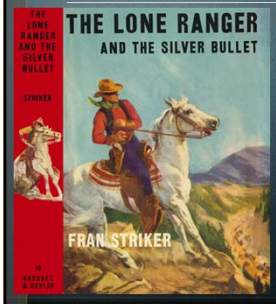
The Problem With Pesticides



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Goals of Today's Class

- You will understand the importance of sound information, when making pest management decisions
  - Monitoring
  - Life stage of pest and plant
- Don't act without information!
- You'll consider your tolerance for pests.

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Class Outline

- Monitoring: catch problems early!
- Identification: know your opponent.
- Action Thresholds: should you even care?
- Management Strategies: using the right tool(s) for the job

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Monitor Your Garden: Why?

- Catch problems in their early stages
- Apply controls at the optimal time

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Monitor Your Garden: Resources

- OSU Extension Garden Calendar
  - http://extension.oregonstate.edu/gardening/calendar
- Plant Clinic Monthly highlights
  - http://plant-clinic.bpp.oregonstate.edu/year

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Monitoring

- Look for pests and/or their damage
  - Collect samples, for your records or for identification
- Look for beneficial organisms that naturally control key pests
- Keep a garden journal

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Monitoring Techniques

- Visual estimates
  - Pest numbers and / or Pest damage
- Color Traps
  - Sticky cards or water bowls
- "Shelter", "Food", "Mate" Traps
  - Beer traps
  - Board Traps
  - Pheromone Traps

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Black Vine Weevil Damage

Lacebug Damage

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Thrips on Yellow Sticky Card

Place near plant(s) to be monitored.

Best for small, flying insects and arthropods (e.g. aphids, thrips, whiteflies), as well as spider mites

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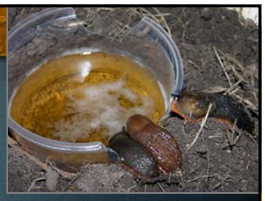
Snails on Board Trap



Slug at Beer Trap

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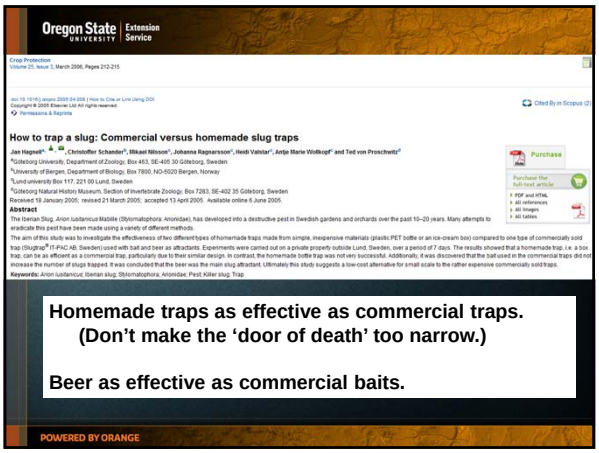
Oregon State University Extension Service
How to trap a slug: Commercial versus homemade slug traps
Homemade traps as effective as commercial traps.
(Don't make the 'door of death' too narrow.)
Beer as effective as commercial baits.
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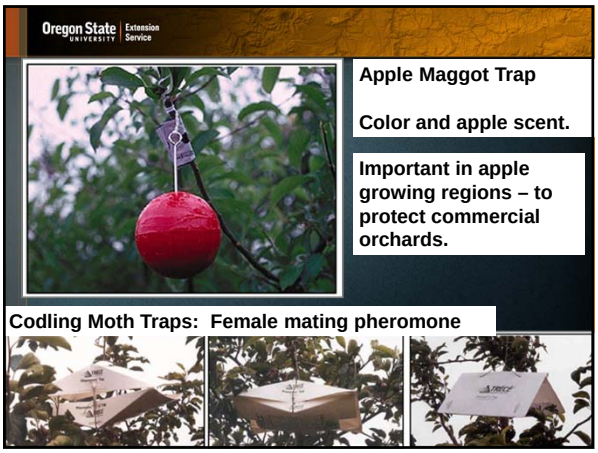
Oregon State University Extension Service
Apple Maggot Trap
Color and apple scent.
Important in apple growing regions – to protect commercial orchards.
Codling Moth Traps: Female mating pheromone


Oregon State University Extension Service
Monitor Your Garden
If you catch moths in your traps, and
If apples/pears are in petal fall –
Spray for codling moth.
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Oregon State University Extension Service
Monitor Your Garden
If you catch flies in your trap, and
If fruit is in the ripe to overripe stage –
Spray for Spotted Wing Drosophila
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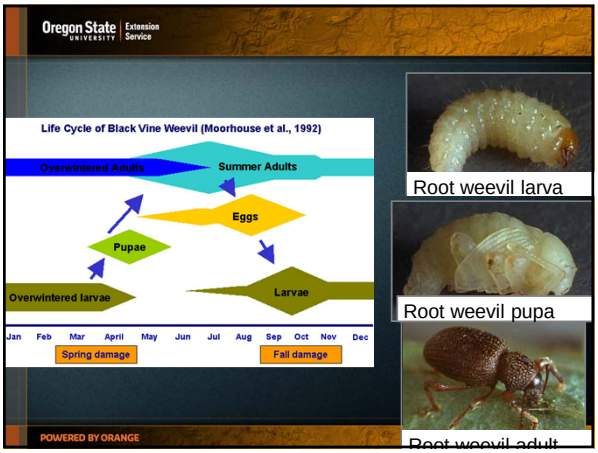
Oregon State University Extension Service
Root weevil larva
Root weevil pupa
Root weevil adult
Black Vine Weevil Damage


Oregon State University Extension Service
Life Cycle of Black Vine Weevil (Moorhouse et al., 1992)
Overwintered Adults
Summer Adults
Eggs
Pupae
Overwintered larvae
Larvae
Jan Feb Mar April May Jun Jul Aug Sep Oct Nov Dec
Spring damage
Fall damage
Root weevil larva
Root weevil pupa
Root weevil adult
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Class Outline

- Monitoring: catch problems early!
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Identification

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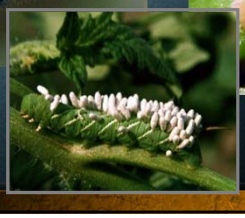
Identification



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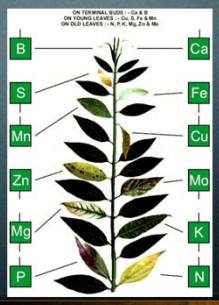
Identification



- Insects & pathogens are often blamed as the cause of plant problems, especially when there is a nutrient deficiency

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Identification: Nutrient Deficiencies

- PNW Plant Disease Handbook
  - Key to nutrient deficiencies in vegetable crops
  - http://pnwhandbooks.org/plantdisease/pathogen-articles/nonpathogenic-phenomena/key-nutrient-deficiencies-vegetable-crops

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Identification

- PNW Plant Disease Handbook
  - Key to nutrient deficiencies in deciduous fruit and nuts
  - http://pnwhandbooks.org/plantdisease/pathogen-articles/nonpathogenic-phenomena/key-nutrient-deficiencies-deciduous-fruit-and-nuts

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Identification

- Use your local Master Gardeners for advice and identification services

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Identification

- PNW Disease Handbook
  - http://pnwhandbooks.org/plantdisease/
- OSU Plant Clinic
  - http://plant-clinic.bpp.oregonstate.edu/

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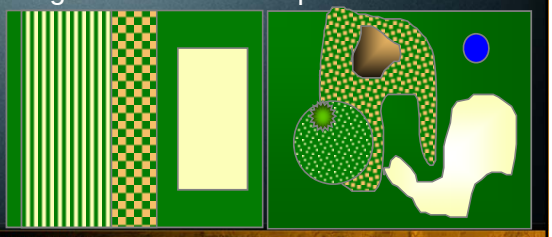
Identification

- Look for patterns of damage in the garden and on the plant.



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Abiotic Plant Problems

- More regular distribution, on plant or within garden.

