Integrated Pest Management for Common Garden Pests

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Soil School Event

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Biography

- Educational Background
  - M.S. in Plant Pathology
  - M.S. in Entomology
  - B.S. in Plant Sciences
- Joined OSU in 2023 as an Integrated Pest Management (IPM) Educator
- 10^{+} years of international experience :
  - Agricultural development, research, project management, capacity building, and clientele management with an emphasis on Plant Protection and IPM.

Outline

- Common garden pests
  - What is a pest?
  - Types of pests
- Integrated Pest Management (IPM)
  - Definition of IPM
  - Pest management methods
  - Principles of IPM (decision-making cycle)
    - Slugs and snails
    - Moles
- Solve Pest Problems program

Common garden pests

What DO YOU consider a pest?

"Any organism which adversely affects humans, our crops, our livestock, or anything we consider to be of value"

Himalayan Blackberry
"IMG_5394" by cyborgsuzy is licensed under CC BY-NC 2.0

Immatures of Brown marmorated stink bugs
David R. Lance, USDA APHIS PPQ, Bugwood.org

Bedbug
Patrick Porter, Bugwood.org

Yellowjacket
"Worth a Sting?" by Tony Iwane is licensed under CC BY-NC 2.0 (cropped)

Rose black spot
William Fountain, University of Kentucky, Bugwood.org (cropped)

Types of pests

Insects

Insect-like organisms

Micro-organisms

Weeds

Nematodes

Molluscus

Vertebrates

Take-home message

- What is a pest for your situation might not be for another.
- Knowing the different pest types is essential for the identification.
- ➢ Identify pest problems which is the First Step to pest management.

Principles of Management

Integrated Pest Management (IPM)

- A strategy to prevent and suppress pests with minimum impact on human health, the environment and non-target organisms.
- Decision-making process that uses regular monitoring to decide if and when treatments are needed to control a pest, then uses a variety of tactics to keep pest numbers low.

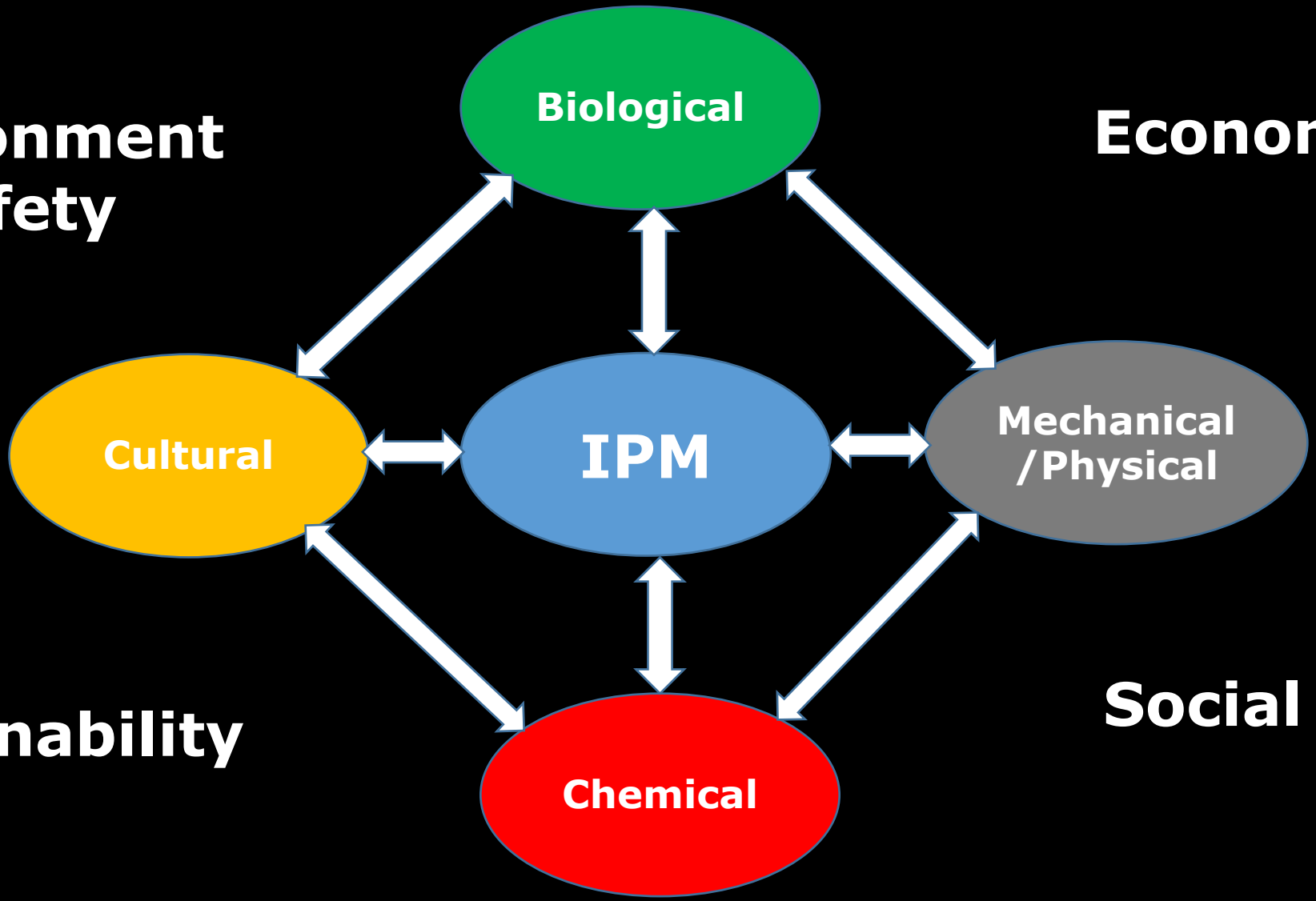
IPM Tools

"A sustainable approach to managing pests by combining biological, cultural, physical/mechanical , and chemical tools in a way that minimizes economic, health, and environmental risks."

7 U.S.C. 136r

Environment
Safety

Economic



Sustainability

Social

Cultural control

- Creating optimal plant growing condition and unfavorable conditions for the pest.

Sanitation

Oregon State University, Extension Services, Master Gardener

Powdery mildew resistant apples include 'Fuji`

Diversification of plants

Congerdesign, pixabay

Weeding

Photo by: PAVELRODIMOV/GETTY IMAGES

Watering when & where needed

Watering the world | MIT News | Massachusetts Institute of Technology

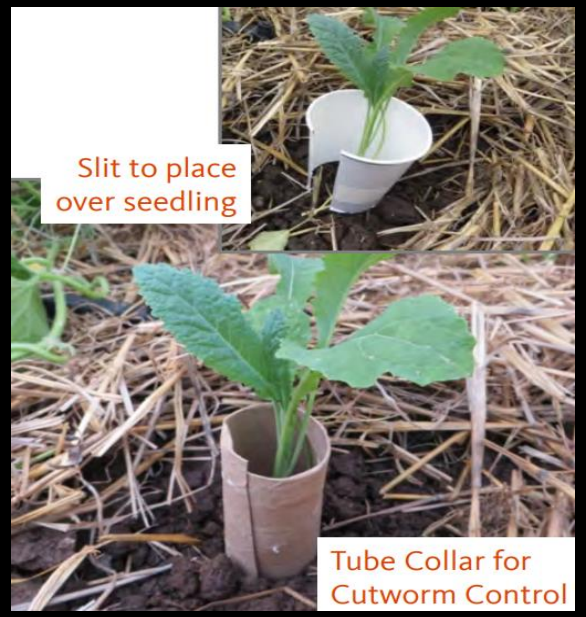
Mulching

Photo: Lithiumphoto/ Shutterstock.com

Mechanical/Physical

Use physical means

- Use of barriers
- Trapping
- Weeding or removal of pests by hand



Collars for cutworm
Oregon State University, Extension Services, Master Gardener

Washing with pressure water

Sticky barriers
Photo by : Mark Guthmiller, Wisconsin DNR

Hand picking

Row covers
Oregon State University, Extension Services, Master Gardener

Biological Control

"Biological control is the beneficial action of parasitoids, pathogens, and predators in managing pests and their damage.(UC-IPM)

Whitney Cranshaw, Colorado State University, Bugwood.org

House sparrow
Jim Occi, BugPics, Bugwood.org

Aphid parasitoid (*Aphelinus sp.*)
Frank Peairs, Colorado State University, Bugwood.org

Western tarnished plant bug killed by the fungus (*Beauveria bassiana)*
Photo by Surendra Dara, UC ANR

Nematode (*Steinernema scapterisci*)
David Cappaert, Bugwood.org

Chemical Control

"The use of synthetic or natural pesticide to control, suppress or minimize pests"

