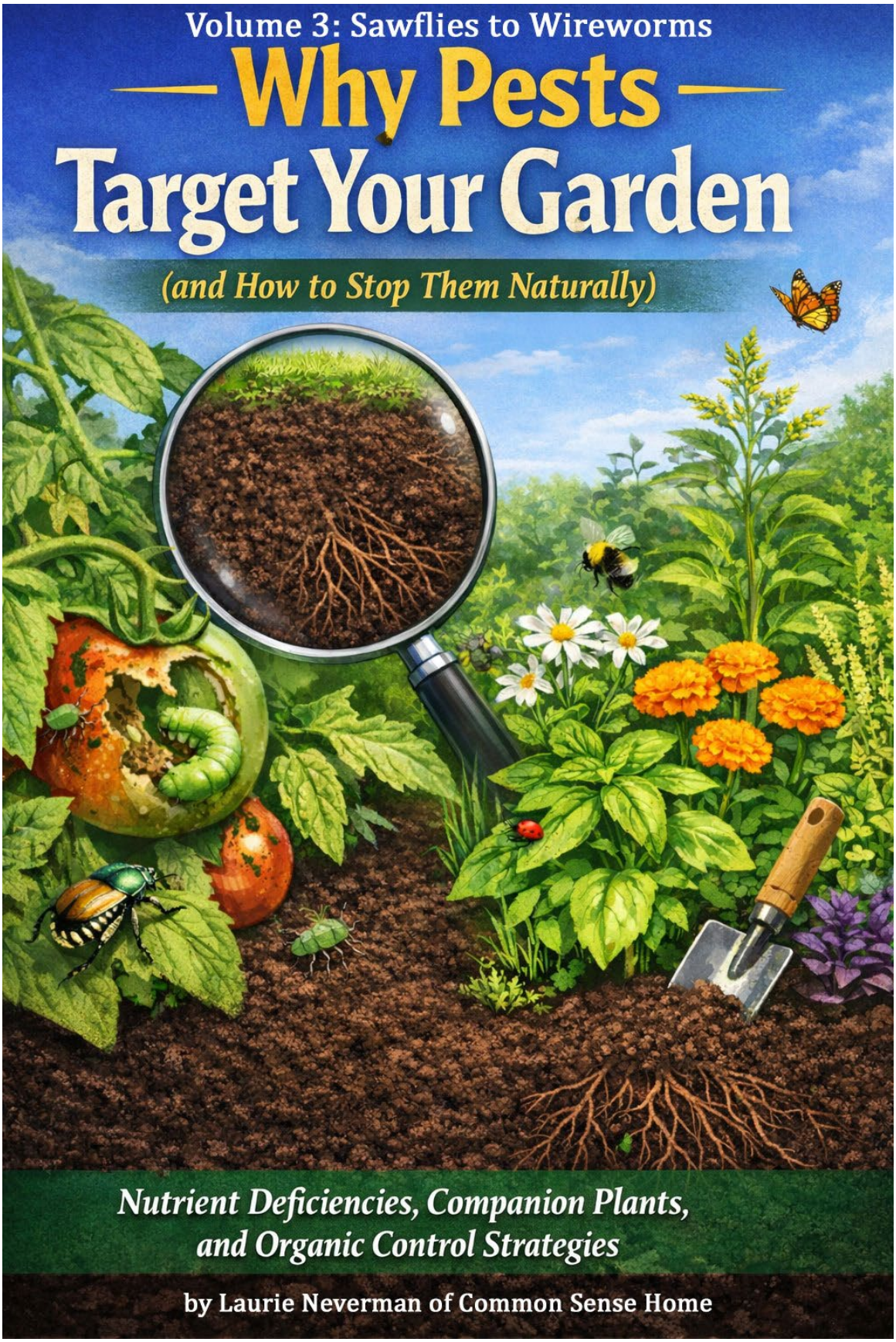
Volume 3: Sawflies to Wireworms
Why Pests Target Your Garden
(and How to Stop Them Naturally)
Nutrient Deficiencies, Companion Plants, and Organic Control Strategies
by Laurie Neverman of Common Sense Home

Why Pests Target your Garden (and How to Stop Them Naturally)

Organic Pest Control Guide Volume 3

Sawflies to Wireworms

By Laurie Neverman

To learn more about Practical Solutions for Resilient and Abundant Living,

visit Common Sense Home at:

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Contents

The Pest Control Tool Box

I've read dozens of gardening books and hundreds of articles, plus I've been gardening in some form or another for over 50 years. From helping my mom in our sprawling country garden, to container plants in college, to our raised cedar bed garden in the suburbs, to a tiny plot in the city while we were building our current home, back out to the country again, I've seen a lot of different pests. I've helped our readers troubleshoot pests in their gardens, too.

I wanted to pull together all the different techniques for organic pest management in easy to follow guides, where you could look up your pest and have a full "set of tools" for control. This guide contains:

- Tips for Identifying Pests and Their Damage
- Companion Plant Recommendations
- Barriers & Physical Controls
- Sprays & Dusts
- Natural Fertilizers and Foliar Feeds to address nutrient deficiencies that attract insects to plants

Note: Many of the pests have similar feeding habits, and are associated with similar nutrient deficiencies. Feel free to mix and match controls and fertilizers to find the solution that works best in your garden. For instance, the entries for aphids and peach tree aphids offer different options to deal with very closely related pests. Work with what you have available.