Nitrogen Deficiency

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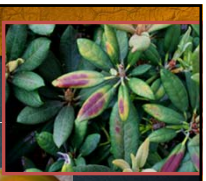
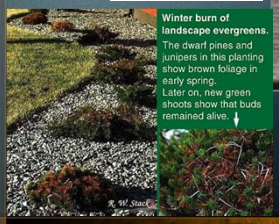
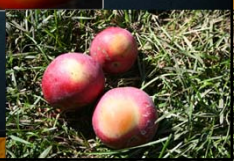
Abiotic Plant Problems

Sun Scald & Winter Burn







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Biotic (Living) Plant Pests

- Vertebrates
- Insects and Mites
- Nematodes
- Fungi
- Bacteria
- Viruses

Pesticides can be used to manage pests – but NOT abiotic damage.

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Powdery Mildew (Biotic)

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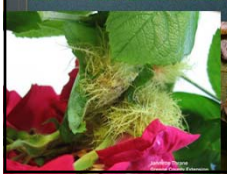
Galls (Biotic)



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Spider Mite Damage (Biotic)

Damage is irregular (expands as infestation grows). Should be able to find 'signs' of the mites (e.g. mites, skins, webbing).

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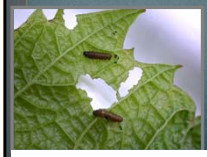
Chewing Insect Damage (Biotic)



Flea Beetle Larvae

Cabbage worm damage

Earwig damage

Chewing mouthparts = beetles, caterpillars, slugs, earwigs, wasps

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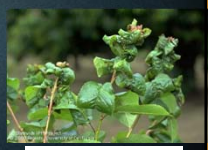
Sucking Insect Damage (Biotic)

Thrips Damage

Spider Mite Damage



Aphid Damage

Sucking mouthparts = bugs, thrips, spider mites.
Suck phloem = wilting, honeydew.
Suck mesophyll = white spots on plant.

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Plant Problem Diagnosis

http://www.entsoc.org/buzz/csi-garden-pests-how-identify-insect-pests-your-vegetable-garden

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Plant Problem Diagnosis

- Practice makes perfect
- Look for patterns
- Observe where damage occurs
- Examine plant for signs of pests
- Determine a likely cause of damage

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Class Outline

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Action Threshholds

Wolf Spider (Lycosidae)

Jumping Spider (Salticidae)

http://www.youtube.com/watch?v=A6Pu-4qzMkk

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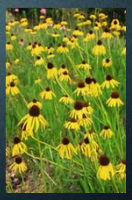
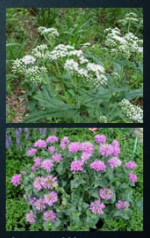
Manage Using All Available Strategies

Cultural
Physical
Biological
Chemical

Least Toxic

Most Toxic





Use a least hazardous approach – but one that will WORK

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Cultural Controls

- HEALTHY, VIGOROUS PLANTS!
- SELECT: quality nursery stock; plants with pest resistance
- INSTALL: in wide, shallow holes; loose backfill
- MAINTAIN: water for deep root spread; don't over fertilize; water soil and not leaves; prune for air management; remove diseased plants or plant parts

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Sea Foam Rose

Angel Face Rose

Root Weevils

R. davidsonianum

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Black Spot on Roses: Carefree Spirit

Leaf Curl on Azalea: Coral Bells


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Liberty Apples
Apple Scab
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Plant Selection at the Nursery. Avoid pot-bound plants (unless they're a bargain!).
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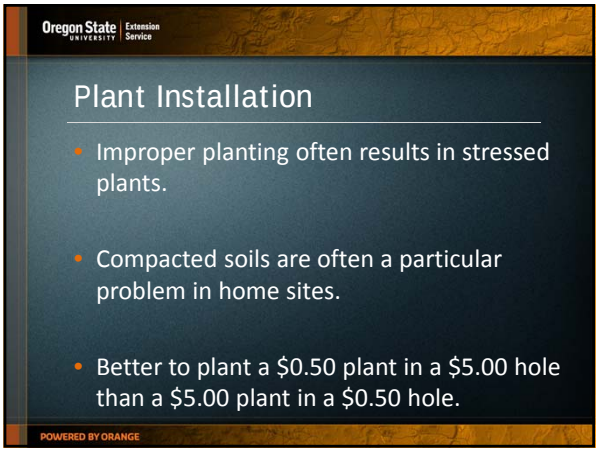
Oregon State University Extension Service
Plant Installation
Improper planting often results in stressed plants.
Compacted soils are often a particular problem in home sites.
Better to plant a $0.50 plant in a $5.00 hole than a $5.00 plant in a $0.50 hole.
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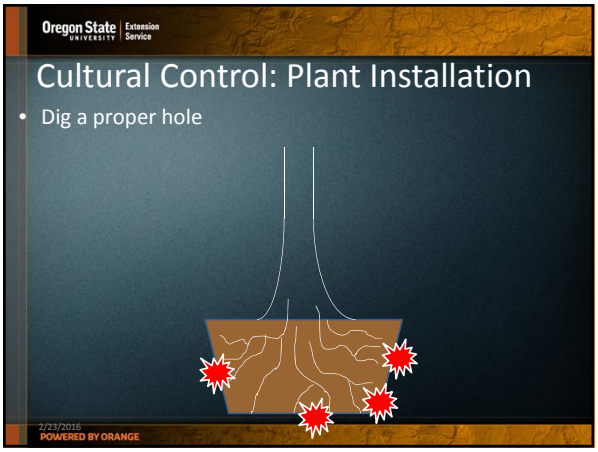
Oregon State University Extension Service
Cultural Control: Plant Installation
Dig a proper hole
2/23/2016
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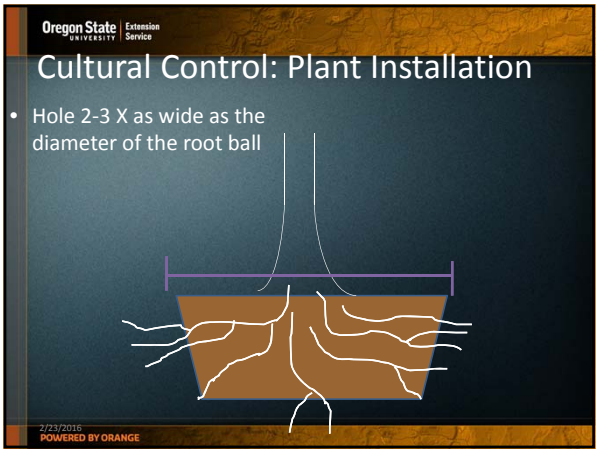
Oregon State University Extension Service
Cultural Control: Plant Installation
Hole 2-3 X as wide as the diameter of the root ball
2/23/2016
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Cultural Control: Plant Installation
Top 10% above ground
2/23/2016
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Garden Sanitation

- Reducing breeding sites and shelter for pests.

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Sanitation - Insects

- Remove vegetation that can serve as overwintering sites for insect pests
  - Aphids in weedy areas
  - Cutworms in garden debris
  - Codling moth in infested apples on the ground

2/23/2016
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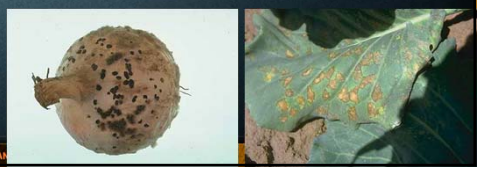
Sanitation - Disease

- Downy Mildew on Cabbage and Cauliflower – manage weeds (wild mustards) that may harbor fungus
- Botrytis Leaf Blight – manage wild onions and garlic that may harbor fungus
- Manage irrigation to reduce periods of high humidity
- Many spring-planted and summer-harvested vegetable crops have fewer disease issues than fall-harvested vegetables



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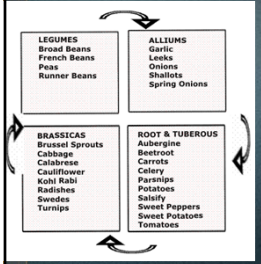
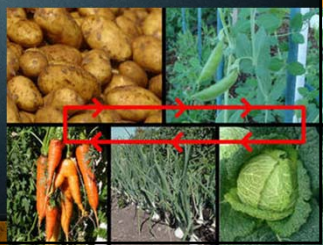
Sanitation – Crop Rotation



Rotating your crops reduces the chance that pests (insects and disease) will build up in your garden, over time.