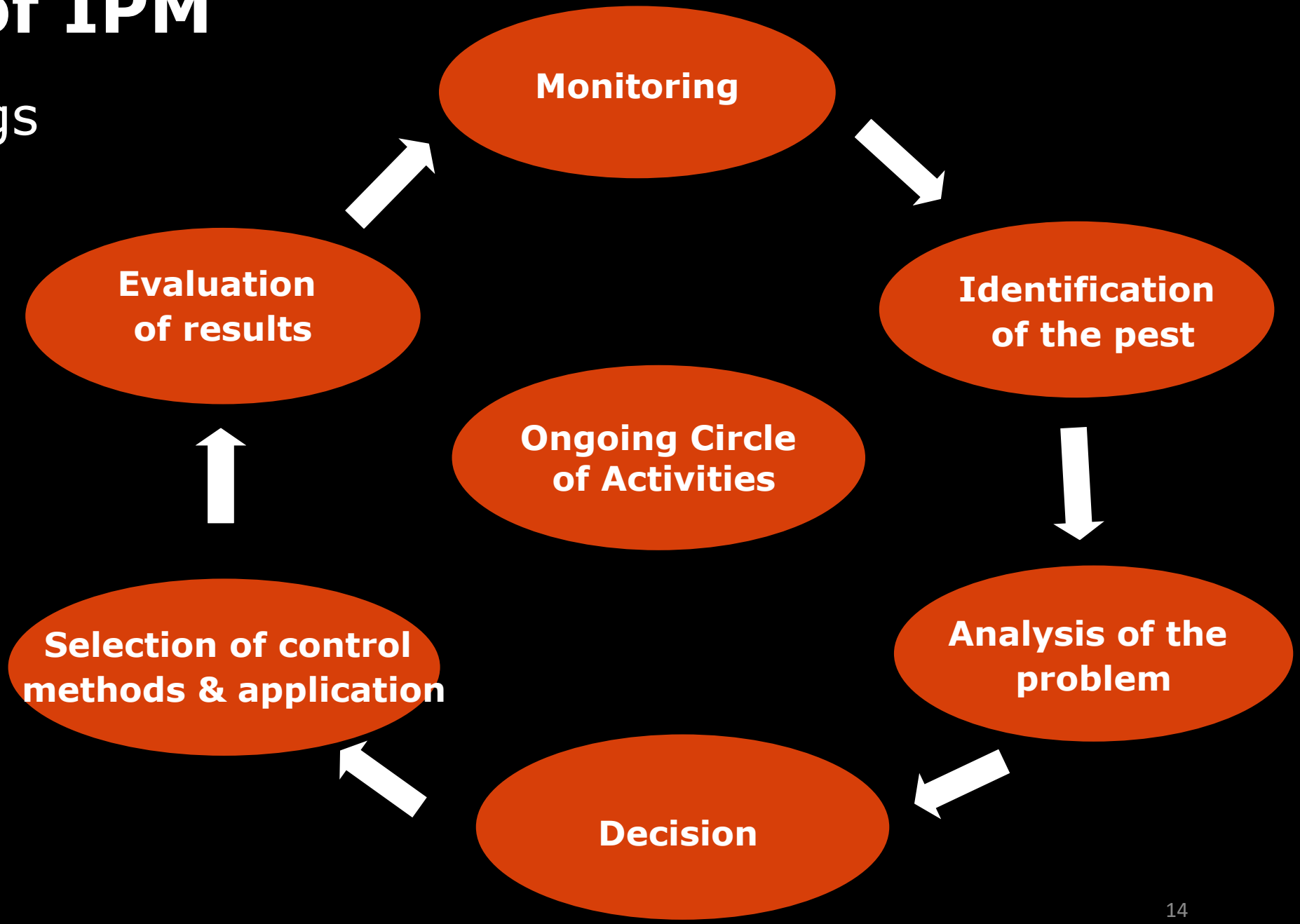
- Insecticide, herbicide, fungicide…etc.

➢ Last-resort tool (txt book definition)

- Specific to target pest : rather than broad-spectrum pesticides
- Less harmful to humans
- Least impact to the environment
- Least disruptive to natural enemies & pollinators

Principles of IPM

- Snails and slugs
- Moles



Slugs and snails as pests

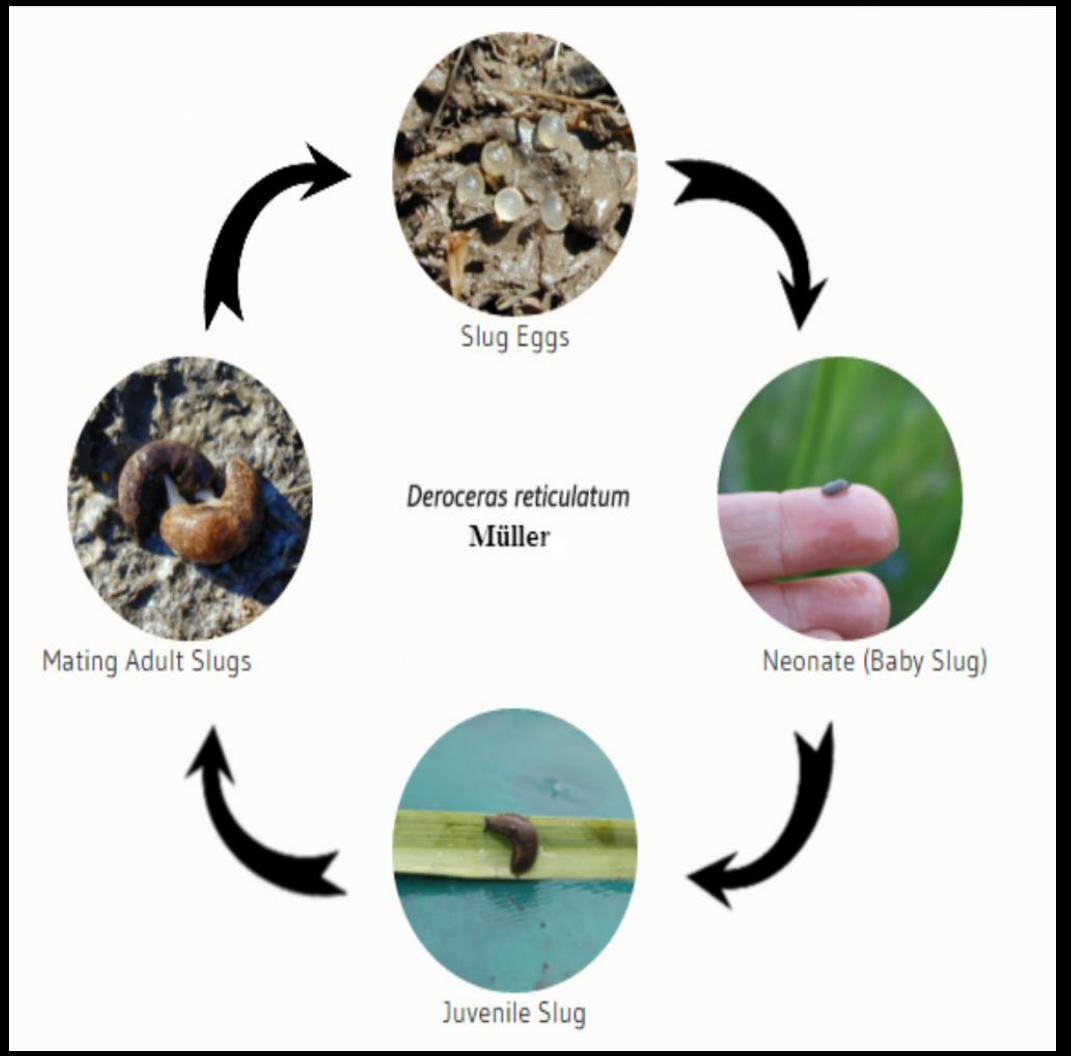
- Direct pests of agriculture and horticulture
- Important contaminant pests

- Vector plant diseases e.g. brassica dark leaf spot
- Transmit human pathogens – e.g. *Escherichia coli*
- Aesthetic damage e.g. mucus and faeces

Biology and life cycle

Adults slugs are hermaphrodites

- ➢ Any slug is capable of laying eggs
- Mating is in fall (Oct- Nov) through spring (Mar-Jun)
- Adults mature in 5-6 months (over the winter)
- Slugs with 200-500mg weight have the capacity to lay eggs
- Adults can overwinter & lay eggs when conditions improve
- Slug's life span can be 6-12 months, can reach up to 18 months



Eggs

- Usually occurs after the first fall rains & before temp. drops
- > 500 eggs in a lifetime; 40 eggs/cluster
- Laid sheltered close to soil surface or in moist soil, under plant residues on the soil
- Matured eggs hatch in 2 weeks - a month time (5 months in winter)
- Eggs laid late in the season can overwinter

Slug portal, Oregon State University

Neonates- newly hatched slug

- Sometimes feed on plants

Juveniles

- Actively feed in spring & in summer (if moist & not hot)

Damage & signs

- Natives are generally not pest
- Invasive slugs and snails are causing damages
  - ➢ Predominantly from Europe
- Eat on leaves leaving them shredded & with ragged holes
- Can feed on entire seedlings & vegetative parts
- Damage fruits e.g. Strawberries & tomatoes
- Can damage root & tubers

Gray garden slug (*Deroceras reticulatum*)
Cheryl Moorehead, Bugwood.org

The Pacific banana slug (*Ariolimax columbianus*)
Thomas Schoch CC BY-SA 2.5

Slugs & snails scrape holes in fruits
Akphamczuk, iStock

Slugs and snail damage
Robin Rosetta, Oregon State University

Slug seedling damage
svehlik, iStock

Leopard slug – *Limax maximus*

- Mantle is typically spotted or marbled black
- Bands sometimes present on tail but never on mantle
- Slime sparse and sticky

- Common in urban and suburban areas but seldom regarde as a pest (prefer fungi and dead plants)
- It has a very elaborate mating behavior