If you want to keep things simple, start with calcium as a foliar feed. It helps with just about everything.

Why have fertilizers and foliar sprays in a pest control book?

According to Dr. Arden Andersen in his book, "The Anatomy of Life& Energy in Agriculture" (and other researchers), pests are more attracted to plants when those plants are lacking in specific nutrients. Address these nutrient deficiencies, and you'll see a dramatic improvement in plant health and vigor – and fewer pests. I combined Dr. Andersen's list of nutrient deficiencies associated with specific pests with fertilizer and foliar feed recommendations that address those deficiencies.

Applying foliar sprays can quickly correct nutrient imbalances and strengthen plants. The fertilizers and foliar feed recommendations are based on regenerative gardening principles. To strengthen plant defenses and correct mineral imbalances, regenerative practices focus on bioavailable, organic amendments.

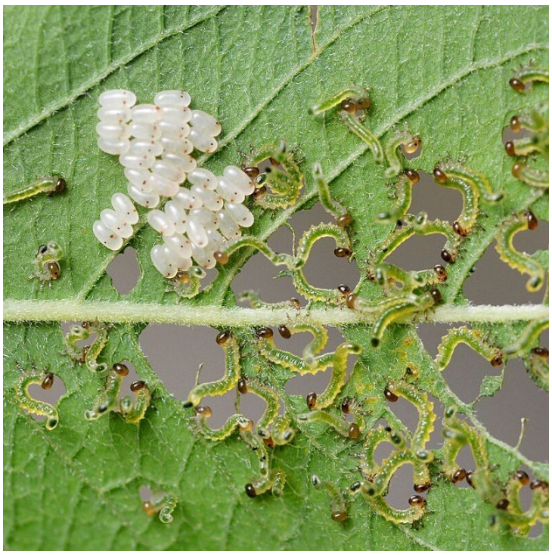
To use these guides, identify your insect, and then choose the strategy or combination of strategies you want to use for control. Each insect entry includes a description of the pest and the damage it does to help with identification.

When using foliar feeds, remember the following tips:

- Apply foliar sprays early in the morning or in the late afternoon to maximize nutrient absorption.
- Alternate different foliar feeds every 7-10 days to maintain a balance of nutrients and support overall plant health.
- **Avoid overusing nitrogen-based fertilizers, as excessive nitrogen can lead to weak, pest-attracting growth.**

Sawflies

Sawflies: Identification, Damage, and Nutrient Link



Sawflies are small, non-stinging wasp-like insects. Adults resemble flies or wasps, while larvae resemble caterpillars but have more than five pairs of abdominal prolegs (a key way to distinguish them from true caterpillars).

These little buggers show up and can quickly engulf a large leaf or section of a plant. We get them most commonly on our volunteer sunflower plants.

Damage includes:

- Skeletonized leaves or large sections of foliage stripped down to the veins
- Ragged or chewed leaf margins
- In severe infestations, complete defoliation of branches or young plants

When sawflies attack, it's often a signal that the plant is struggling to maintain strong cellular structure and systemic defenses due to deficiencies in calcium and phosphorus, as well as compromised immune function from low iron, copper, vitamin C, and selenium.

Control Strategies

Cultural Practices

- **Manual removal**: Handpick or knock larvae into soapy water in the early morning.
- **Pruning**: Remove infested stems or branches, especially in the early stages of infestation.
- **Rinse leaves regularly**: A strong blast of water can dislodge young larvae before they mature.

Companion Plants

- **Garlic and onion**: Emit sulfur compounds that deter sawfly adults from laying eggs.
- **Lavender and rosemary**: Aromatic herbs that help mask the scent of susceptible host plants.
- **Yarrow and dill**: Attract beneficial parasitoids and predatory wasps that feed on sawflies.

Barriers

- **Floating row covers**: Use on young plants in spring to block adults from laying eggs.
- **Sticky traps**: Yellow traps can catch adults and alert you to their presence early.

Sprays and Dusts

- **Neem oil**: Effective at disrupting hormone function in young larvae. Spray early in the morning or late evening.
- **Insecticidal soap**: Use on larvae during early stages of feeding—ensures direct contact.

- **Kaolin clay**: Creates a barrier film that discourages egg-laying and feeding behavior.
- **Homemade garlic-chili spray**: Blend garlic, cayenne pepper, and soap in water; spray weekly.

Note: Avoid Bt (Bacillus thuringiensis) products. Sawflies are not true caterpillars and are unaffected by Bt strains used for moth larvae.

Encourage Natural Predators

- **Birds**, especially chickadees and wrens, feed on sawfly larvae—provide nesting habitat nearby.
- **Parasitic wasps and ground beetles** also target sawfly larvae. Avoid synthetic sprays that harm these allies.

Fertilizer and Foliar Spray Recommendations

Soil Amendments

- **Crushed eggshells or oyster shell lime**: Boost calcium over time and improve soil pH if acidic.
- **Rock phosphate or bone meal**: Slow-release phosphorus source to support root health and flower production.
- **Iron sulfate** or **iron-rich compost**: Especially important in clay or alkaline soils.
- **Copper sulfate (low dose)**: Or apply a dilute seaweed extract, which includes copper and other trace minerals.

- **Selenium source**: Incorporate mustard meal or add trace selenium via seaweed-based amendments.