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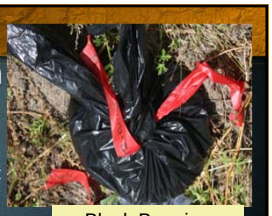
Burying

Clean Up

Infested SWD fruit

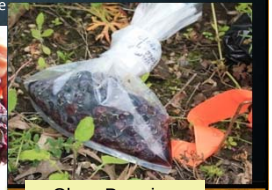
*Remove breeding site



Black Bagging

Solarization

Crushing



Clear Bagging

Plant Maintenance

- Water for deep, spread roots.
- Use mulches and groundcovers to reduce weed problems.
- Apply fertilizers at recommended rates.

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Manage Using All Available Strategies

Cultural
Physical
Biological
Chemical

Least Toxic
↓
Most Toxic

Use a least hazardous approach – but one that will WORK

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Physical Controls

- PREVENT INFESTATIONS
- Row covers: squash beetles; flea beetles; leaf miners
- Handpicking: aphids; caterpillars
- Water sprays (not as effective)

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Physical Controls

- Protect seedlings, or other vulnerable stages of plant

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Physical Controls: SWD

- Cover fruit to prevent adult infestations

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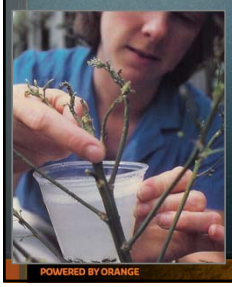
Handpicking



Place insects in soapy water to kill them

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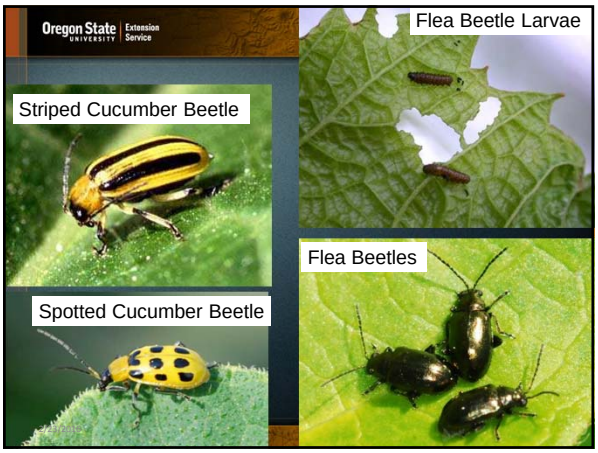
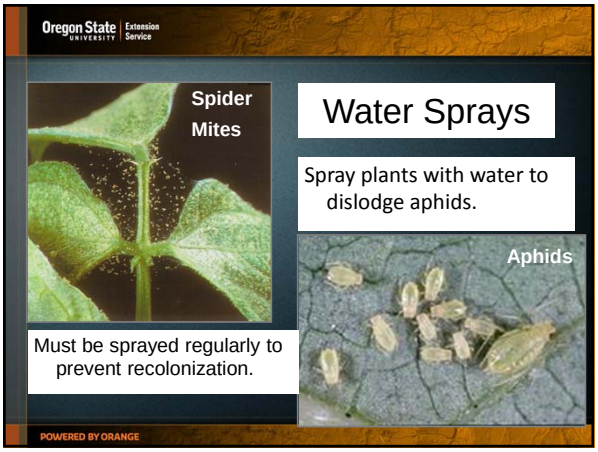
Oregon State University Extension Service
©Peter G. May


Oregon State University Extension Service
Flea Beetle Larvae
Striped Cucumber Beetle
Flea Beetles
Spotted Cucumber Beetle


Oregon State University Extension Service
Copper Barriers for Mollusks
Reschka, Wolfgang Christoph (2009) The effect of copper barriers on pulmonate land snails. Diplomarbeit, Universität Wien. Fakultät für Lebenswissenschaften
BetreuerIn: Spitzer, Gerhard.
it takes the snails 23 times longer to overcome the copper barrier than it takes them without a barrier.


Oregon State University Extension Service
Spider Mites
Water Sprays
Spray plants with water to dislodge aphids.
Aphids
Must be sprayed regularly to prevent recolonization.
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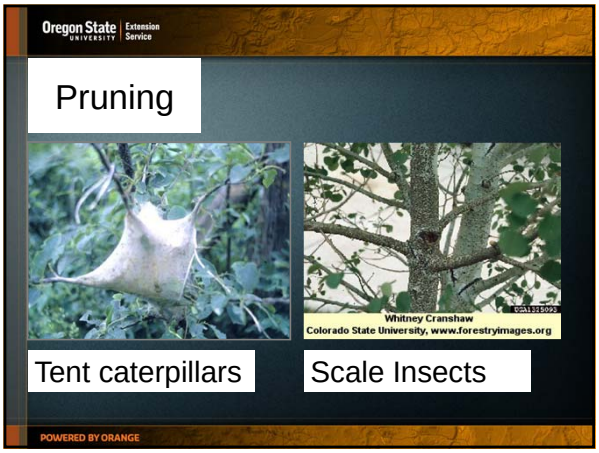
Oregon State University Extension Service
Pruning
Whitney Cranshaw
Colorado State University, www.forestryimages.org
Tent caterpillars
Scale Insects
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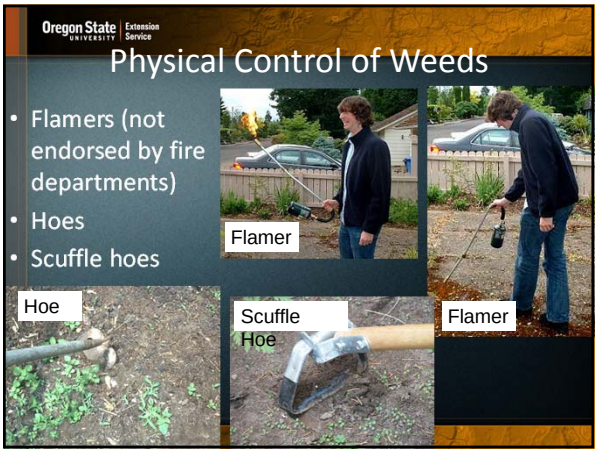
Oregon State University Extension Service
Physical Control of Weeds
Flamers (not endorsed by fire departments)
Hoes
Scuffle hoes
Flamer
Flamer
Hoe
Scuffle Hoe

Manage Using All Available Strategies

Cultural
Physical
Biological
Chemical

Least Toxic

Most Toxic

Use a least hazardous approach – but one that will WORK

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Biological Control

- Use of living organisms –parasites, predators, or pathogens—to manage pests

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Syrphid Fly

Lacewing

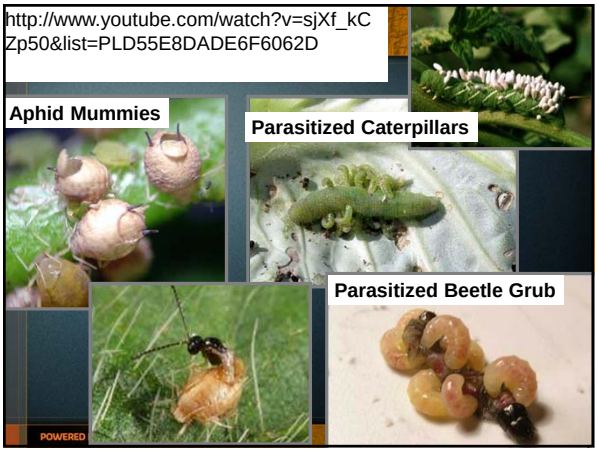
Ladybug

http://www.youtube.com/watch?v=sjXf_kCZp50&list=PLD55E8DADE6F6062D

Aphid Mummies

Parasitized Caterpillars

Parasitized Beetle Grub



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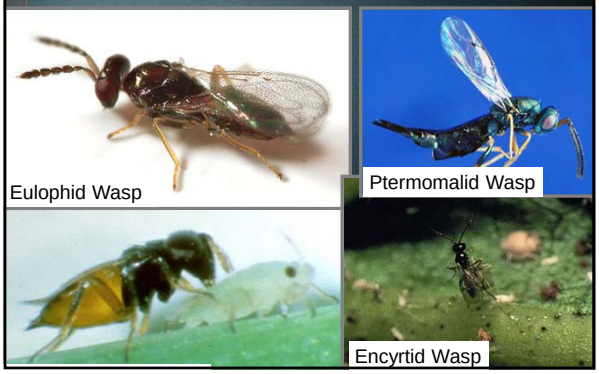
Eulophid Wasp