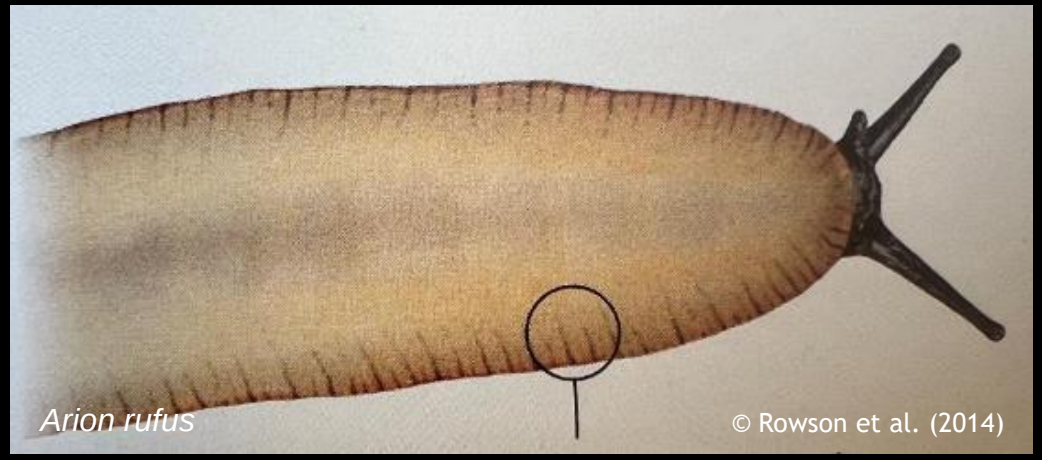
Gray field slug – *Deroceras reticulatum*

- Most damaging slug pest in the PNW
- Damages ornamentals, fruits, vegetables, grains, forages and seed crops

- Pale body flecked with darker patches
- Secretes a milky colored mucus

Great red slug – *Arion rufus*

- Foot fringe color brighter than rest of the body, typically orange or red
- Fringe with distinct vertical lines that often penetrate sole
- Head and tentacles distinctly darker than rest of the body



- One of the largest invasive slugs in the U.S.
- Known pest of ornamentals

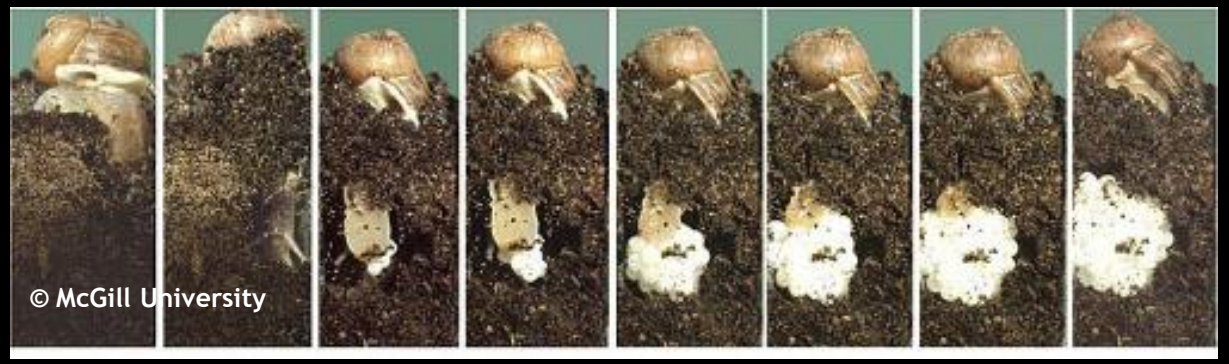
Valencia slug - *Ambigolimax valentianus*

- Body with two tram line stripes
- Mucus colorless and watery
- Body often appears translucent under bright light

- Common pest in greenhouses and urban gardens, often found clustered together in groups
- Pest of ornamentals e.g. orchids

Brown garden snail – *Cornu aspersum*

- Shell >25 mm diameter in adults
- Shell wrinkled, pale brown with darker blotches
- Apertural lip light colored



- Major pest of citrus and grapes
- Important contaminant pest of ornamentals
- Introduced to the U.S. (California) as a source of food in the 1800s

Amber snails - Family Succineidae

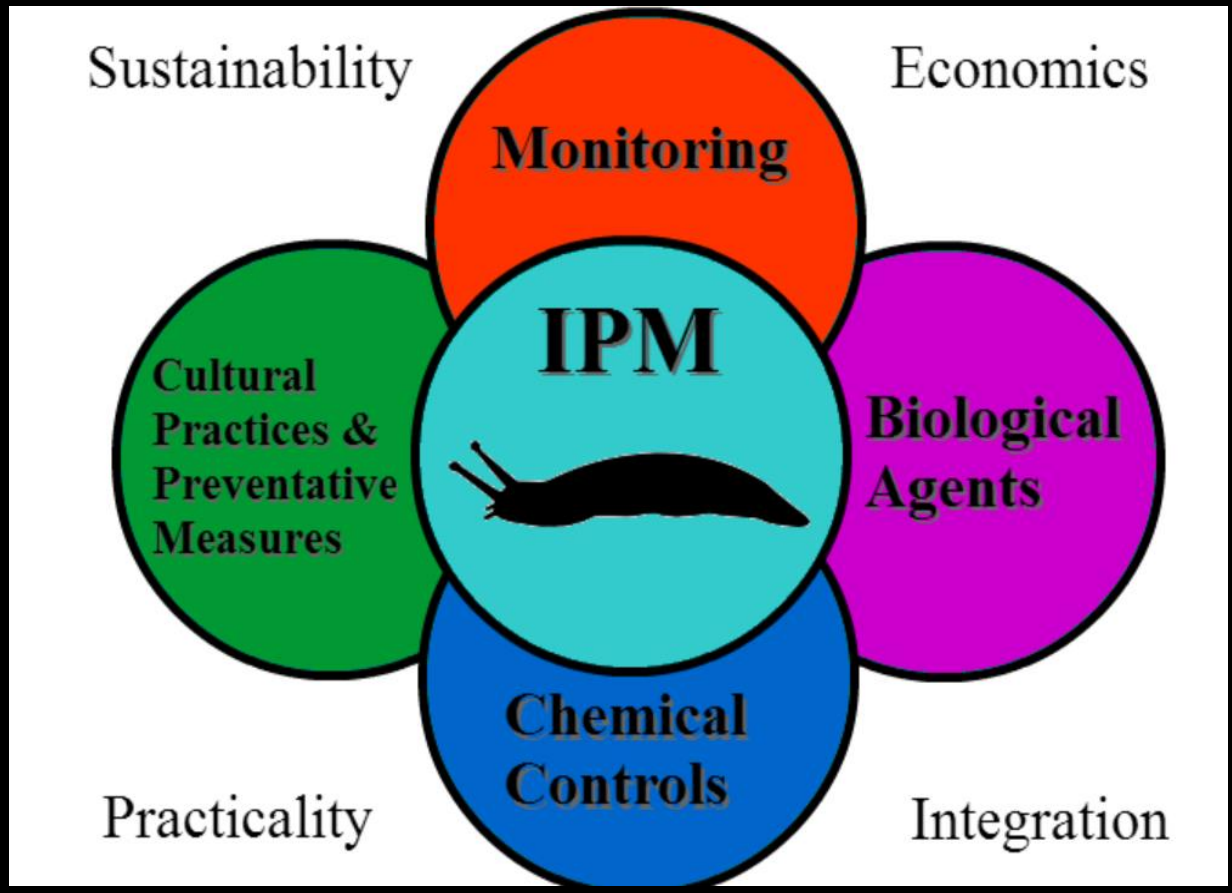
- Amber shell with length always greater than width.
- Shell with large body whorl and relatively small spire.

Succinea putris

- We have introduced and native species in PNW
- Terrestrial or semi-amphibious snails
- Primarily a contaminant pest in Oregon

IPM strategy

- Correctly identify slug & snail species
- Monitoring at night
  - What is your tolerance level?
  - Have a strategy using different methods
- Intensify control in fall & early spring, it will lower the population throughout the season



Oregon State University

- Remove hiding places
- Hand-picking
- Water in the morning not in the evening
- Encourage predators, ground beetles, amphibians, and snakes
- Minimizing weeds will reduce alternative food sources and shelters
- Work the first 4 to 6 inches of soil

Signe Danler, Oregon State University

- Use a trap e.g. boards/shingles, beer or bread dough
- Use copper barriers
- Consider using slug/snail resistant plants e.g., ferns, nasturtium, foxglove
- Check plants before bringing them to new site

Gray garden slug (*Deroceras reticulatum*)
Cheryl Moorehead, Bugwood.org

Signe Danler, Oregon State University

➢ Chemical molluscicides

- Effective products available
- Some are toxic to dogs & cats
- Refer the additional information page

Copper barriers
Photo by : Clark, Jack Kelly,
University of California Statewide IPM program