Foliar Feeds

Broad-Spectrum Micronutrient Tea

- *Comfrey + nettle tea*: High in calcium, phosphorus, iron, and vitamin C. Ferment for 5–7 days and dilute 1:10 for foliar use.

Eggshell + Vinegar Extract

- Soak finely crushed eggshells in vinegar for 1–2 weeks. Strain and apply at 1–2 tbsp per gallon. Provides plant-available calcium.

Citrus Peel Infusion

- Soak organic citrus peels in water or vinegar for 5–7 days. Strain and spray at 1:10 dilution for vitamin C and light antimicrobial protection.

Micronutrient Mineral Blend

- Create a foliar from dried seaweed or kelp powder (1 tsp per gallon), plus a few drops of molasses to enhance microbial activity and trace mineral uptake.

Seed Corn Maggots

Seed Corn Maggot: Identification, Damage, and Nutrient Link

Seed corn maggots are the larval stage of a small, grayish-brown fly. The maggots are slender, pale white, and legless, typically found burrowing into seeds or seedlings.

Damage appears as:

- Poor germination or seedling emergence
- Hollowed-out seeds or decaying roots
- Wilting or stunted seedlings that die shortly after sprouting

Their presence typically signals that the plant and surrounding environment are lacking in essential structural and energy-supporting nutrients—**calcium** (for cell wall strength), **phosphorus** (for root and energy development), **copper** (for lignin formation and enzyme activity), and **carbohydrates** (critical for early root and immune development). Cool, wet soils with decaying organic matter exacerbate susceptibility.

Control Strategies

Cultural Practices

- **Avoid early planting in cold, wet soils**: Wait until soil temps are above 60°F for faster seedling growth and reduced larval activity. (Flint corn is significantly more tolerant of cold soils and wet conditions than sweet corn, making it a better choice for early spring planting in cooler climates, while sweet corn needs warmer soils (above 50-60°F) for

germination and struggles with cold, wet conditions, with some supersweet varieties being particularly sensitive. Dent corn is also more cold tolerant.)

- **Practice crop rotation**: Avoid back-to-back planting of susceptible crops like corn, beans, peas, and brassicas in the same soil.
- **Minimize raw organic matter in planting rows**: Well-composted material is less likely to attract egg-laying flies.

Companion Plants

- **Marigolds**: Help deter root-dwelling pests and enhance general soil bioactivity.
- **Borage and chamomile**: Improve microbial diversity and nutrient cycling, supporting early root health.
- **Clovers and vetch (used in rotation or cover cropping)**: These plants promote mycorrhizal fungi, improving phosphorus uptake and carbohydrate balance.

Barriers

- **Floating row covers**: Install immediately after sowing to exclude adult flies from laying eggs in the soil.
- **Collars or soil drapes**: Use mulch collars around direct-sown seeds or transplant bases to limit access to the soil surface.

Sprays and Soil Drenches

- **Garlic-chili-soap spray**: Repels adult flies when sprayed lightly over soil surface.

- **Neem oil soil drench (diluted)**: May reduce larval survival when applied to seed furrows, but must be used with care to avoid overuse.

Dusts

- **Wood ash**: Lightly dusted over seed rows, it raises local pH, provides potassium, and discourages egg-laying.
- **Diatomaceous earth**: Can be sprinkled in seed furrows before planting to deter maggot movement—but be cautious not to dry out soil.

Fertilizer and Foliar Spray Recommendations

Soil Amendments

- **Crushed eggshells or gypsum**: For plant-available calcium; gypsum is preferable in neutral-pH soils.
- **Bone meal or soft rock phosphate**: Slow-release phosphorus source that supports seedling root development.
- **Molasses or compost tea drenches**: Feed soil microbes and enhance carbohydrate levels around root zones.
- **Copper**: Use low-dose copper sulfate or seaweed-based amendments; compost with trace copper (e.g., leaf mold or well-rotted manure) also helps.

Foliar and Root-Zone Feeds

1. Eggshell Vinegar Calcium Extract

- Soak finely crushed eggshells in apple cider vinegar for 1–2 weeks. Strain and apply at 1–2 tbsp per gallon of water as a foliar or seedling drench.

2. Fermented Comfrey or Nettle Tea

- Rich in phosphorus and trace minerals. Steep in water 5–7 days, strain, dilute 1:10, and apply as a foliar spray or root drench.

3. Molasses + Seaweed Microbial Boost

- Mix 1 tbsp blackstrap molasses and 1 tbsp liquid seaweed into 1 gallon of water. Spray or drench to support plant immune response, trace minerals (including copper), and carbohydrate development.

4. Aerated Compost Tea

- Brewed with worm castings, kelp, and molasses for 24–36 hours with aeration. Apply as a drench for seedling vigor and microbial inoculation.

Spider Mites

Spider Mites: Identification, Damage, and Nutrient Link

Spider mites are tiny, spider-like arachnids that are often reddish, yellow, or green in color. They thrive in dry, dusty conditions and often go unnoticed until populations explode. Look for:

- Fine webbing on leaves and stems
- Speckled, yellowing, or bronzed foliage
- Leaf drop or scorched-looking patches

Spider mite infestations frequently occur in plants lacking **calcium** (cell wall integrity), **phosphorous** (energy flow and root resilience), **iron** (chlorophyll synthesis), and **copper** (enzyme activity and lignin strength). These deficiencies weaken plant defenses and make them more vulnerable to sap-sucking pests like spider mites.