Ptermomalid Wasp

Encyrtid Wasp



Conservation Biological Control

- Complex landscapes suppress azalea lace bug infestations (Shrewsbury and Raupp 2006)
- More web-building sites for spiders

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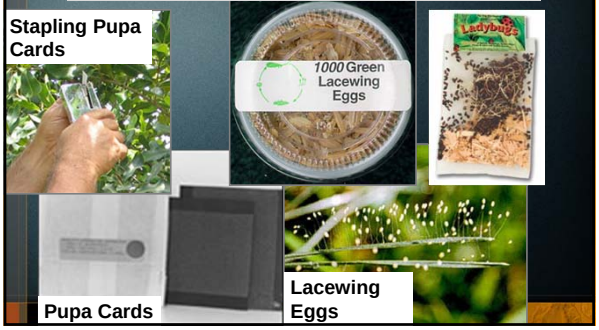
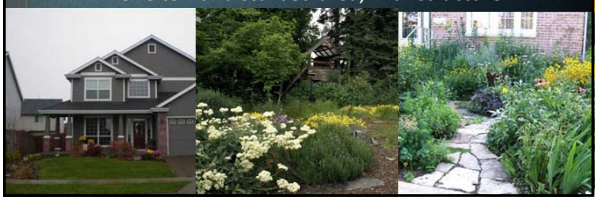
What About Buy and Release?

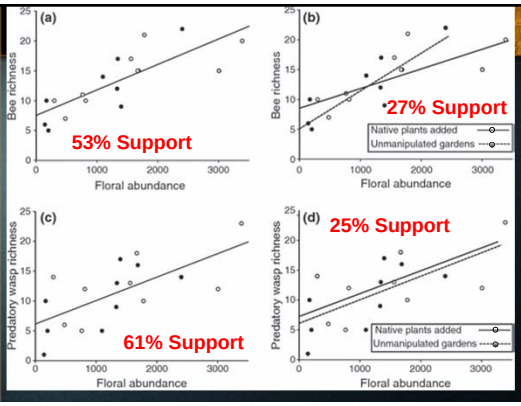


Conservation Biological Control Strategie

- Provide Basic Needs
  - Food: nectar and pollen, when prey disappears
  - Water: no need to provision
  - Shelter: undisturbed area, with structure



Matteson and Langellotto. 2010. Small scale additions of native plants fail to increase beneficial insect richness in urban gardens. Insect Conservation and Diversity. 4: 89-98.



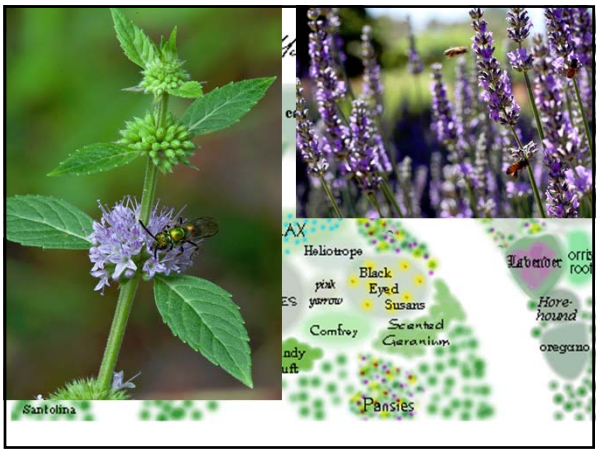
Matteson and Langellotto. 2010. Small scale additions of native plants fail to increase beneficial insect richness in urban gardens. Insect Conservation and Diversity. 4: 89-98.

Conservation Biological Control Strategies

- Reduce Disturbance
  - Reduce Pesticide Use on the Lawn and in the Garden
  - Leave an area of the garden undisturbed – no or low mowing, raking or pruning

Flowering Plants for Biological Control

- Flowering Herbs
  - Coreopsis
  - Mints
  - Parsley
  - Basil
  - Oregano
  - Lavender
- Early-Flowering Lawn Weeds
  - Dandelions
  - Clover


Heliotrope
Black Eyed Susans
Comfrey
Scented Geranium
Lavender
Horehound
oregano
Pansies
Santolina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© BJORN ROBLETT / SCIENCE PHOTO LIBRARY
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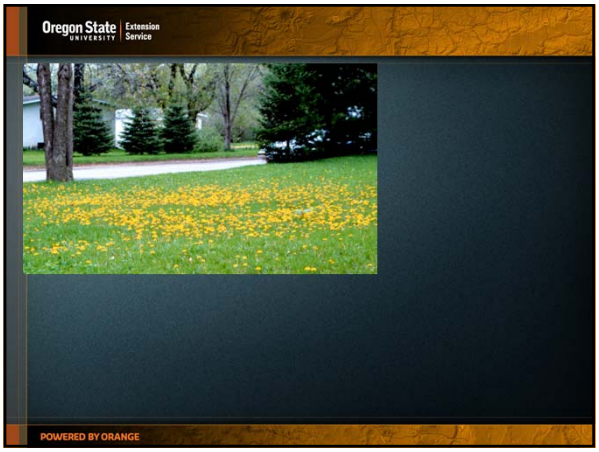
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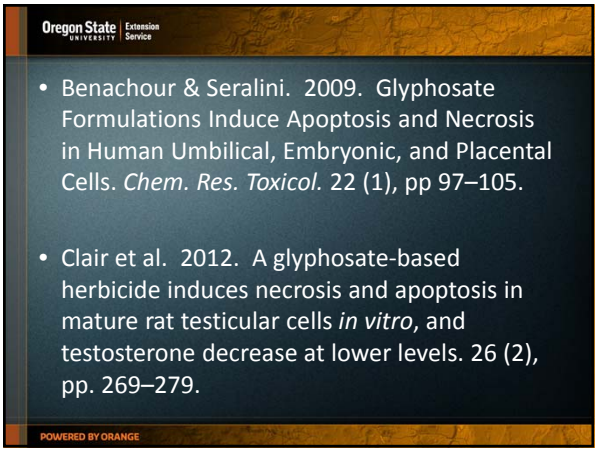
Oregon State University Extension Service
• Benachour & Seralini. 2009. Glyphosate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells. *Chem. Res. Toxicol.* 22 (1), pp 97–105.
• Clair et al. 2012. A glyphosate-based herbicide induces necrosis and apoptosis in mature rat testicular cells *in vitro*, and testosterone decrease at lower levels. 26 (2), pp. 269–279.
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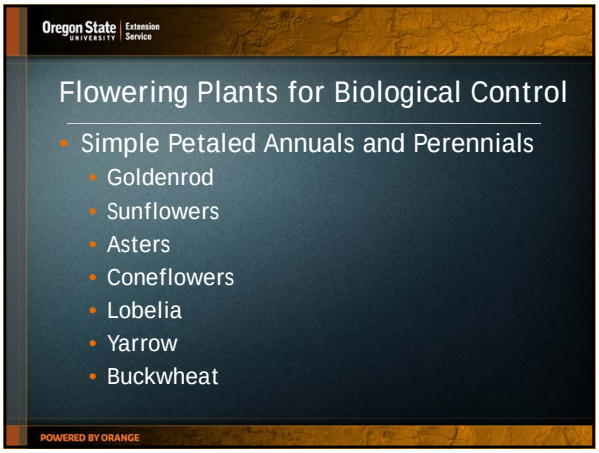
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Flowering Plants for Biological Control
• Simple Petaled Annuals and Perennials
• Goldenrod
• Sunflowers
• Asters
• Coneflowers
• Lobelia
• Yarrow
• Buckwheat
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Manage Using All Available Strategies

Cultural
Physical
Biological
Chemical

Least Toxic ↓ Most Toxic

Use a least hazardous approach – but one that will WORK

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Chemical Control and IPM

- IPM permits integrated use of chemical pesticides, but also actively seeks to minimize applications
- REDUCE – spray when needed, and not according to schedule
- REPLACE – use other, less toxic alternatives to pesticides
- REDESIGN – correct past landscape design issues to reduce pest problems

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Chemical Control and IPM

- Some pest problems require the use of chemical controls
- ALWAYS READ THE LABEL before purchasing and using a product
- Consult with professionals for more vexing problems

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What is a pesticide?

- Any substance intended to control, destroy, repel, or attract a pest.

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How do I know if it is a pesticide?