Additional information

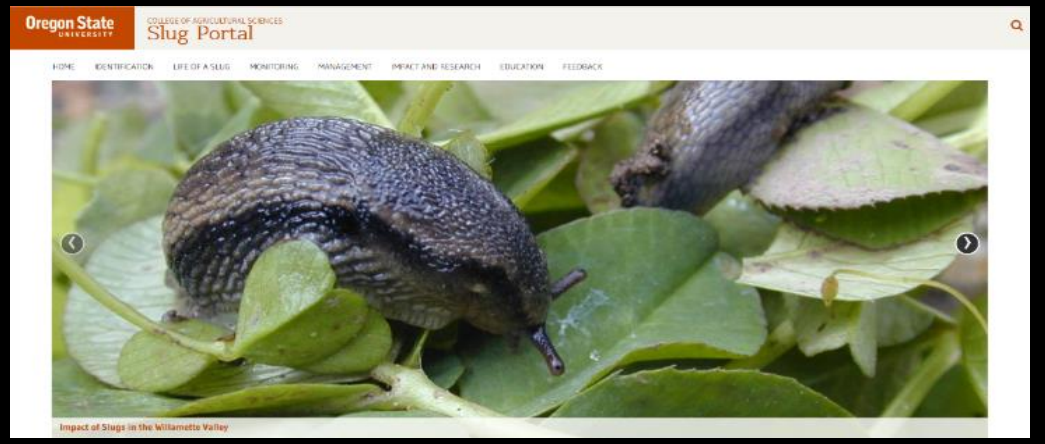
- Slug Portal:

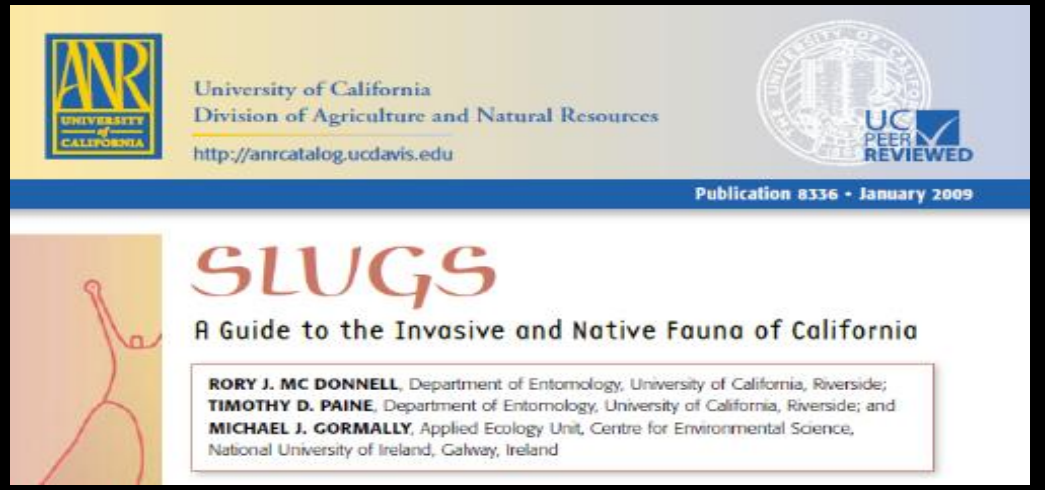
http://agsci.oregonstate.edu/slug-portal

- Solve Pest Problems

- Free guidebook:

https://anrcatalog.ucanr.edu/pdf/8336.pdf





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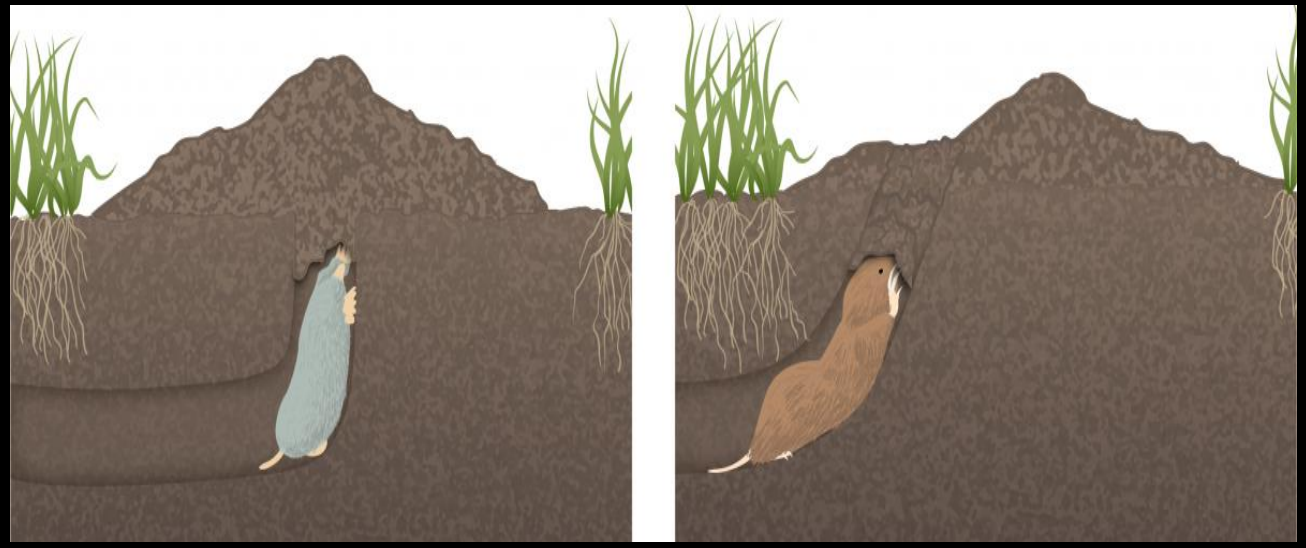
Moles

- Small mammals
- Native to PNW
- Mostly feed on insects and worms in the soil
- May sometimes feed on bulbs, sprouting seeds & grass roots (20% of Townsend's mole diet)
- Borrowing damages plants
- Rarely seen unless captured or killed while burrowing

Baby moles
Washington State University Extension

Damages and signs

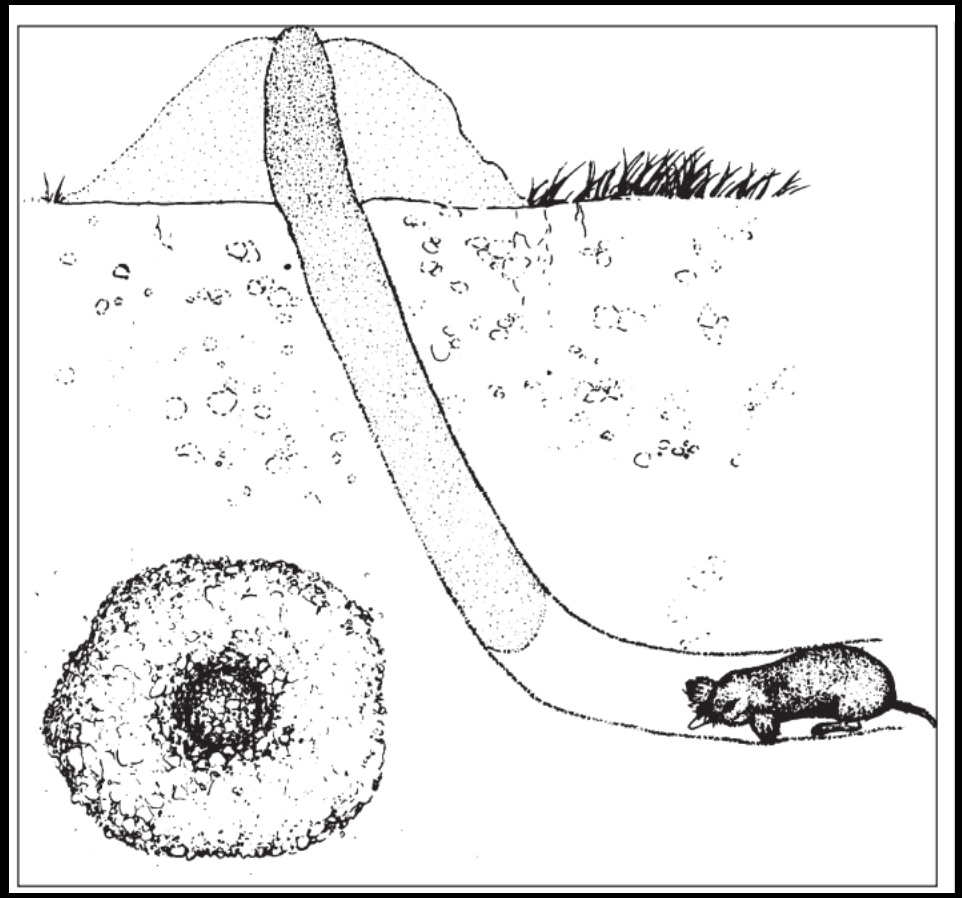
- Primary damage is caused by burrowing & mound building
- Encourages weed growth on exposed soil
- Check for mounds of pushed soil to the surface
- Tunnels are "volcano type", round in shape and symmetrical
  - ➢ Pocket gophers make flattened semi-circle/fan-shaped tunnels



Volcano-type mole mound (left) and fan-shaped pocket gopher mounds (right) with plug of dirt at the top of the tunnel
Iowa State University Extension and Outreach

Damage and signs

- Tunnels depth can be 3 to 30 inches
- Interconnected with passages
- In extremer weather moles dig dipper as earthworms become scares on upper soil layer
- A single mole can dig 50 to 100 mounds
  - ➢ Average mole density per acre is 2 in Tillamook county, OR



OSU Extension Catalog in 2015

Townsend's mole -*Scapanus townsendii*

- Largest (6-9 inches) and most damaging to gardens and lawns
- Black to brownish-black in color
- Most common in OR and WA

