A Gardener's Guide to Integrated Pest Management

Adam Romero

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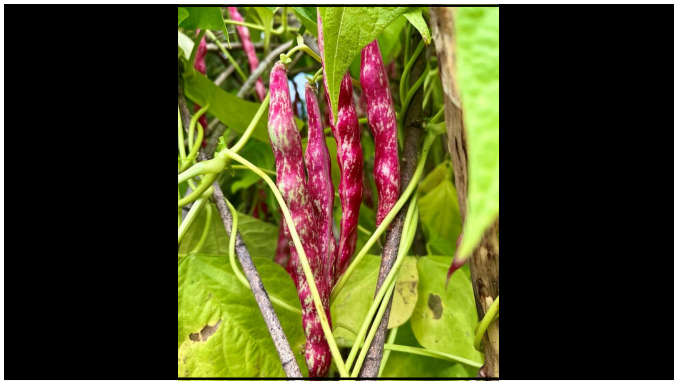

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Integrated Pest Management

Washington State University defines Integrated Pest Management (IPM) as:

"an effective and environmentally sensitive approach to pest management. IPM works by reducing sources of food, water, and shelter for pests and only *using* least-toxic pesticides when necessary. An effective IPM Program requires identifying and monitoring pest populations, and then selecting the most effective control methods with the least possible hazard to people, pets, and the environment."

The United States Department of Agriculture (USDA) defines Integrated Pest Management (IPM) as:

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

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"IPM does not mean simply switching from chemical pesticides to organic pesticides. Nor does it mean eliminating the use of all chemical pesticides completely. IPM is a strategy that uses various combinations of pest control methods, biological, cultural, and chemical in a compatible manner to achieve satisfactory control and ensure favorable economic and environmental consequences.' IPM is not one single action, it is a process, a series of steps that must be carefully thought out ahead of time. Each step depends upon the given situation, the given pest and your given ability, both physically and financially, to accomplish all of the steps."

Clemson University Agricultural Extension

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"An environmentally friendly, common-sense approach to controlling pests."

US Environmental Protection Agency

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An ecosystem-level approach to pest management using a combination of complementary methods to manage pests in a more sustainable manner and that only uses pesticides as a last resort. It is about creating the conditions in which pests do not thrive.

IPM is really about your relationship to the non-human organisms that inhabit your garden.

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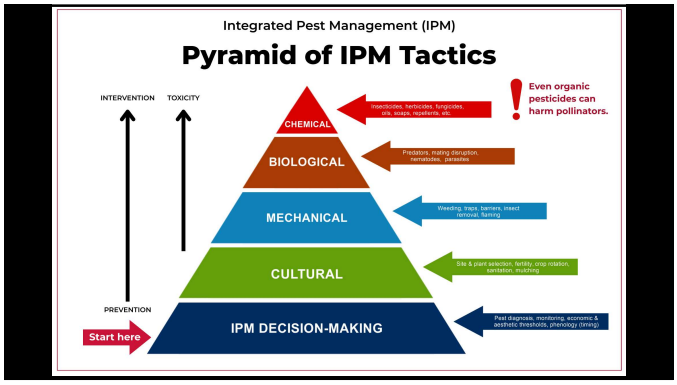

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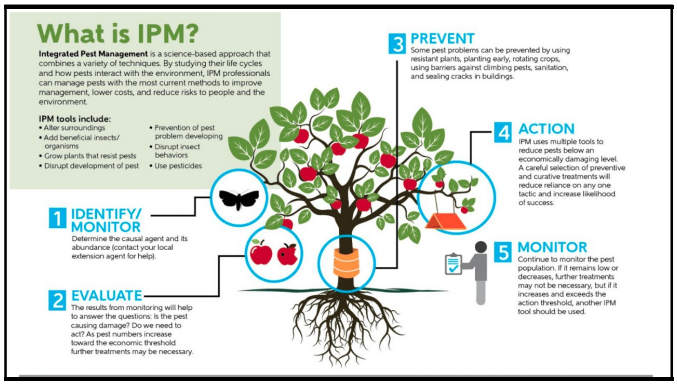

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1. Know your pest
2. What are my thresholds?
3. Choose the best management options
4. Prevention practices
5. Monitor and evaluate

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Pest – any insect, plant, animal, or pathogen that damages or interferes with desirable plants in our fields, garden, or homes. These also include organisms that impact human health, transmit disease, are nuisances, or that harm other parts of the ecosystem (University of California IPM).