Control Strategies (see also “Mites”)

Companion Plants

- **Coriander** and **dill**: Attract predatory insects like lacewings and predatory mites.
- **Chrysanthemums**: Contain pyrethrins, which can help repel spider mites naturally.

- **Garlic and onions**: Repel mites when interplanted with susceptible crops.
- **Bush beans**: Can act as a trap crop; monitor and remove infected plants promptly.

Barriers and Environmental Controls

- **Shade cloth or misting**: Reduces heat stress and lowers dust buildup, which discourages mites.
- **Mulch**: Retains soil moisture and stabilizes microclimate, reducing mite-favorable conditions.
- **Strong water spray**: Physically dislodges mites from leaves when done in the morning (avoid overuse on fungal-sensitive crops).

Sprays

- **Neem oil** (1–2% dilution): Effective against all mite life stages; apply every 5–7 days until under control.
- **Insecticidal soap**: Kills mites on contact; use in early morning or late afternoon to avoid leaf burn.
- **Garlic-chili spray**: A deterrent that also supports microbial activity on the leaf surface.

DIY Garlic-Chili Spray:

- Blend 1 head of garlic and 2 hot peppers in 1 qt water. Let sit 24 hours, strain, and dilute to 1 gallon. Add a few drops of castile soap. Spray on undersides of leaves.

Dusts

- **Diatomaceous earth**: Useful for soil applications and leaf undersides (avoid inhalation, and do not apply when flowering to protect pollinators).
- **Clay-based powders** (e.g., Surround WP): Create a physical barrier that makes it harder for mites to feed and reproduce.

Fertilizer and Foliar Spray Recommendations

Soil Amendments

- **Crushed eggshells or gypsum**: Adds calcium; gypsum preferred where pH needs to stay stable.
- **Soft rock phosphate or bone meal**: Long-lasting phosphorus sources to improve root strength and energy flow.
- **Iron sulfate or chelated iron**: Best for chlorosis-prone soils; integrate into compost teas or directly into soil.
- **Seaweed or kelp meal**: Rich in bioavailable copper and trace minerals that support pest resistance and plant immunity.

Foliar Feeds

1. Eggshell-Vinegar Calcium Extract

- Steep 1 cup finely crushed eggshells in 2 cups of apple cider vinegar for 7–10 days. Strain and dilute at 1–2 tablespoons per gallon of water. Spray bi-weekly.

2. Fermented Comfrey Tea

- High in phosphorus and iron. Steep chopped comfrey in water for 5–7 days, then strain and dilute 1:10 for foliar use.

3. Seaweed + Molasses Spray

- Mix 1 tbsp liquid seaweed and 1 tbsp unsulfured blackstrap molasses per gallon of water. Spray every 10–14 days to improve trace mineral uptake and support microbial foliar activity.

4. Aerated Compost Tea

- Brew compost tea with worm castings, kelp, and molasses for 24–36 hours with aeration. Apply to leaves and roots to increase beneficial microbial populations and overall plant resilience.

Spittlebugs

Spittlebugs: Identification, Damage, and Nutrient Link

Spittlebugs are small, wedge-shaped insects (nymphs resemble frothy masses) known for the foamy "spit" they produce on stems and leaves. Adults resemble small leafhoppers and are typically brown or green. The nymphs hide inside the frothy mass, which protects them from predators and desiccation.

In our area, I see the “spit” regularly in strawberry patches. The commercial growers hate them (and will typically spray for them) because they can cause deformed berries. Once in a while I find a blob of the “spit” in the garden, but usually on edge plants or weeds where it’s not likely to cause much damage. If it’s on a plant I want to protect, I wash off the “spit”, and that usually takes care of the problem.

Damage includes:

- Wilting or stunted growth
- Deformed leaves
- Reduced yield or flower development
- Honeydew and sooty mold in heavy infestations

Spittlebug attacks are more prevalent on plants lacking **calcium** (for strong cell walls), **phosphorous** (vital for root development and sugar movement), **iron** (for chlorophyll formation), and **vitamin C**, which plays a role in plant immune signaling. Plants with these deficiencies have weakened vascular and metabolic systems that make them more attractive to sap-sucking insects.

Control Strategies

Companion Plants

- **Chives and onions**: Repel spittlebugs with their sulfur compounds.
- **Lavender and rosemary**: Strongly aromatic and unattractive to spittlebugs.
- **Marigolds**: Attract beneficial insects and deter many sap-suckers.
- **Dill and fennel**: Attract predatory insects like lacewings and ladybugs, which feed on spittlebug nymphs.

Barriers and Physical Controls

- **Hand removal**: Gently wash off the foamy masses with a strong water spray early in the morning. Repeat every 2–3 days during active periods.
- **Row covers**: Use lightweight insect mesh to protect young, vulnerable plants. Remove during flowering to allow pollination.
- **Mulching**: Maintain healthy soil moisture and suppress weeds, reducing habitat for adult spittlebugs.

Sprays

- **Neem oil (1–2%)**: Disrupts spittlebug feeding and life cycle. Apply weekly, especially targeting foam masses.
- **Insecticidal soap**: Penetrates the protective spit and kills soft-bodied nymphs. Repeat every 5–7 days during infestation.
- **Garlic-chili spray**: A natural repellent and deterrent.