Photo by Maughn, https://www.pesticide.org/moles

The *broad-footed-Scapanus latimanus*

- Silver-gray or copper-brown in color
- Smaller than Townsend's mole
- Common from the Klamath Basin of south-central Oregon

Observation © Chris Brown

Observation © Chris Brown

The Coast mole-*Scapanus orarius*

- Half-as large as Townsend's mole
- Found farther east in WA & OR, and northward into southern British Columbia

Photo 110578286, (c) Terry Carr

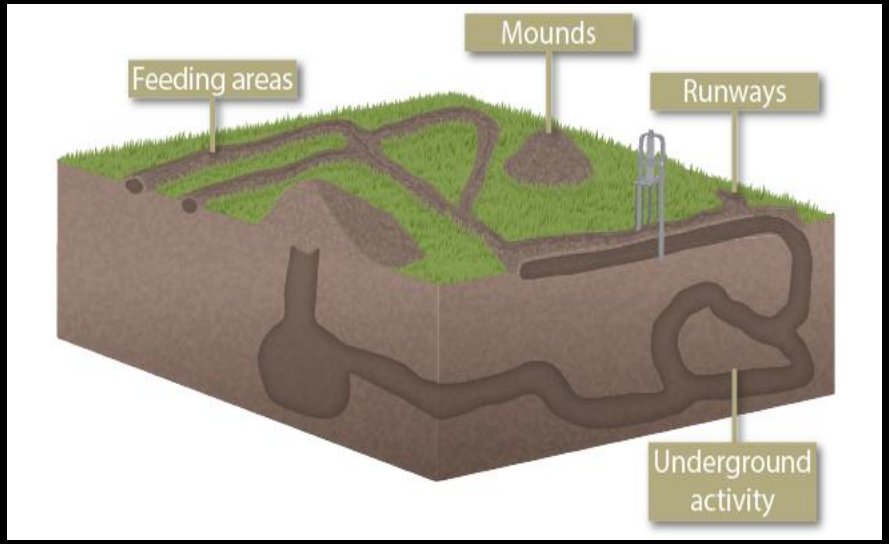
IPM Strategy

- Daily monitoring your garden/landscape
- Check for fresh mole activity
  - Punch holes along the tunnel system & mound using a stick
  - Check for signs of repair
- Apply control methods in tunnels with fresh activity

Monitoring tunnels and mounds
Washington State University

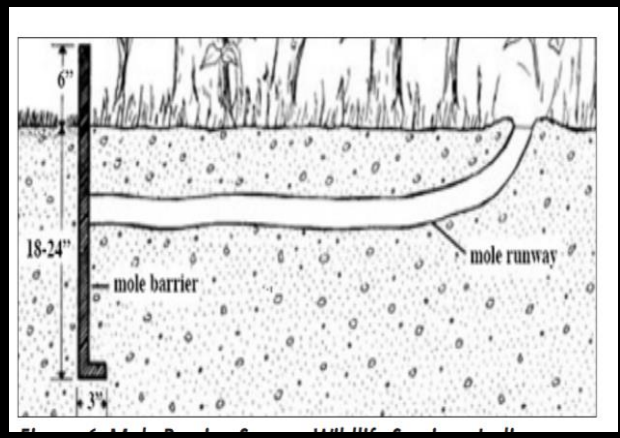
Scissor-jaw trap
Iowa State University Extension and Outreach

- Use traps to remove moles in home garden and lawns
  - Scissor-jaw (tunnel trap) mole trap is recommended for PNW (OSU Extension)
- Planting "mole plant" or caper spurge, caster oil(not scientifically proven)
- Fencing: only small lawns but expensive
- Toxic baits registered for home



Correct trap placement on long, straight stretch tunnel
Iowa State University Extension and Outreach

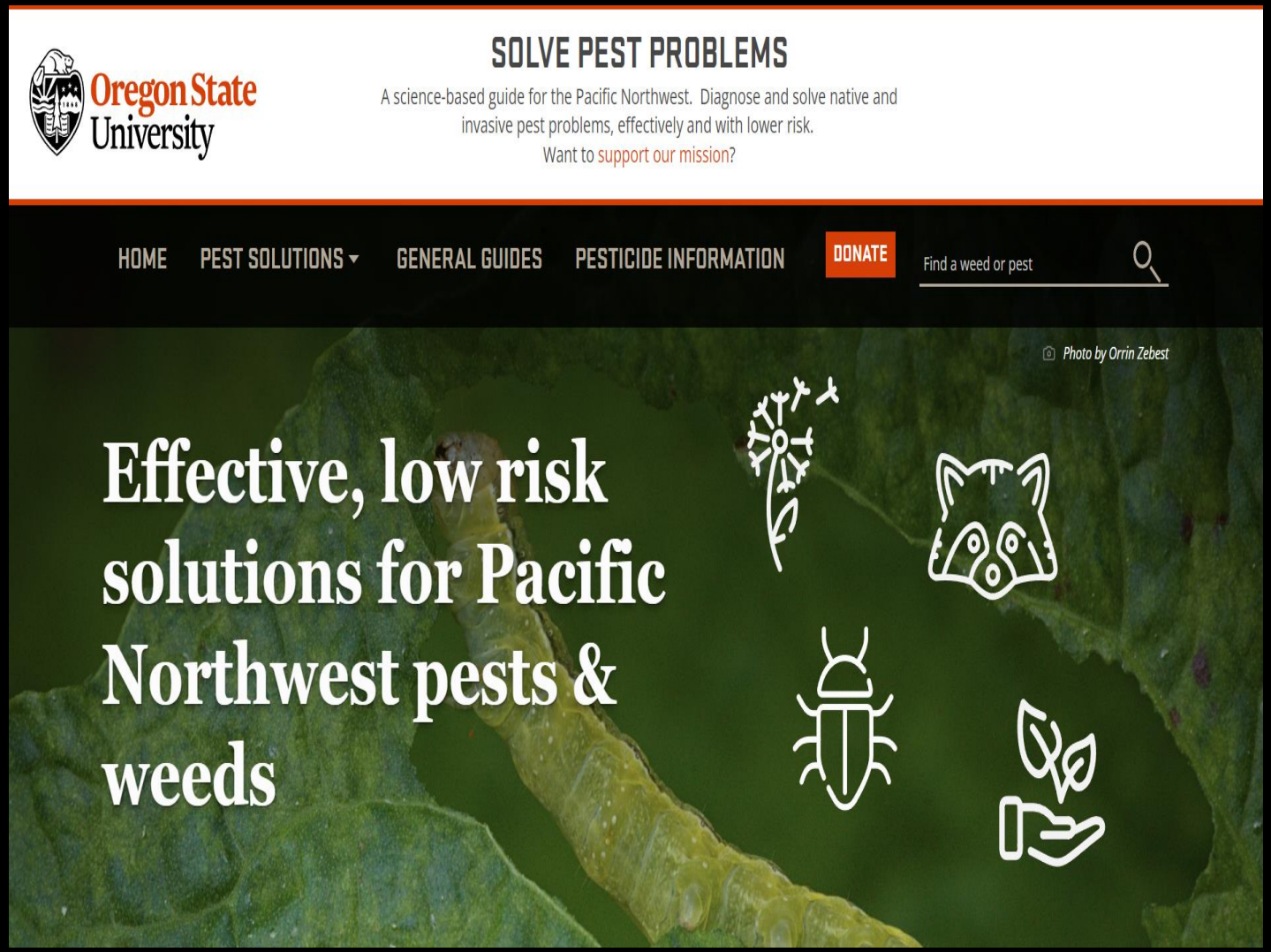
"mole plant" *Euphorbia lathyris*
Washington State University



Mole Barrier
Wildlife Services, Indiana Department of Natural Resources—
Division of Fish & Wildlife, & Purdue Extension Entomology