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Know Your Pest

- IPM practices are geared to specific pests. You first step is to identify the pest and to confirm that it indeed is causing issues. Insects and pathogens that cause harm are often specific to plant type or species.
- Insect and pathogen identification can be tricky and takes practice. There are books and other online/AI resources available. WSU offers many IPM factsheets on specific crops and is often it is easier to start with the plant first.
- Be sure that plant damage matches cause. For example, some insects penetrate leaves and suck out nutrition, others eat edges of mine the center of leaves. Some pathogenic problems may look like insect damage, cold damage, or nutrient/pH concerns and vice versa.
- Life cycle matters. Often it is too late to prevent insect damage for that year. Management practices can differ by stage of life cycle.

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Insects are often thought of in good/bad terms. We as Master Gardeners' have signs saying that. But I hesitate to use those terms.

Insects are part of complex ecosystems. Insects transition through many phases. Sometimes insects may be beneficial or destructive. Some phases of growth may be beneficial or destructive.

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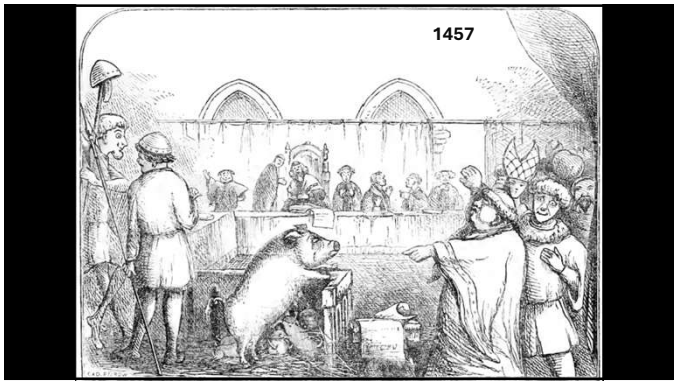

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What are your thresholds?

- When is the appropriate time to intervene? How many holes in my kale before I want to do something?
- Thresholds of action are specific to you and your values, to what you are growing, and to your labor.
- For example, if the plant you are growing is perfectly edible even with a little insect damage, how much effort do you want to put into its aesthetic appearance?
- For example, does the variety of apple you of the azalea you grow require more labor, money, or pesticides to achieve your desired results?
- For example, does the solution to the issue align with your personal gardening philosophy?
- Your thresholds and your clients' thresholds may not align.

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Choose the best management option

- Choose the best management option that fits your action thresholds
- Management options should start with the "least hazardous methods of pest control." (WSU)
- There are many types of interventions, such as cultural, physical, mechanical, and chemical.
- Cultural management is key for many bacterial and fungal disease
- Physical barriers and mechanical interventions work well for many insects
- For example, row cover cloths for cabbage moths; nylon barriers for codling moth, sticky tape for many insects that climb trees during certain life stages

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Cultural management

- Cultural controls are practices that reduce pest establishment, reproduction, dispersal, and survival. For example, changing irrigation practices can reduce pest problems, since too much water can increase root disease and weeds.
- Cultural practices also include crop rotation, resistant varietal selection, intercropping, sanitation/hygiene, and soil quality management.
- Cultural management is the care and labor that you put into your garden. It is about adjusting how you care for your plants in way that keeps pests from becoming too problematic.

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Physical and Mechanical

- Physical barriers or mechanical means of reducing pest populations.
- For example, physically removing pests or problematic parts of plants.
- Pruning is also an IPM tool.
- The use of traps or pheromones.
- Mulches for weed management
- Flame, vacuum, soil solarization methods.
- Or my favorite, using a water jet to rinse insects off plants

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Biological Control

- The use of insects or pathogens to manage other insects or pathogens
- One of the oldest forms of pest control
- Ex. Lady bug and the Los Angeles citrus industry (1890s)
- Still a major practice of some industrial growers
- Not as impactful for the home gardener.
- Beware internet claims of using "good" insects to fix your problems.
- WSU offers limited biocontrol solutions for the home gardener.