- Is an **EPA registration number** on the container?
- If so, it is a pesticide.

EPA Reg. No. 3120-280

Identifies manufacturer

Identifies product

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Minimum Risk Pesticides

- Do not have an EPA Registration Number
- Are deemed 'demonstrably safe'
- A complete list can be viewed at:
  - http://www.epa.gov/oppbppd1/biopesticides/regtools/25b_list.htm

Citronella	White pepper
Castor oil	Egg whites and egg solids
Cinnamon oil	Citric acid
Clove oil	Rosemary oil
Dried Blood	Thyme oil
Mint oil	Corn gluten meal

Pesticide Terms

- Pesticide: kills a pest
  - Insecticide: kills insects
  - Herbicide: kills weeds
  - Fungicide: kills plant fungal pathogens

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Pesticide Terms

- Commercial versus Home Use
- Organic versus Synthetic
- Broad Spectrum versus Narrow Spectrum
- Contact versus Systemic
- Eradicant versus Preventative

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Broad Spectrum Pesticides

- Kill a wide range of pests (and beneficials)
  - Organophosphates
  - Carbamates
  - Pyrethoids
  - Neonicitinoids

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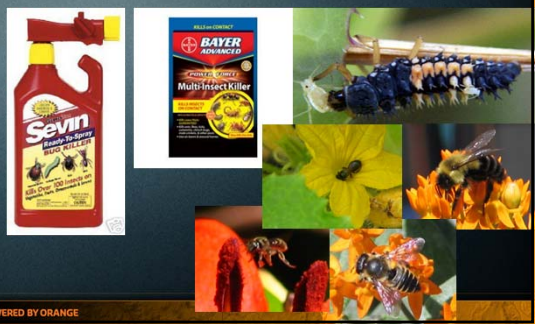
Broad Spectrums Impact 'the good guys'. Don't spray plants in bloom!



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Narrow Spectrum Pesticides (Bt products)

- Requires Ingestion of Product
  - Dipel Dust, Thuricide Concentrate = caterpillar
  - Mosquito Dunks, Mosquito Bits = flies

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Organic versus Synthetic Pesticides

- Derived from an organic source
  - Degrades quicker in the environment
  - Not necessarily less toxic (rotenone)

Synthetic Pyrethroid

Organic Pyrethrin

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What about the toxicity of organics?

- Organic: Derived from an organic source
  - Botanicals (pyrethrum, Neem™)
  - Microbials (Bt sprays)
  - Minerals (Sulfur or Lime Sulfur)

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Least Toxic Pesticides: Soaps and Oils

- Soaps: degrade waxy cuticle
- Oils: block spiracles and smother eggs

Oils also useful against powdery mildew

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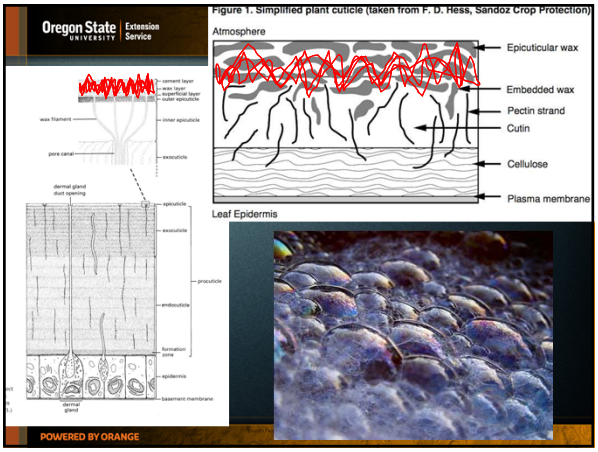

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Two classes of woody ornamentals sensitive to oil when applied under seasonal conditions.	
Oil Sensitive Plants	
Plant	***Time of Treatment***
Maple (Japanese, Silver, Sugar)	Dormant
Hickories	Dormant
Black Walnut, Japanese Walnut	Dormant
Cryptomeria	Anytime
Smoketree	Summer
Some Azaleas	Summer
Brambles (Rubus)	Summer
Butternut	Summer/Dormant
Blue Spruce/ Koster Spruce	Will lose blue color
Alberta Spruce	Late summer
Plants with a Tendency Toward Sensitivity	
Plant	***Time of Treatment***
Beech	Dormant
Japanese Holly	Summer/Dormant
Redbud	Dormant
Savin Junipers	Summer, Spring
Photinia sp.	Summer
Spruce; Norway, White	Dormant
Douglas Fir	Dormant, Flowering time

Table adapted from: Johnson, W.T. 1985. Horticultural Oils, J. of Environmental Horticulture. 3(4): 188 - 191.

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Contact versus Systemic Pesticides

- Contact pesticides work when they contact a pest
  - Effects degrade as pesticide degrades in the environment

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Systemic Pesticides

- Taken up by the plant roots, transported through the phloem (and xylem), and incorporated into plant tissues
  - Effects are long term

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Systemic Pesticides

- Must be ingested in order to work
- Long term protection of plant

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Systemic Pesticides: Benefits

- Best option we have for protecting estate or 'at risk' trees
  - Ashes from Emerald Ash Borer


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Concerns Regarding Imidacloprid in *Home Gardens and Urban Landscapes*

- Persistence and Concentration in Ornamental Plants
  - How long is active ingredient 'active' in plant tissues?
  - Does active ingredient persist in fallen leaves?
  - What is the concentration in nursery plants, or in home garden plants?
- Non-target impacts on beneficial insects

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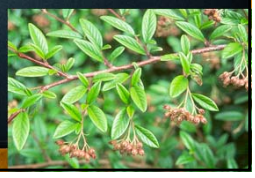
Neonicotinoids are PERSISTANT!

- Toxicity persisted and pests were absent up to 3 years following application of imidacloprid to potted coteneaster
  - Szepaniec and Raupp (2007)

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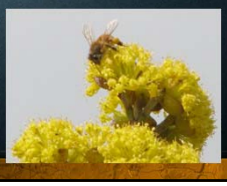
Neonicotinoids are PERSISTANT!

- Rhododendrons treated at label rates had 19 ppb of imidacloprid in blossoms 3-6 years after application
  - Bayer Crop Science Ag Report # G201806


Neonicotinoids are PERSISTANT!

- Cornus mas had 1038-2816 ppb of imidacloprid in blossoms, 505 days after application
  - Bayer Crop Science Ag Report # G201801

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Imidacloprid in Home Gardens / Landscapes

- Imidacloprid half life in soil is 40 days to 997 days
  - National Pesticide Information Center (2010) Fact Sheet
- On golf courses, imidacloprid applied as soil drench to linden trees is taken up, so that you get
  - 100 ppb in tree leaves
  - 12,865 ppb remains in soil and can be taken up by other plants
  - Krischik, unpublished data ~ news interviews

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Neonicotinoids are PERSISTANT!

- Toxicity of imidacloprid persists for months to years after application
- Often ~ last date of noted persistence = end of experiment or last day data was taken
- Pesticide directions on home use products suggests annual applications.

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Impacts on Non-Target Insects

- Lethal impacts on *Anagryus* parasitoids, lady beetles
- Sub-lethal impacts on lady beetles, predaceous bugs, bees
- Suggestion that predators feeding on imidacloprid-dosed prey have increased mortality, versus control

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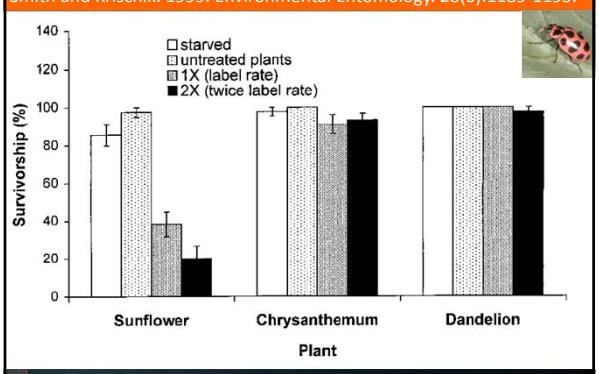
Smith and Krischik. 1999. Environmental Entomology. 28(6):1189-1195.