DIY Garlic-Chili Spray

- Blend 1 head garlic + 2 hot peppers in 1 quart of water. Let steep 24 hours, strain, and dilute to 1 gallon with a few drops of castile soap. Apply to foliage, especially under leaves and on stems.

Dusts

- **Diatomaceous earth (DE)**: Apply around plant stems to deter crawling adults. Reapply after rain and avoid applying to flowering plants during pollinator activity.
- **Clay-based sprays (e.g., kaolin clay)**: Coat foliage to discourage feeding and egg-laying.

Fertilizer and Foliar Spray Recommendations

Soil Amendments

- **Crushed eggshells or gypsum**: Boosts calcium levels; gypsum also improves soil structure.

- **Soft rock phosphate or bone meal**: Supplies long-lasting phosphorus and trace minerals.
- **Iron sulfate or chelated iron**: Essential for leaf color and vigor, especially in iron-deficient soils.
- **Composted citrus peels**: A natural source of vitamin C and trace minerals when added to compost piles or directly buried.

Foliar Feeds

1. Eggshell Vinegar Extract

- Fill a jar with finely crushed eggshells and cover with apple cider vinegar. Let react for 7–10 days. Strain and dilute 1–2 tablespoons per gallon of water. Spray bi-weekly to increase calcium uptake.

2. Fermented Comfrey or Dandelion Tea

- Rich in phosphorus, iron, and trace elements. Fill a bucket ⅓ full with leaves, cover with water, and ferment for 5–10 days. Strain and dilute 1:10 for foliar feeding.

3. Seaweed-Molasses Spray

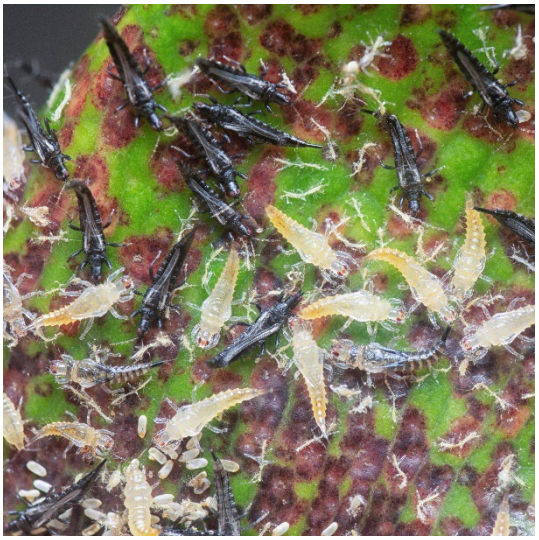
- Mix 1 tbsp liquid seaweed + 1 tbsp unsulfured blackstrap molasses in 1 gallon water. Spray on foliage to provide copper, iron, and stimulate plant defense responses.

4. Compost Tea with Vitamin C Boost

- Add 1 tbsp dried citrus peel powder or a crushed vitamin C tablet per gallon of aerated compost tea. Spray weekly during stress or infestation periods.

Thrips

Trips: Identification, Damage, and Nutrient Link



Thrips are tiny, slender insects (1–2 mm long) with fringed wings, often yellow, black, or brown. Though difficult to spot without magnification, their damage is easy to identify: silver streaks, stippling, or distorted, curling leaves. Thrips feed by puncturing plant cells and sucking out their contents, often spreading viral diseases such as Tomato Spotted Wilt Virus (TSWV).

Plants susceptible to thrip infestations are often deficient in **Calcium** (weak cell walls and poor tissue repair), **Phosphorous** (low energy and metabolic function), and **Copper** (weak immune responses and reduced lignification).

Control Strategies

Companion Planting

- **Basil** and **onions**: Strong aromatic foliage can repel thrips.
- **Marigold (Tagetes spp.)**: Produces thiophenes that naturally repel pests and attract beneficial insects.
- **Cilantro and dill**: Attract lacewings and predatory wasps that prey on thrips.
- **Sweet alyssum**: Encourages hoverflies, whose larvae eat thrips.

Physical Barriers

- **Floating row covers**: Lightweight and breathable, these exclude thrips from young plants. Remove during flowering if pollinators are needed.
- **Reflective mulches (aluminum foil or silver plastic film)**: Repel thrips by disorienting them with light reflections.
- **Yellow or blue sticky traps**: Thrips are attracted to these colors and can be trapped en masse.

Sprays

- **Neem oil (azadirachtin)**: Insect growth regulator that reduces feeding, mating, and molting. Spray in the evening to protect pollinators.
- **Insecticidal soap (OMRI-listed)**: Disrupts thrips' soft bodies on contact. Use in early mornings and repeat every 5–7 days.
- **Garlic and chili spray**: Natural repellent. Avoid using during hot midday sun to prevent leaf burn.

DIY Garlic-Chili Spray Recipe:

Blend 1 garlic bulb, 2 hot peppers, and 1 quart of water. Let steep 12–24 hours, strain, and add 1 tsp biodegradable soap. Dilute 1:3 with water before applying.

Dusts

- **Diatomaceous earth (DE)**: Apply to the soil around the base of the plant and on leaf undersides where thrips gather. DE damages their exoskeletons, leading to desiccation.
- **Kaolin clay**: Coat leaves with this white powder (mixed with water as a spray) to deter feeding and egg-laying.