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Prevention

- This includes design.
  - You can design your garden and landscaping in ways to reduce pest management. Sometime this means compromise.
- Cause may be multifaceted. Many pests and diseases require a non-target host.
  - Ex. Removing juniper species will reduce rust damage or stopping ants to prevent aphid or scale damage.
- Be careful with your fertilization practices. Scaling back how much, the timing, or the method of fertilization can have dramatic effects on pest populations.
- Be careful with your irrigation practices. Many bacterial and fungal diseases are exacerbated by overhead irrigation.
- Stressed plants are more susceptible to bacterial, fungal, and insect issues.
- IPM is a long-term strategy to reduce problematic pest populations below your thresholds of action.

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Monitor and Evaluate

- Short term
  - Are my IPM practices maintaining the problematic pest below my thresholds?
  - Are my IPM practices meeting my gardening needs, desires, and philosophy?
- Long term
  - Are the plant varieties I grow or how my garden is structured the best for my IPM needs?
  - Are my current practices adequate to meet my long-term desired IPM goals?
- Keep a garden diary/photo journal

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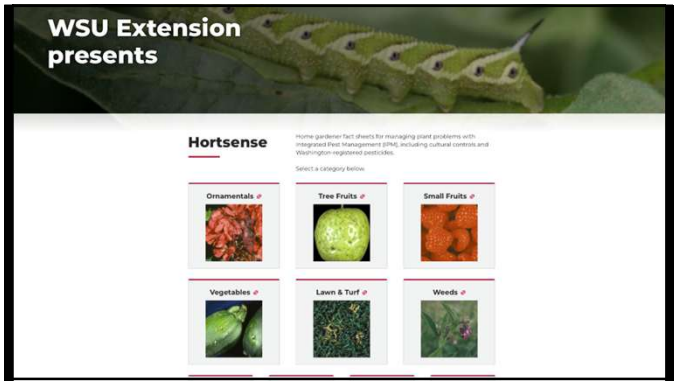

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Trade patterns continuously introduce new species to our ecosystems. Climate change creates the conditions for other insects/pathogens to become pests.

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Ex. Freezing temperatures have been a part of my IPM strategy since I moved to the Cascade foothills. Normally a hard freeze in October would knock back cabbage moth populations, But that did not happen until December this year.

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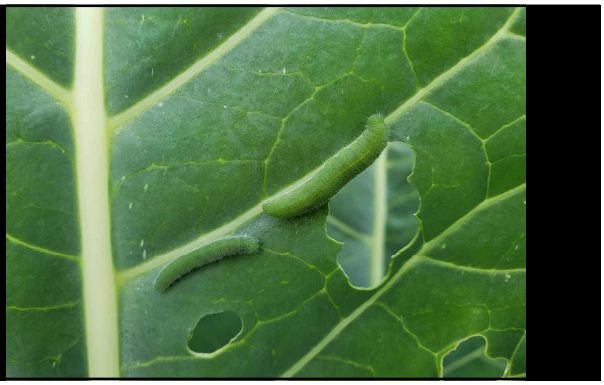

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Ecologically-Based Pest Management (EBMP)

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Ecologically-Based Pest Management (EBMP)

- Rapidly growing area of IPM research first centered in CA wine country
- Places strong emphasis on habitat management, natural enemy augmentation and conservation, and animal integration.
- Tends to be more costly (more labor intensive) than traditional IPM and may not produce the consistent results that IPM-based chemical applications do.
- Many who practice/research EBMP argue that it returns to some of the original values of IPM theory that have been lost of watered down as IPM went from niche agricultural practice to a widespread approach.
- Habitat management, the use of hedgerows/cover crops, intercropping/crop rotation, no/low-tillage and thinking through multiple temporal/spatial scales (total systems approach) are central tenants of EBMP
- However, this might mean a complete rethinking of how we structure our gardens and yards and push us to reimagine our relationship with animals in the garden
- EBMP shows great promise for home gardeners

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Rethink order and messiness

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Oregon State University
Oregon IPM Center
Native Hedgerow Planting:
10 Years Later

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Western IPM Center
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A Humble Hedgerow Serves Pollinators and Beneficial Insects
by Steve Elliott
August 29, 2023
The native flowers in this hedgerow provide food for wild and managed bees throughout the summer.
In an expansive field of organically grown blueberries at Humbug Farms in Independence, Oregon, the most interesting rows aren't blueberries at all.