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New York Times, March 29, 2012

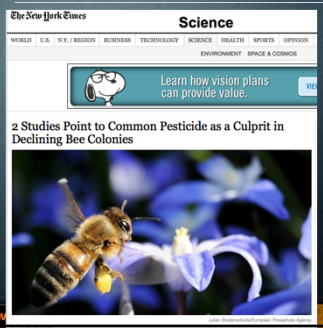
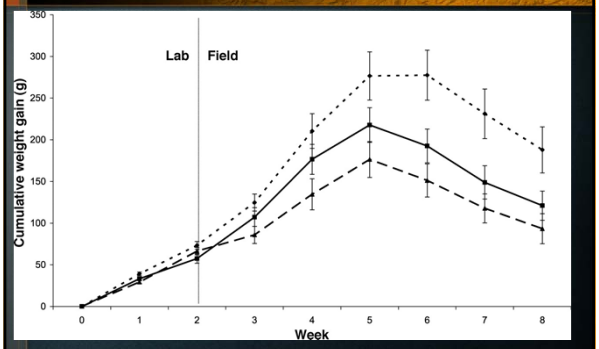


Fig. 1 Mean observed colony weight for control (short-dash line), low (solid line), and high (lo
dash line) treatments at weekly intervals.



P R Whitehorn et al. Science 2012;336:351-352

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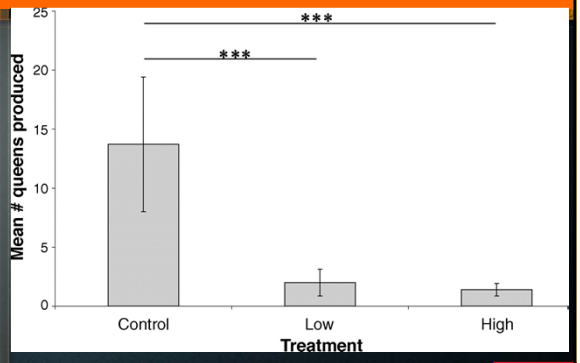
Science

Fig. 2 The number of new queens produced by the control colonies was greater than the number produced in both low- and high-treatment colonies.



P R Whitehorn et al. Science 2012;336:351-352

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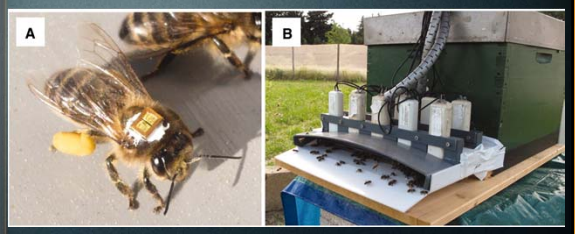
Fig. 1 Honey bee RFID monitoring equipment.

French Study on Honey Bees



M Henry et al. Science 2012;336:348-350

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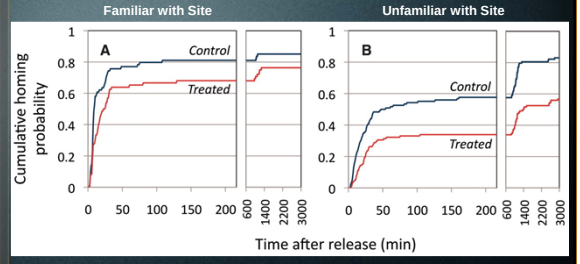
Fig. 3 Cumulative homing probability of foragers released 1 km away from the hive.



M Henry et al. Science 2012;336:348-350

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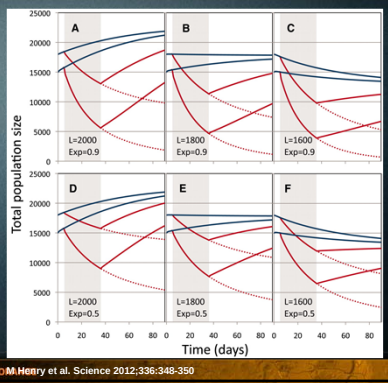
Fig. 4 Comparison of honey bee population dynamics between simulated colonies exposed to thiamethoxam (red lines) or not exposed (blue lines), following six demographic scenarios.



M Henry et al. Science 2012;336:348-350

Science

Systemic Insecticides

- Systemic insecticides have proven to be a useful tool in efforts to preserve at risk trees.
- In ornamental landscapes ~ persistence is high, toxicity to non-targets is being documented.
  - Accelerated reevaluation of neonicotinoid risks is in progress

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Minimizing Negatives of Pesticides

- Choose narrow over broad spectrum insecticides.
- Spot treat, rather than broadcast a pesticide.
- Always read the label, follow directions and do not apply more than is recommended.
- Wear protective clothing and eyewear.
- Dispose of unwanted pesticides and empty containers properly.
- Do not spray plants in bloom.

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Brown Marmorated Stink Bug

Situation: Brown Marmorated Stink Bug

- Nuisance Pest
- Agricultural / Garden Pest

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Image Source:
http://www.nytimes.com/2010/09/27/us/27stinkbug.html?pagewanted=all&_r=0

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Image Source:
http://www.usnews.com/news/blogs/washington-whispers/2011/04/11/foul-stink-bug-targets-wine-grapes

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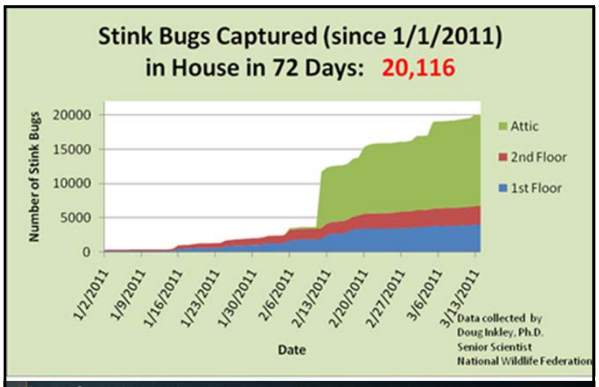

Image Source:
http://www.nwf.org/Wildlife/Threats-to-Wildlife/Invasive-Species/Stink-Bugs.aspx

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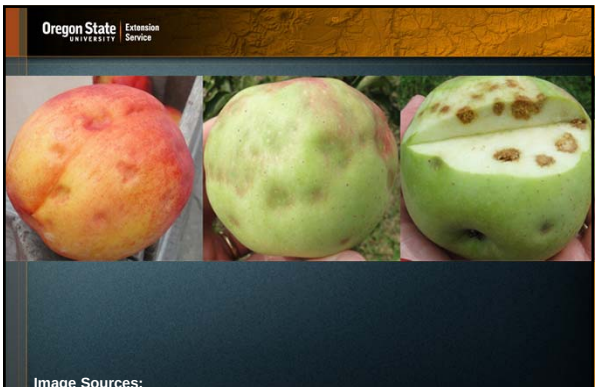

Image Sources:
http://pubs.ext.vt.edu/2902/2902-1100/2902-1100.html

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Image Source:
https://agdev.anr.udel.edu/weeklycropupdate/?tag=brown-marmorated-stinkbug

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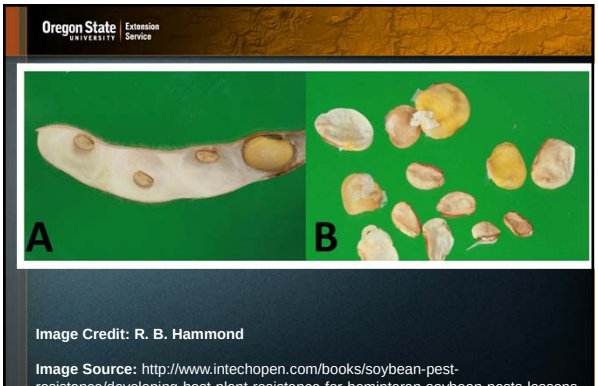

Image Credit: R. B. Hammond

Image Source: http://www.intechopen.com/books/soybean-pest-resistance/developing-host-plant-resistance-for-hemipteran-soybean-pests-lessons-from-soybean-aphid-and-stink-b

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Fig. 6 Tomato (above) with mild BMSB feeding injury (arrow) and its corresponding plate (right) with some *E. coryli* growth. Tomato (below) with increased BMSB damage (arrow) and its corresponding plate with much greater *E. coryli* growth over same time period.