Solve Pest Problems

Mobile phone



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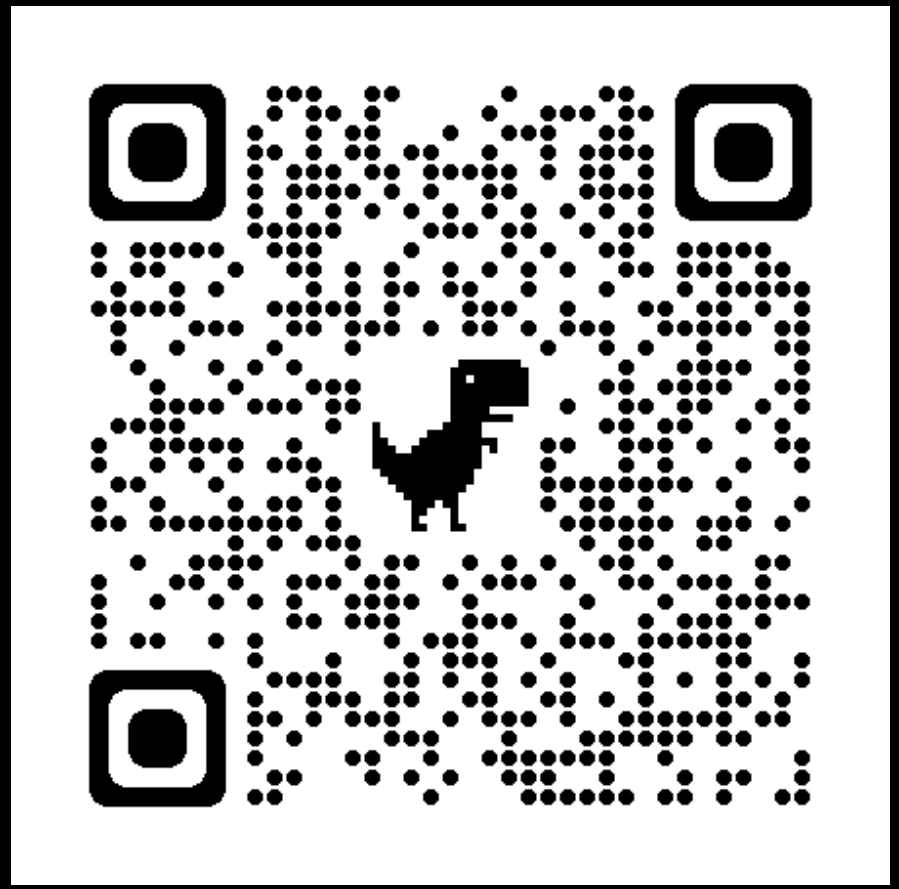
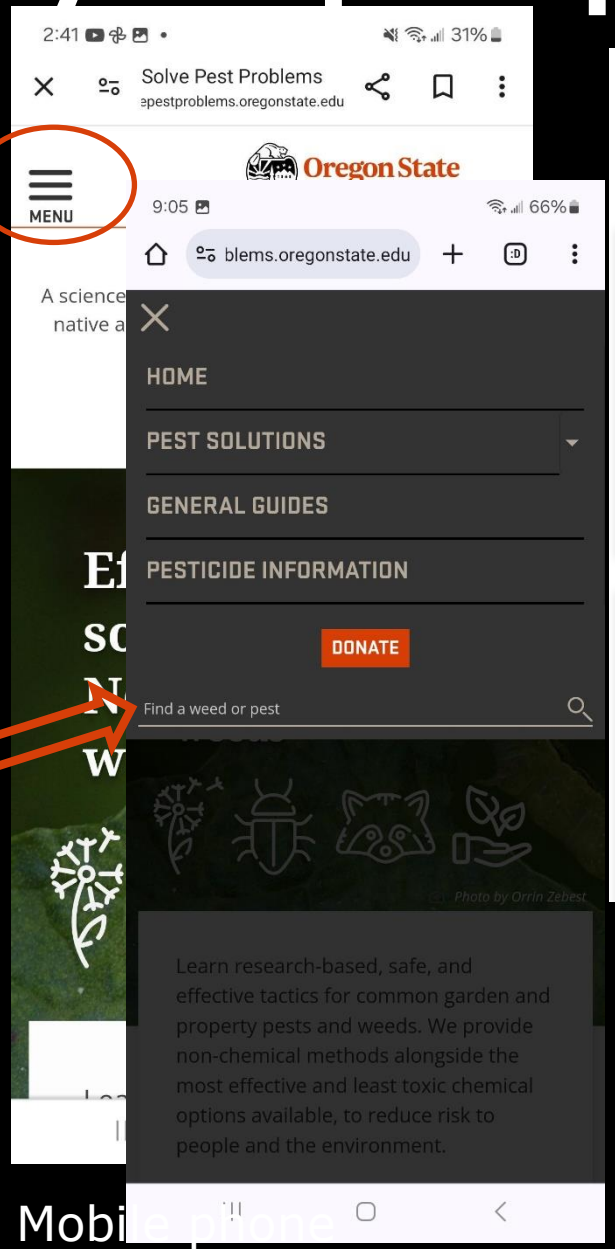
Solve Pest Problems

https://solvepestproblems.oregonstate.edu



What is your pest problem ?

- Science-based, low risk & effective pest solutions
- Specifically for home owners & landscapers
- Uses plan-language
- Mobile-friendly design with quality graphics



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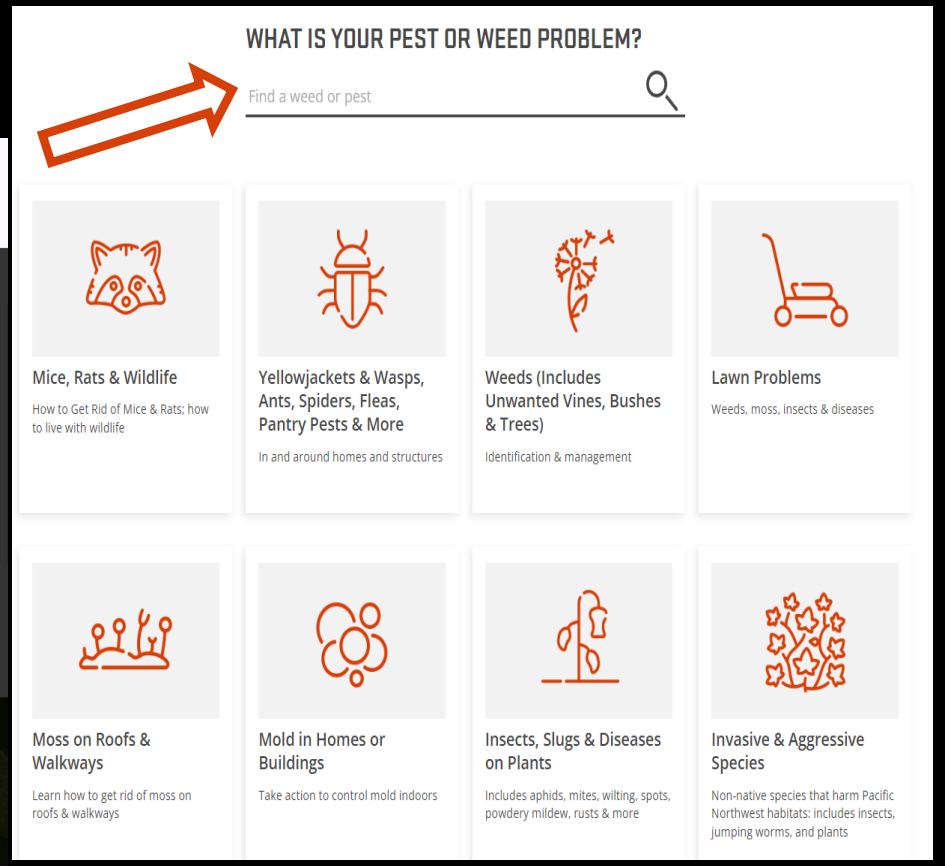

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Other relevant information

GENERAL GUIDES

Solve Plant Problems without Pesticides

65 practical tips. Often described as natural, non-chemical and mechanical methods.

Control Weeds without Weed Killer (Herbicides)

46 practical tips. Often described as natural, non-chemical, or mechanical methods.

Biological Pest Control Methods

16 practical tips to attract insect predators and natural enemies.

Prevent Lawn Problems

Grow dense grasses to prevent lawn problems.

IF USING WEED KILLERS (HERBICIDES), TAKE PRECAUTIONS & MINIMIZE RISKS

Herbicides are the most widely used type of pesticide product in homes and gardens in the United States.
(Source: U.S. Environmental Protection Agency EPA-733-R-04-001)

THE LABEL IS THE LAW

ALWAYS read the label before using herbicide products. The label is a legal document that provides information on how to safely use the herbicide. This helps avoid harm to human health and the environment. Using an herbicide in off-label ways is illegal. It can result in legal enforcement actions.

READ THE LABEL & Follow Instructions
It has instructions to protect you and the environment.

- Labels are different for every product and they often change over time.

Protect Plants You Want to Keep

- Glyphosate and similar herbicide ingredients damage both grass and broadleaf plants.
- Minimize spraying of foliage, stems, exposed roots, or the trunks of desirable shrubs or trees to avoid harm.
- Follow the label to avoid damaging the roots of trees and shrubs.

Avoid Wet, Windy, or Hot Weather
Use during favorable weather for best results.