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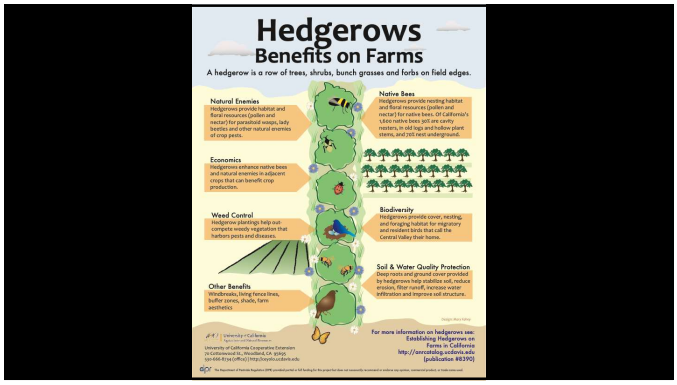
Hedgerows
Benefits on Farms
A hedgerow is a row of trees, shrubs, bunch grasses and forbs on field edges.
Natural Enemies
Hedgerows provide habitat and floral resources (pollen and nectar) for parasitoid wasps, lady beetles and other natural enemies of crop pests.
Economics
Hedgerows enhance native bees and natural enemies in adjacent crops that can benefit crop production.
Weed Control
Hedgerow plantings help out compete weedy vegetation that harbors pests and diseases.
Other Benefits
Windbreaks, living fence lines, buffer zones, shade, farm aesthetics
Native Bees
Hedgerows provide nesting habitat and floral resources (pollen and nectar) for native bees. Of California's ~1,600 native bees 30% are cavity nesters, in old logs and hollow plant stems, and 70% nest underground.
Biodiversity
Hedgerows provide cover, nesting, and foraging habitat for migratory and resident birds that call the Central Valley their home.
Soil & Water Quality Protection
Deep roots and ground cover provided by hedgerows help stabilize soil, reduce erosion, filter runoff, increase water infiltration and improve soil structure.
For more information on hedgerows see:
Establishing Hedgerows on Farms in California
http://anrcatalog.ucdavis.edu
(publication #8390)

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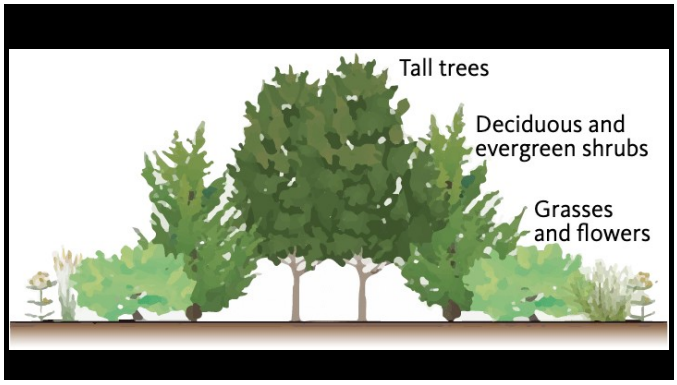
Tall trees
Deciduous and evergreen shrubs
Grasses and flowers

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Reduce landscape fragmentation

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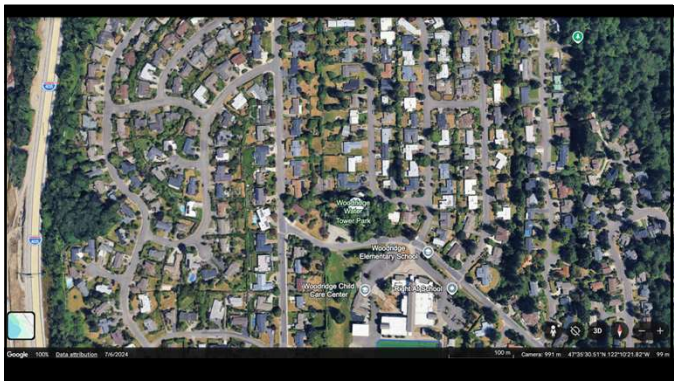