Image Source:
http://extension.umd.edu/learn/transmission-yeast-eremothecium-coryli-fruits-and-vegetables-brown-marmorated-stink-bug

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Distribution: Brown Marmorated Stink Bug

- United States
- Oregon

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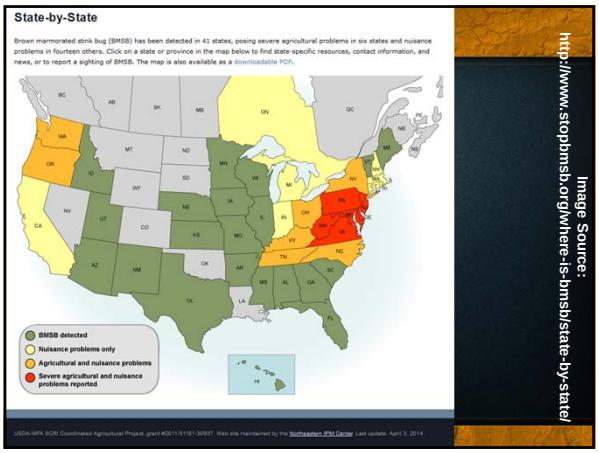
State-by-State
Brown marmorated stink bug (BMSB) has been detected in 41 states, posing severe agricultural problems in six states and nuisance problems in fourteen others. Click on a state or province in the map below to find state-specific resources, contact information, and news, or to report a sighting of BMSB. The map is also available as a downloadable PDF.
BMSB detected
Nuisance problems only
Agricultural and nuisance problems
Severe agricultural and nuisance problems reported
Image Source:
http://www.stopbmsb.org/where-is-bmsb/state-by-state/


Legend
BMSB Status
Established population
Detection only
Not detected
Not surveyed
Portland
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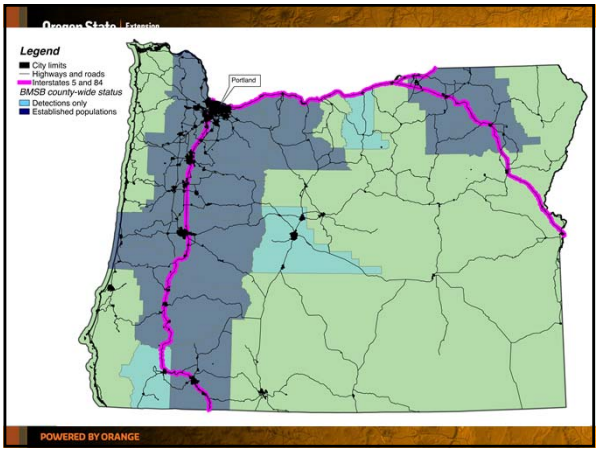
Legend
City limits
Highways and roads
Interstates 5 and 84
BMSB county-wide status
Detections only
Established populations
Portland
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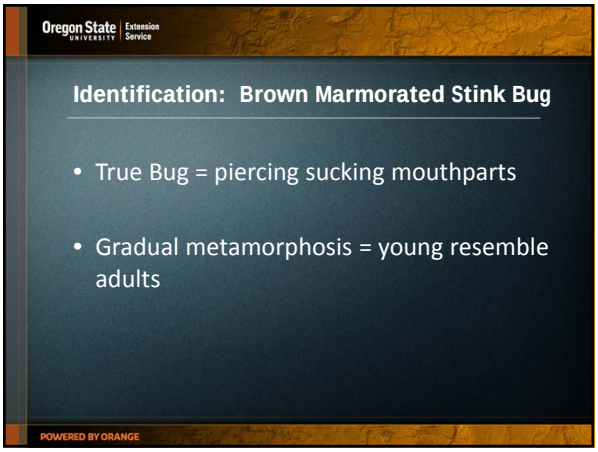
Oregon State University Extension Service
Identification: Brown Marmorated Stink Bug
• True Bug = piercing sucking mouthparts
• Gradual metamorphosis = young resemble adults
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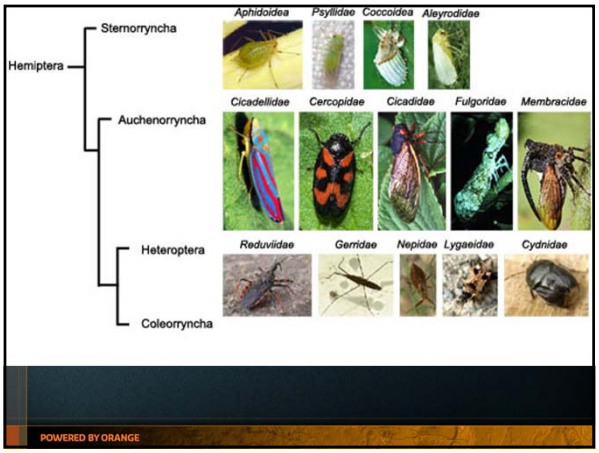
Hemiptera
Sternorrhyncha
Auchenorrhyncha
Heteroptera
Coleorrhyncha
Aphidoidea
Psyllidae
Coccoidea
Aleyrodidae
Cicadellidae
Cercopidae
Cicadidae
Fulgoridae
Membracidae
Reduviidae
Gerridae
Nepidae
Lygaeidae
Cydnidae
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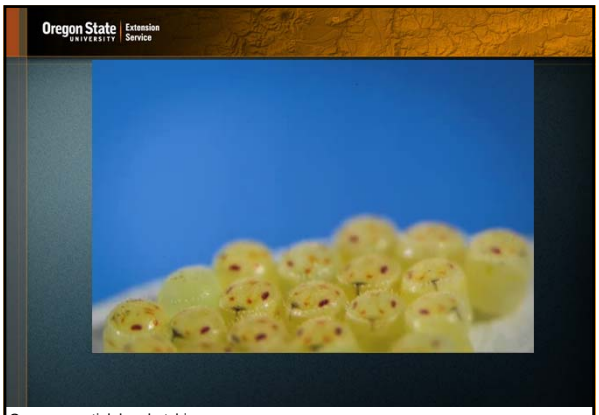
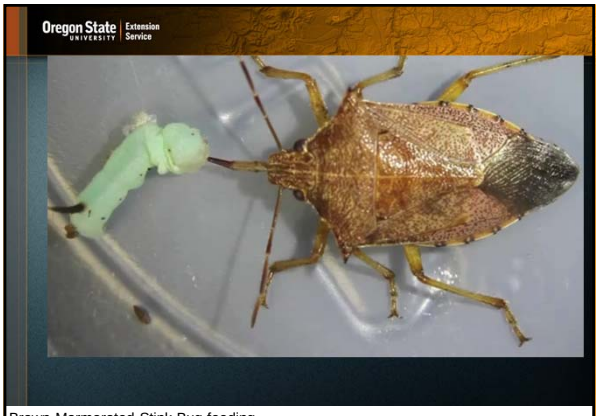
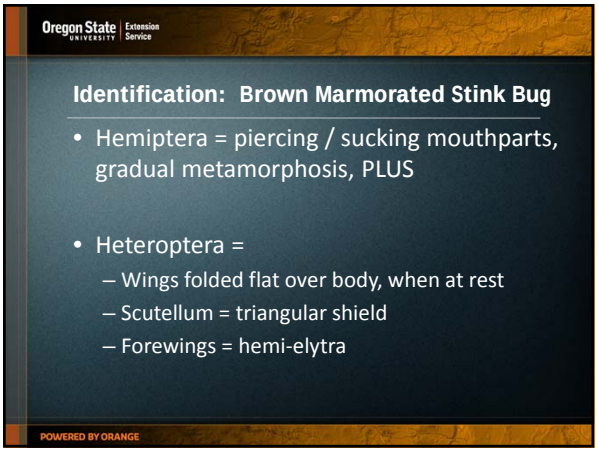
Brown Marmorated Stink Bug

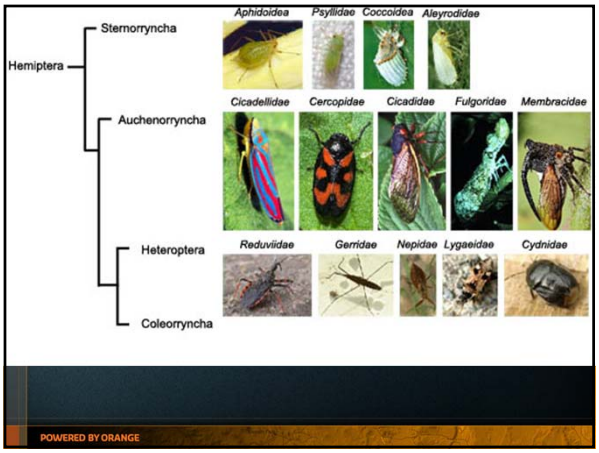


Consperse stink bug hatching.
Source: Chris Hedstrom, OSU



Brown-Marmorated Stink Bug feeding.
Source: Chris Hedstrom, OSU





November 12, 2012, Broadcast on AM Northwest (KATU)
http://www.katu.com/amnw/segments/Good-vs-Bad-Stink-Bugs-179392021.html