Fertilizer and Foliar Spray Recommendations

Soil Fertilizers

- **Gypsum or oyster shell flour**: Supplies bioavailable calcium and improves soil structure.
- **Soft rock phosphate**: Provides slow-release phosphorous and essential trace minerals.
- **Composted seaweed or seaweed meal**: High in copper, potassium, and plant-growth stimulants.
- **Compost or vermicompost**: Enhances overall nutrient cycling, microbial health, and trace mineral bioavailability.

Foliar Feeds

Eggshell Vinegar Calcium Extract

Soak crushed eggshells in apple cider vinegar for 7–10 days. Strain and dilute 1–2 tbsp per gallon of water. Apply every 10–14 days during growth periods.

Comfrey–Nettle Fermented Tea

Ferment chopped comfrey and nettle leaves in a covered bucket of water for 1–2 weeks. Strain and dilute 1:10 with water. Rich in calcium, phosphorous, and micronutrients.

Seaweed Extract + Molasses Spray

Mix 1 tbsp liquid kelp and 1 tbsp unsulfured blackstrap molasses in 1 gallon of water. Spray biweekly for enhanced copper and trace mineral delivery.

Wood Ash Tea (for Calcium & Potassium)

Steep 1 cup of fine wood ash in 2 gallons of warm water for 24 hours. Strain and spray diluted (1:5) onto leaves. Avoid overuse on young tender foliage.

Tobacco Hornworms

Tobacco Hornworms: Identification, Damage, and Nutrient Link

Tobacco hornworms (Manduca sexta) are large, plump, green caterpillars with seven diagonal white stripes along each side and a curved red horn on their tail. They are often confused with tomato hornworms, but tobacco hornworms have the red horn, while tomato hornworms' horns are black or blue.

Hornworm damage is unmistakable:

- Large, ragged holes chewed in leaves.
- Stripped stems on tomatoes, peppers, eggplants, and tobacco.
- Green frass (droppings) on leaves or soil.
- Entire leaf defoliation if left unchecked.

Hornworms tend to target plants that are nutritionally compromised—especially those low in **Calcium** (critical for cell wall strength), **Phosphorous** (needed for root and shoot development), and **Cobalt** (important for nitrogen fixation and overall enzyme function in soil microbes and plant metabolism).

Control Strategies

Companion Plants

- **Borage**: Known for repelling hornworms and improving the growth of nearby plants.
- **Marigold**: Repels a wide range of insect pests, including moths.
- **Dill and Fennel**: Attract parasitic wasps that prey on hornworms.
- **Basil**: Confuses moths and deters egg-laying.

Barriers and Cultural Practices

- **Floating Row Covers**: Prevent moths from laying eggs. Use early in the season and remove once plants start flowering to allow for pollination.
- **Trap Cropping**: Plant sacrificial crops like Nicotiana sylvestris (ornamental tobacco) at the garden perimeter to lure moths away from main crops.

Biological and Manual Control

- **Handpicking**: Check plants in early morning or dusk. Hornworms are large and easy to spot. Drop them into a bucket of soapy water, or feed them to your flock. One year we had a brief outbreak of these critters show up on tomato plants in a particular garden bed with poor soil. The duck patrol made short work of them.
- **Braconid Wasp Allies**: Look for hornworms with tiny white cocoons on their backs—these are braconid wasp larvae. Leave these hornworms alone; the wasps are natural enemies.
- **Tillage and crop rotation**: Till soil in early spring to disrupt overwintering pupae.

Organic Sprays

- **Bacillus thuringiensis (Bt)**: A natural bacterium safe for humans and beneficial insects but deadly to caterpillars. Spray early when larvae are small.
- **Neem Oil**: Disrupts feeding and reproduction in young hornworms. Apply in evening to avoid harming bees.
- **Garlic-Pepper Tea Spray**: Blend garlic, hot peppers, and water. Let sit for 24 hours. Strain and spray onto foliage as a repellent.

Dusts

- **Diatomaceous Earth (DE)**: Sprinkle on and around plants. Abrades the bodies of soft-bodied larvae. Reapply after watering or rain.
- **Kaolin Clay**: A natural white mineral clay that coats leaves, making them less palatable and harder for moths to recognize.

Fertilizer and Foliar Spray Recommendations

Soil Amendments

- **Crushed Oyster Shell or Agricultural Lime**: Supplies plant-available calcium and improves soil structure.
- **Soft Rock Phosphate**: Long-term source of phosphorous; aids in root development and energy transfer.
- **Activated Charcoal (Biochar)**: Inoculated with compost tea, it supports cobalt bioavailability by fostering microbial life that releases trace minerals.

For cobalt specifically:

- **Compost from legumes** (especially with cobalt-rich soils) or **Azomite** (a rock dust containing cobalt and other trace minerals) may help increase cobalt levels organically.
- Use **diverse cover crops** including legumes like clover and vetch to improve microbial access to cobalt.

Foliar Feeds

Eggshell Vinegar Extract

- Provides soluble calcium. Mix 1–2 tablespoons of eggshell vinegar extract (eggshells + ACV, fermented for 7–10 days) per gallon of water. Spray every 2 weeks.

Fermented Plant Extract (Comfrey + Stinging Nettle)

- Comfrey is high in calcium and phosphorous, and nettle adds micronutrients. Ferment with water and molasses for 1–2 weeks. Dilute 1:10 and spray biweekly.