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Prey/pests eaten

- Mites
- Aphids
- Leafhoppers
- Whiteflies
- Thrips
- Mealybugs
- Caterpillars
- Insect eggs
- Scale insects

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No pesticides, provide overwintering habitat, no/fewer lawns

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Reduce landscape fragmentation

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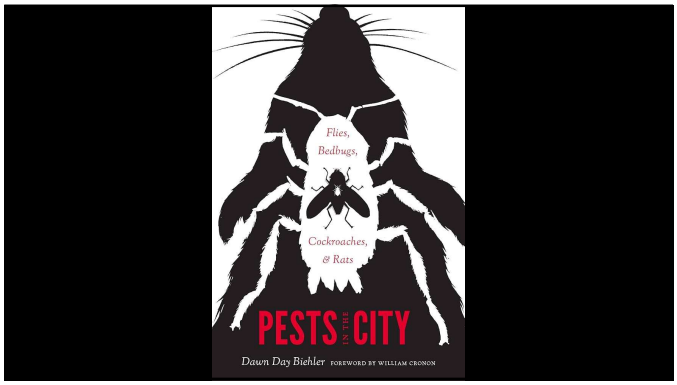

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Community-based/community-wide pest management practices

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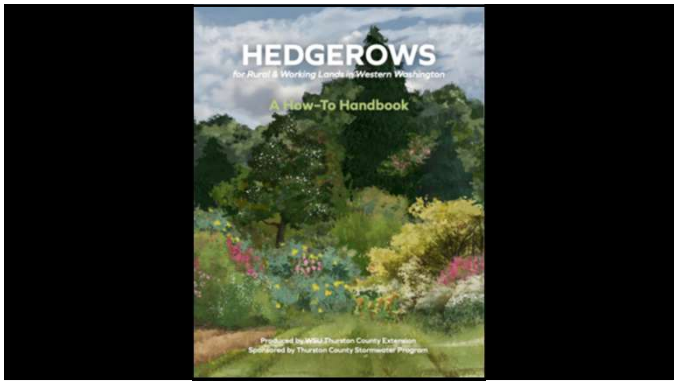

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Garden Symphyla

- Not true insects. Soil-dwelling myriapods, aka "garden centipede"
- Many native species occur in the PNW, but *Scutigerellidae immaculata* is the only species currently causing damage.
- California, Oregon, and Utah growers reported significant crop damage as early as the 1920s
- They can cause a variety of symptomatic damage to a broad range of plants. Ex. Stunted growth, seedling and shoot damage, reduced vigor, etc.
- Damage results from small holes eaten in the roots of the in the host plant/seed.
- Damage is most often found in high-organic matter soils with good drainage.
- In the PNW, most damage occurs to vegetable growers, especially when they don't practice spring tillage.
- Increasingly an issue for home gardeners

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Organic gardening and low-input gardening practices can exacerbate the presence of garden symphyla. Ex. Well-composted manure added to soil.

We could consider garden symphyla damage a form of cultivation-caused disease.

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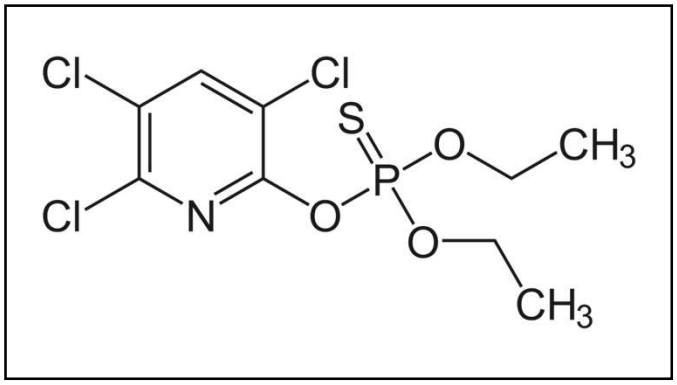

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Irrigated “healthy” well-structured soils are the most vulnerable to GS damage. Ex. GS move through holes in the soil created by other organisms.