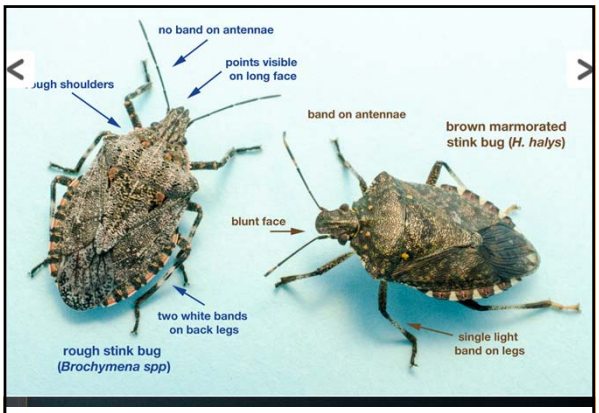


Image Source:
http://horticulture.oregonstate.edu/content/native-stink-bugs-and-identification-resources

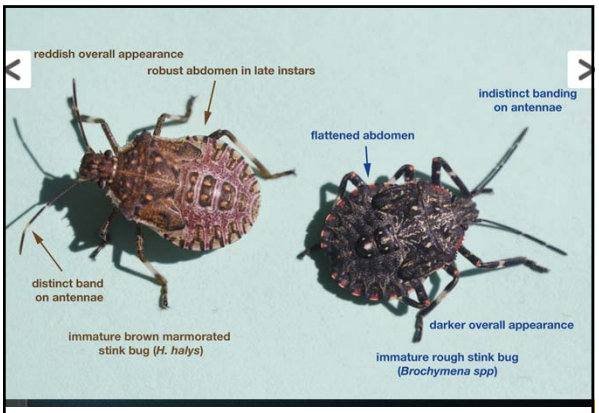
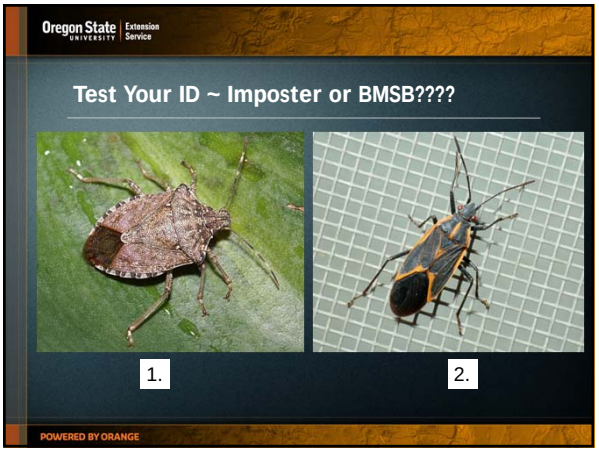
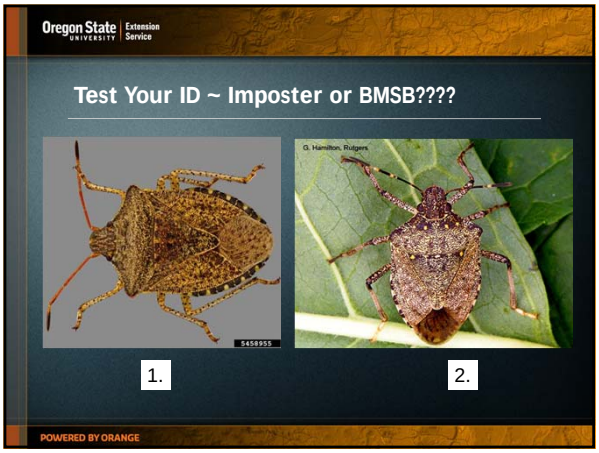
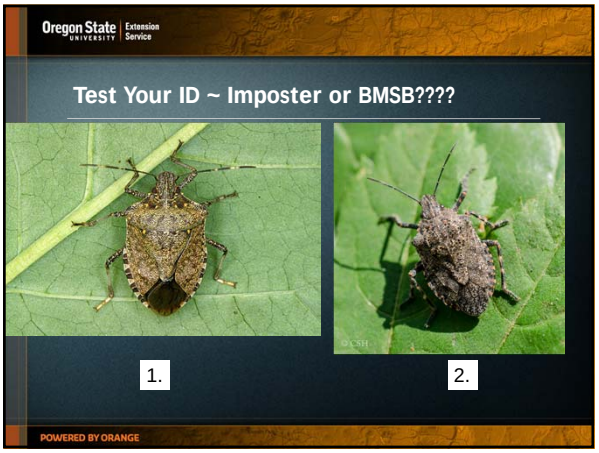


Image Source:
http://horticulture.oregonstate.edu/content/native-stink-bugs-and-identification-resources







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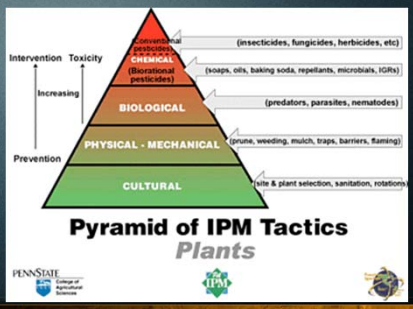
Management: Brown Marmorated Stink Bug



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Management: Brown Marmorated Stink Bug

- Cultural ~ remove invasive hosts, if in yard. Seal up cracks and crevices in house.
- Physical ~ hand pick, vacuum, trap, light traps.
- Biological ~ spiders, generalist predators, import of parasitoid under investigation.
- Chemical ~ not generally recommended

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BMSB Management Video ~ "Exclusion & Execution"

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Exclusion: Brown Marmorated Stink Bug

- Seal up cracks and crevices in your house.
- Weather stripping.
- Utility outlets.
- Attic screening.

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'Think Before You Stink' by Univ. of MD Extension.
Source: https://www.youtube.com/watch?v=9jIgJ4WjryY

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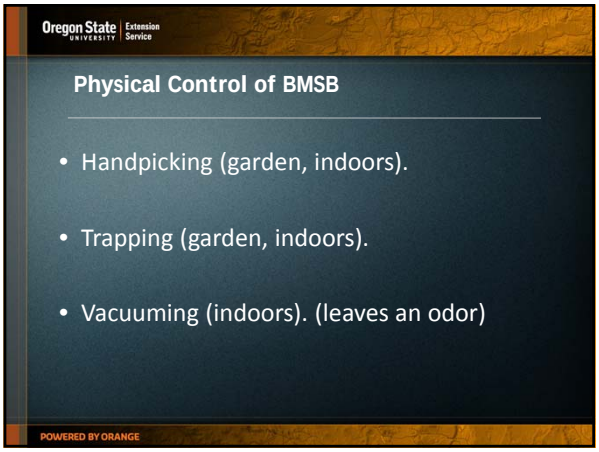

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http://www.wsls.com/story/25140599/virginia-tech-researchers-find-the-best-way-to-catch-stink-bugs

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Source: https://www.youtube.com/watch?v=9jlgJ4WjryY

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Disposing of BMSB

- Put in ziploc bag, and place in freezer for 48+ hours.
- Dump into bucket of soapy water.
- DON'T flush them down the toilet.

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Management ~ Abiotic Controls ('Cold Kills')

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Brown-Marmorated Stink Bug versus jumping spider ~ 3 hours, no kill.
Source: http://www.fishpondinfo.com/insects/stinkbug.htm

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Brown-Marmorated Stink Bug Egg Parasitoid.
Source: Chris Hedstrom, OSU

Oregon State University Extension Service

Report BMSB Sitings to OSU Researchers!

Include in your report:

1. Time and date of sighting.
2. Habitat (agricultural, urban, natural).
3. Host plant (ornamental, weedy, crop).
4. Approximate number of BMSB.
5. Your contact info.

Send reports to BMSB@oregonstate.edu

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