- Don't spray when it's raining or when rain is

RELATED CONTENT

General Property & Pest Management Guides

Solve Pest and Weed Problems

Pesticide Information

Solve Pest and Weed Problems

Practical Lawn Care for Western Oregon

OSU Extension Service

Lawn Maintenance Calendar for Central Oregon

OSU Extension Service

Practical Lawn Establishment and Renovation

OSU Extension Service

Fertilizing Lawns

OSU Extension Service

Pesticides and Children

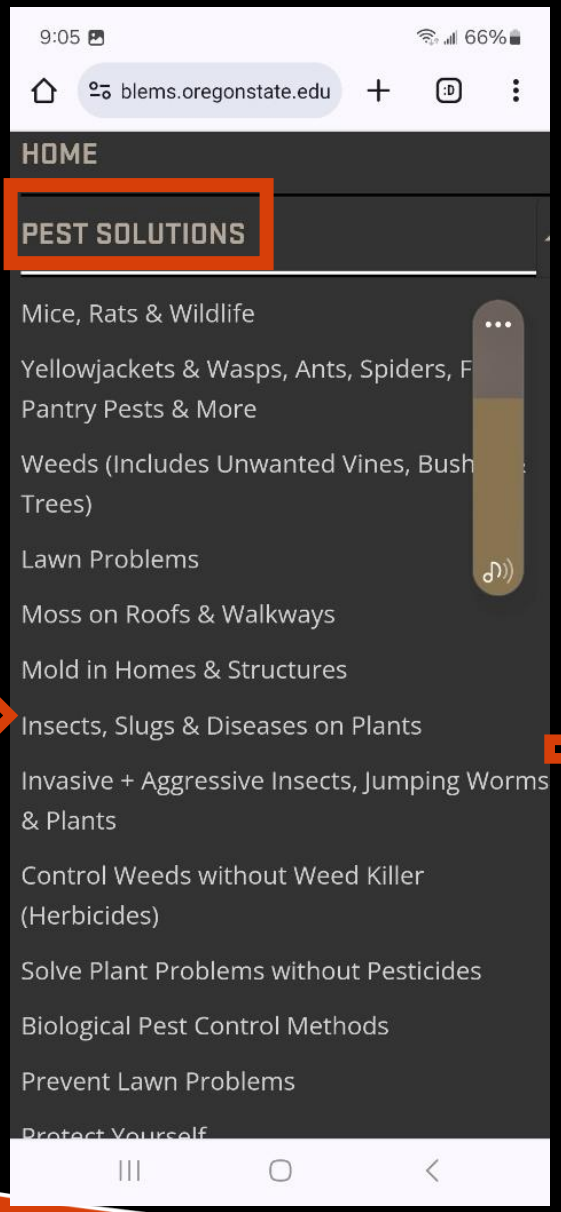
National Pesticide Information Center

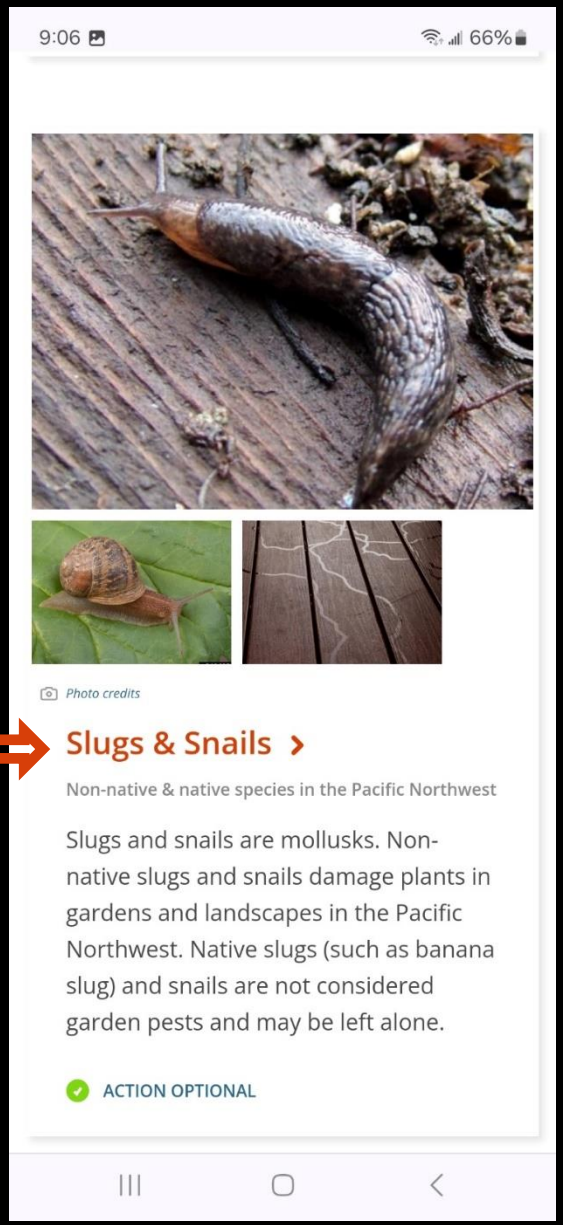
Pesticide Use Around Pets

National Pesticide Information Center

Searching for a specific pest problem ?

Mobile phone





Searching for a specific pest problem ?

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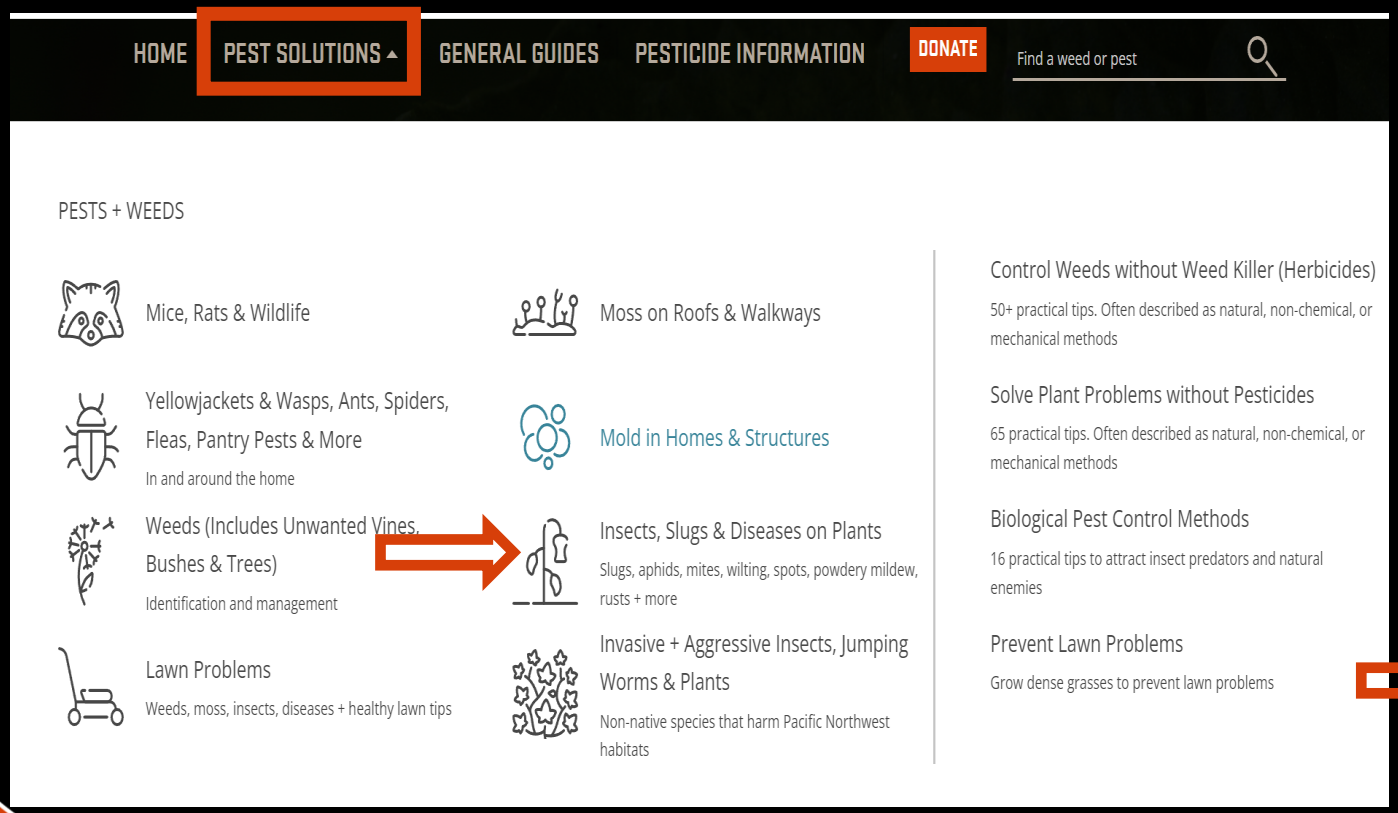
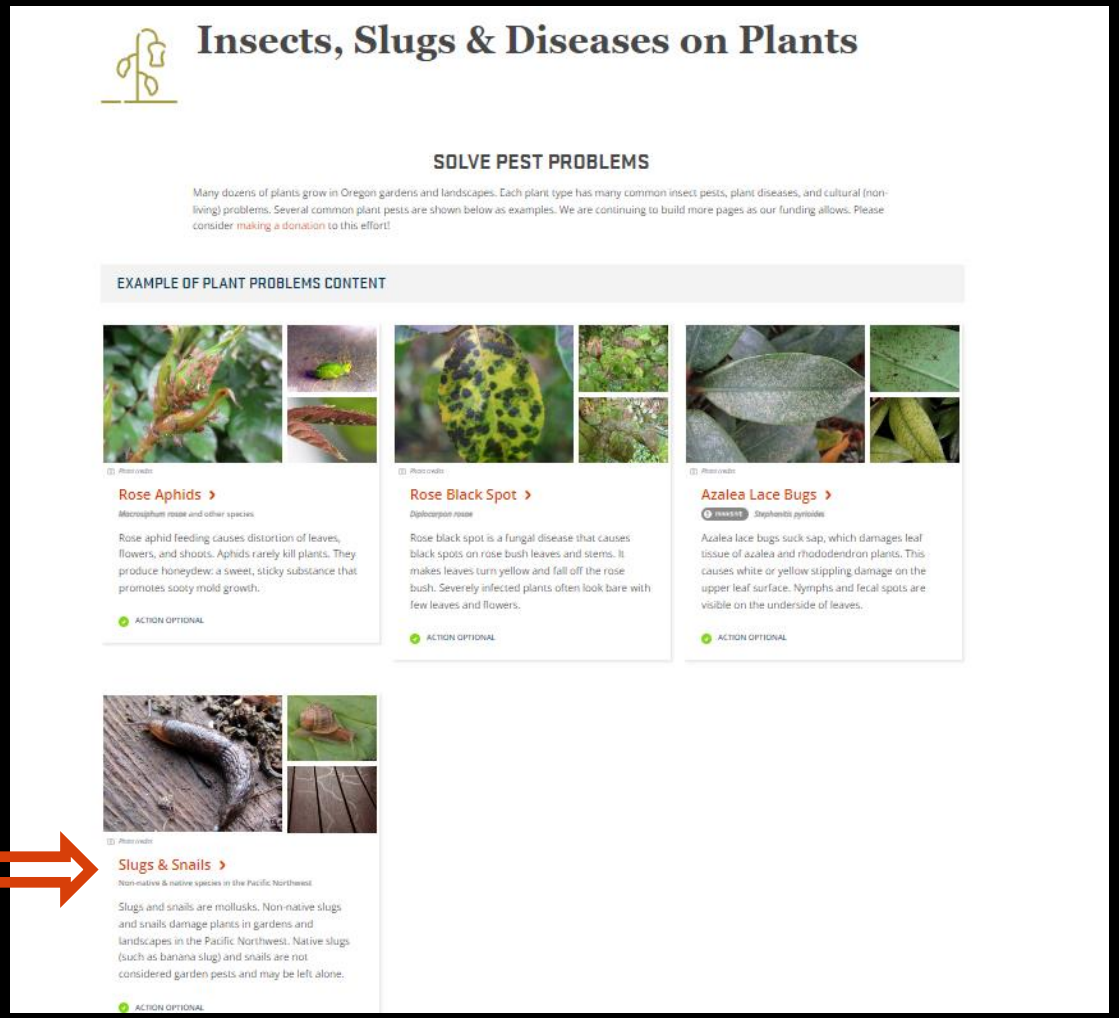
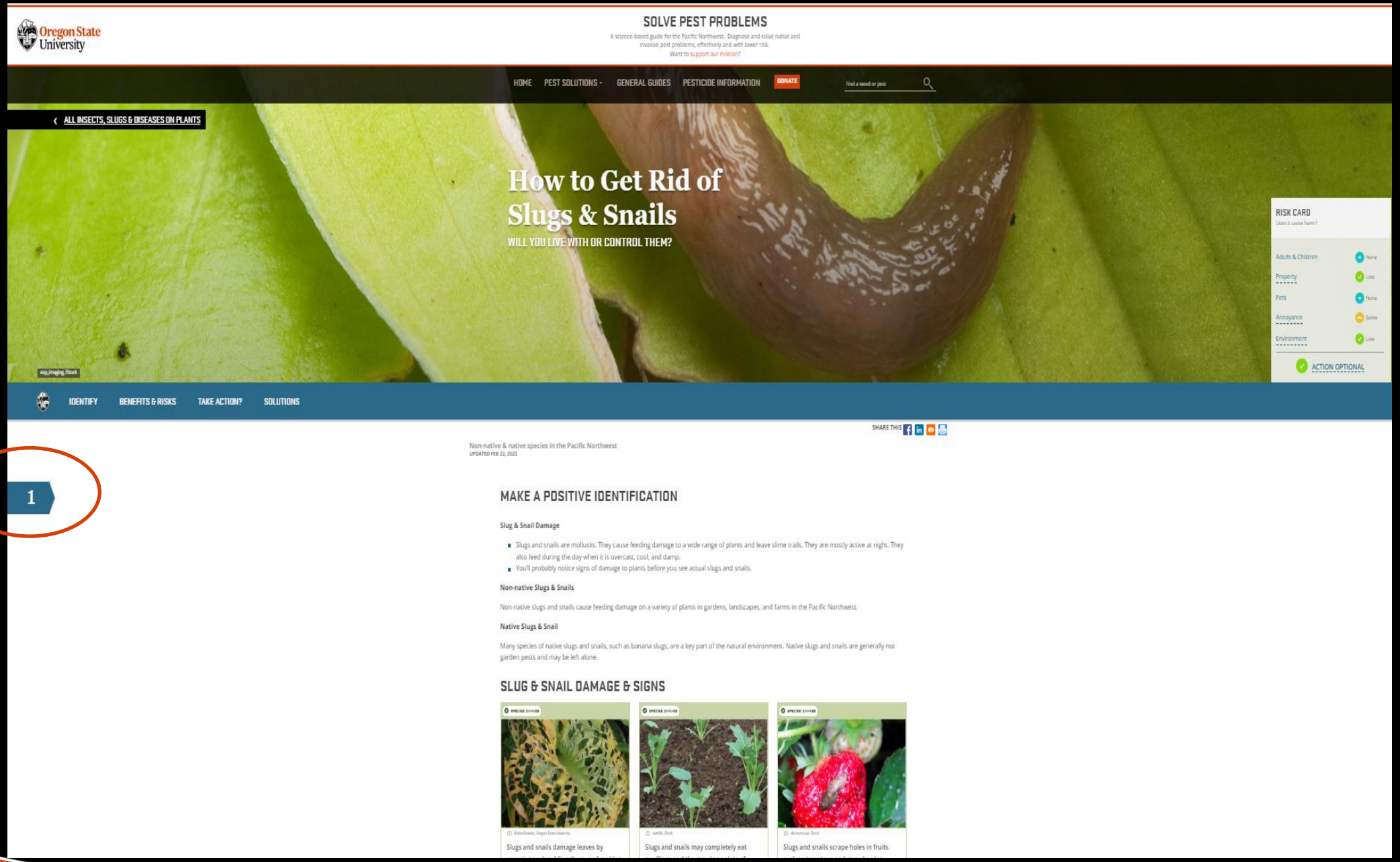