Seaweed Extract or Kelp Meal Tea

- Contains trace cobalt and copper along with plant hormones that stimulate growth and stress resistance. Apply as a foliar spray or soil drench every 2–3 weeks.

Wood Ash Tea

- If your soil pH allows, a weak wood ash tea can add potassium and trace minerals like cobalt. Use sparingly and dilute well (1:10). Avoid if soil is already alkaline.

Tomato Fruitworms

Tomato Fruitworms: Identification, Damage, and Nutrient Link

Tomato fruitworms (*Helicoverpa zea*), also known as corn earworms, are caterpillars that vary in color (green, brown, or pink) and have light stripes running along their bodies. Adults are tan moths with dark wing spots and a wingspan of about 1.5 inches.

Damage symptoms:

- Larvae bore into tomatoes near the stem end.
- Feeding tunnels often filled with frass (insect excrement).
- Affected fruit often rots prematurely.
- Leaves may also be chewed, but the most economic damage is to the fruit.

Tomato fruitworms tend to target plants with **weakened cell walls (low Calcium)** and **underdeveloped roots and immune function (low Phosphorous).**

Control Strategies (see also Corn Earworm)

Companion Plants

- **Basil**: Repels moths and enhances tomato growth.

- **Marigold**: Strong-scented flowers that confuse and repel egg-laying moths.
- **Dill and Fennel**: Attract predatory insects like lacewings and parasitic wasps.
- **Calendula and Nasturtium**: Serve as trap crops and attract beneficial insects.

Barriers and Cultural Controls

- **Floating Row Covers**: Use before flowering to prevent moths from laying eggs on tomato plants.
- **Night Lighting Control**: Reduce artificial night lighting near gardens, which attracts adult moths.
- **Crop Rotation**: Avoid planting tomatoes in the same location year after year to reduce overwintering larvae.
- **Manual Removal**: Inspect young plants for eggs or early larval stages; remove by hand if possible.

Organic Sprays

- **Bacillus thuringiensis (Bt)**: Apply weekly during egg-laying periods. Effective against young caterpillars but harmless to pollinators.
- **Neem Oil**: Acts as an antifeedant and disrupts insect hormone cycles. Apply in late evening to protect bees.
- **Spinosad Spray**: Derived from a natural soil bacterium; very effective on fruitworms but should be used selectively and not during bloom.

Dusts

- **Diatomaceous Earth (DE)**: Apply around the base and on lower leaves. It damages soft-bodied insects.
- **Kaolin Clay**: Coats foliage and fruit with a fine film that deters egg-laying and feeding. Must be reapplied after rain.

Fertilizer and Foliar Spray Recommendations

Soil Amendments

- **Crushed Oyster Shell or Agricultural Lime**: Rich in slow-release calcium for stronger cell walls.
- **Soft Rock Phosphate**: Provides bioavailable phosphorous; promotes root vigor and disease resistance.

Foliar Feeds

Eggshell Vinegar Extract

- For calcium. Combine finely ground eggshells with apple cider vinegar; allow to react for 7 days. Strain and dilute 1–2 tablespoons per gallon of water. Spray biweekly.

Comfrey-Kelp Fermented Plant Extract (FPE)

- Comfrey (rich in Ca and P) + kelp (rich in Se and Co). Ferment with water and a small amount of molasses. Strain and dilute 1:10 for foliar use every 2–3 weeks.

Liquid Seaweed/Kelp Tea

- Dilute liquid seaweed or a kelp tea (1:100 ratio) and apply weekly. Offers trace minerals and plant-growth promoting hormones.

Tomato Hornworms

Tomato Hornworms: Identification, Damage, and Nutrient Link

Tomato hornworms (*Manduca quinquemaculata*) are large, bright green caterpillars with white diagonal stripes and a curved “horn” on their rear end. They can grow up to 4 inches long. Despite their size, they can be surprisingly hard to spot due to their excellent camouflage.

Damage symptoms include:

- Defoliated stems and leaves, often overnight.
- Large dark droppings (frass) on leaves or ground below.
- Chewed fruit, particularly green tomatoes, often with surface scarring.
- Stunted or stressed plants, especially under heavy infestation.

These symptoms may also reflect **weakened cell wall integrity (low Calcium)**, **poor energy and root development (low Phosphorous)**, and **compromised immune response and lignin synthesis (low Copper)**.

Control Strategies

Companion Plants

- **Borage**: Attracts beneficial insects like parasitic wasps and predatory lacewings.

- **Marigold**: Repels moths and other garden pests.
- **Dill, Fennel, and Parsley**: Attract parasitic wasps (*Cotesia congregata*) that lay eggs in hornworms.
- **Basil**: Enhances tomato flavor and may repel moths when interplanted.

Barriers and Cultural Controls

- **Floating Row Covers**: Use before flowering to keep moths from laying eggs on tomato plants.
- **Crop Rotation and Fall Cleanup**: Prevent pupae from overwintering in soil by rotating solanaceous crops and cleaning up plant debris.
- **Handpicking**: Regularly inspect plants and remove caterpillars. They are easiest to find early in the morning or late evening.
- **Tilling Soil in Fall and Spring**: Disrupts the pupal stage in the soil and reduces overwintering populations.

Sprays

- **Bacillus thuringiensis (Bt)**: A microbial insecticide effective against young hornworm larvae. Spray in the evening and repeat weekly.
- **Neem Oil**: Inhibits feeding and disrupts development; apply cautiously and avoid when flowers are open.
- **Spinosad**: Highly effective on hornworms but should be used with care to avoid harming pollinators.