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GS concerns

- Identifying and diagnosing GS related problems is very difficult for the home gardener
- Ecosystem knowledge of GS is limited
- Their symptoms mimic many related root diseases and cultural problems
- Mostly affect cole vegetable crops (brassicas) but can also damage bare root trees, perennials, and annuals.
- Potato bait method can be used to concentrate GS for analysis. Bury half a potato in the ground and cover, wait 2-5 days.
- Check with a diagnostic expert to confirm presence.
- Once you know you have them in your soils, you can then use plant decline as a proxy for their presence. They move.

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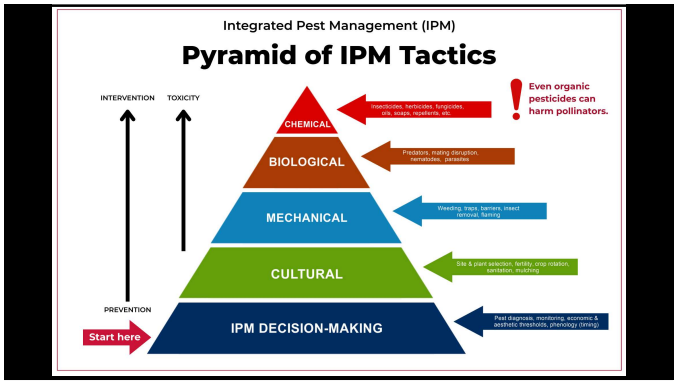

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GS IPM

- Prevention is always the best approach, but prevention is not really an option in this case. GS are present in most soils. Populations become problematic in highly managed alluvial soils.
- Soil populations correlate with high organic matter.
- Cultural/mechanical practices include soil compaction, tillage, rethinking compost/manure practices.
- Timing matters. Most damage occurs to young plants and seeds. Ex. Plant larger transplants rather than sowing seed. Does not work for all plants.
- Tillage has been shown to significantly reduce GS populations in the uppermost soil layer. The more destructive tillage the better. Trying to reduce soil pore connectivity.
- Cover crops have been shown in some studies to increase predatory mite populations, but results are inconsistent.
- Traditional IPM practices like crop rotation do not reduce GS populations.
- Flooding has been shown to be very effective at reducing GS populations.

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Resources

WSU Hortsense IPM factsheets for specific crops/plants and issues
https://hortsense.cahnrs.wsu.edu

University of California IPM website
https://ipm.ucanr.edu

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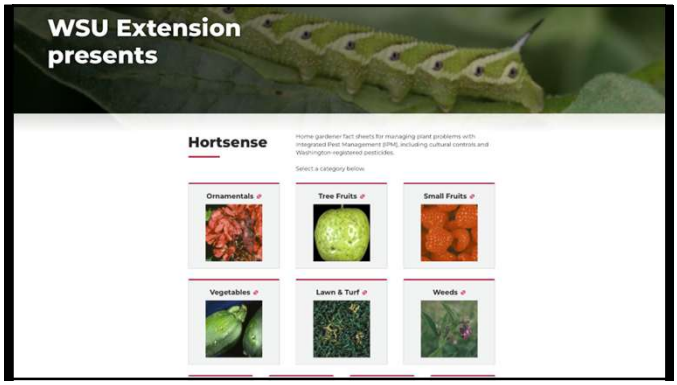

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Some closing thoughts

IPM is not a singular practice that you do in the garden when you have a pest issue. It is a collection of short and long-term ecosystem level practices that help you meet your desired goals. Identifying what you want from your garden is key to determining your thresholds of actions.

Prevention of insect and pathogen problems is best way to deal with insects and pathogens. Least toxic options are always the best solution. But some issues may not have a solution, or at least one that aligns within your philosophy or labor expectations.

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What do you want from your garden? What are your goals? How do those goals align with the potential pest management practices needed to achieve them?

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Questions?

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