Oregon State University
SOLVE PEST PROBLEMS
A science-based guide for the Pacific Northwest. Diagnose and solve native and invasive pest problems, effectively and with lower risk.
Want to support our mission?
HOME
PEST SOLUTIONS
GENERAL GUIDES
PESTICIDE INFORMATION
DONATE
ALL INSECTS, SLUGS & DISEASES ON PLANTS
How to Get Rid of Slugs & Snails
WILL YOU LIVE WITH OR CONTROL THEM?
RISK CARD
Adults & Children
Property
Pets
Annoyance
Environment
ACTION OPTIONAL
IDENTIFY
BENEFITS & RISKS
TAKE ACTION?
SOLUTIONS
SHARE THIS
Non-native & native species in the Pacific Northwest
UPDATED FEB 22, 2023
1
MAKE A POSITIVE IDENTIFICATION
Slug & Snail Damage
Slugs and snails are mollusks. They cause feeding damage to a wide range of plants and leave slime trails. They are mostly active at night. They also feed during the day when it is overcast, cool, and damp.
You'll probably notice signs of damage to plants before you see actual slugs and snails.
Non-native Slugs & Snails
Non-native slugs and snails cause feeding damage on a variety of plants in gardens, landscapes, and farms in the Pacific Northwest.
Native Slugs & Snail
Many species of native slugs and snails, such as banana slugs, are a key part of the natural environment. Native slugs and snails are generally not garden pests and may be left alone.
SLUG & SNAIL DAMAGE & SIGNS
Slugs and snails damage leaves by
Slugs and snails may completely eat
Slugs and snails scrape holes in fruits

IDENTIFY BENEFITS & RISKS TAKE ACTION? SOLUTIONS Back to top

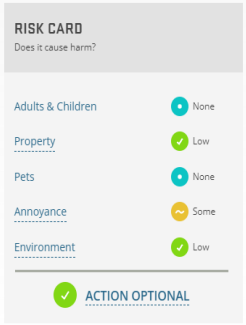
2

SLUGS & SNAILS BENEFITS

- Slugs and snails provide food for insects, birds, reptiles, amphibians, mammals, and other predators.

SLUGS & SNAILS RISKS

- Slugs and snails damage plants and make them look tattered.
- They can eat young plants to the ground and make crops such as strawberries unusable.
- Slugs and snails have also been implicated in the spread of plant diseases and human pathogens.



3

TAKE ACTION?

Take action to protect vegetable crops, strawberries, and ornamental crops if you can't tolerate

IDENTIFY BENEFITS & RISKS TAKE ACTION? SOLUTIONS Back to top

4

SOLUTIONS FOR SLUGS & SNAILS

For best results to control slugs and snails, use a combination of methods.

Monitoring & Timing

- Look for slugs and snails at night with a flashlight and/or under planting containers, boards, rocks, and debris.
- Control efforts in the fall and early spring will lower their numbers through the course of the growing season.

Non-chemical Methods

- Remove slug and snail hiding places such as under planting containers, rocks, and boards.
- Encourage slug and snail predators such as ground beetles, amphibians, and snakes. See Biological Pest Control Methods.
- Hand-pick slugs and snails and drop them into a container with soapy water.

TELL US WHAT YOU THINK

Take an **anonymous survey** to tell us about your experience using the Solve Pest Problems website.

HAVE A SUGGESTION?

Make a comment / provide feedback to help us improve this pest management information service. Also, upload original photos for consideration on this website.

SIGN UP FOR OUR NEWSLETTER

Yes! Subscribe me

HELP US BUILD

Please consider **making a donation** to help us build more pages about pest management and pesticide safety.

Poisoned? Get expert help. Immediately call Poison Help: 1-800-222-1222.

Weston Miller,
Project Founder,
OSU Extension Agent
until October 2022

Signe Danler,
Instructor of the
Master of Gardening
Online Program

Thomas A. Jima,
IPM Educator

Jessica Green,
Pesticide Safety Instructor,
and IPM Educator

Ebba Peterson
IPM Educator

and many, many more.....

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Oregon IPM Center

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