Dusts

- **Diatomaceous Earth (DE)**: Apply around the base of plants and on lower leaves to deter crawling caterpillars.
- **Kaolin Clay (Surround)**: Forms a white film that deters egg-laying and feeding. Must be reapplied after rain.

Fertilizer and Foliar Spray Recommendations

Soil Amendments

- **Crushed Oyster Shell or Agricultural Lime**: Long-term source of calcium; supports strong plant structure and resistance.
- **Soft Rock Phosphate**: Bioavailable phosphorous for root health and energy transfer.
- **Copper Sulfate (in trace amounts)**: Use sparingly and only if deficiency is confirmed; better yet, use copper-rich organic sources.
- **Azomite or Andesite Rock Dust**: Supplies trace minerals, including Copper, in a slow-release form.
- **High-Quality Compost**: Rich in microbial life and a balanced source of macronutrients and trace elements.

Foliar Feeds

Eggshell Vinegar Extract (Calcium source)

- Mix powdered eggshells with apple cider vinegar; ferment for 7 days. Strain and dilute 1–2 tbsp per gallon. Spray weekly.

Comfrey Fermented Plant Extract (FPE)

- Comfrey is high in Calcium and Phosphorous. Ferment chopped comfrey in water with a spoonful of molasses for 7–10 days. Dilute 1:10 and spray every 2–3 weeks.

Kelp or Seaweed Extract

- Naturally rich in trace minerals including Copper. Dilute per label (usually 1–2 tsp per gallon) and apply every 2 weeks.

Compost Tea with Copper-Enhancing Inputs

- Use compost that includes copper-rich materials (such as cocoa hulls or aged bark from hardwood trees). Apply as both soil drench and foliar spray (or just use them as mulch and let them break down naturally).

White Grubs

White Grubs: Identification, Damage, and Nutrient Link

White grubs are the larval stage of various beetles, most commonly Japanese beetles, June bugs, or chafer beetles. These C-shaped larvae are cream-colored with a brown head and six small legs. They live in the soil and feed primarily on plant roots.

Damage symptoms include:

- Yellowing, wilting, or stunted growth due to root damage.
- Sudden plant collapse, especially in young seedlings.
- Turf that lifts easily like a carpet (in lawns), with roots chewed off.
- Increased presence of predators like skunks or birds digging for grubs.

Plants affected by white grubs are often deficient in **Phosphorous (root energy and development), Calcium (cell wall strength), vitamin C (antioxidant defense), Manganese (enzyme activation), Cobalt (symbiotic nitrogen fixation), and Copper (plant immune function)**.

The standard guides will tell you to treat your turf with pesticides. I highly encourage you to opt for boosting calcium and overall soil health instead.

Control Strategies

Companion Plants

- **Tansy and Calendula**: Known to repel beetles that lay grub eggs.
- **White Clover**: Supports soil life and can outcompete beetle larvae; fixes nitrogen and supports root zone resilience.
- **Nasturtiums**: Can act as a trap crop for beetles, keeping them away from target plants.
- **Marigold (Tagetes)**: Known for nematocidal and insect-repelling root exudates.

Cultural and Physical Controls

- **Beneficial Nematodes (Steinernema or Heterorhabditis species)**: These microscopic worms actively seek out and kill white grubs without harming plants or humans.
- **Milky Spore Powder (Bacillus popilliae)**: Targets Japanese beetle grubs specifically; long-term biological control but requires seasonal applications.
- **Crop Rotation**: Avoid planting susceptible crops (like corn, turf, or potatoes) repeatedly in the same area.
- **Tilling in Fall and Spring**: Disrupts grub life cycle and exposes them to predators.
- **Encourage Soil Predators**: Birds, chickens, and ground beetles are natural grub control agents. Skunks are major predators of white grubs. You can tell they've been hunting grubs in the lawn when you find a patchwork of small divots (2-3 inches across) scooped into the turf. Racoons can do more damage when grub hunting, often rolling back a larger area of turf to clear grub in the root zone. Armadillos apparently split the difference,

digging holes several inches wide and deep. (We have no armadillos in our area. I've seen the skunk divots, but not racoon turf peel backs.)

Barriers

- **Floating Row Covers**: Use during the egg-laying season (early summer) to block adult beetles from accessing soil near plants.
- **Mulch Timing**: Avoid applying fresh mulch during peak egg-laying times, as it can create a moist, inviting environment for beetles.

Sprays and Dusts

- **Neem Oil Soil Drench**: Dilute neem and apply to soil to disrupt larval development. Use consistently for best results.
- **Garlic-Red Pepper Soil Soak**: Acts as a repellent and disrupts insect feeding. Mix garlic and hot pepper with water, strain, and apply as a drench.
- **Wood Ash or Diatomaceous Earth**: Sprinkle lightly around plant bases and in seed furrows before planting to deter larvae and disrupt soft-bodied pests.

Fertilizer and Foliar Spray Recommendations

Soil Amendments

- **Rock Phosphate or Soft Rock Phosphate**: Slow-release form of phosphorous to support root development.
- **Crushed Oyster Shell or Agricultural Lime**: Adds calcium while buffering soil pH.

- **Azomite or Andesite Rock Dust**: Supplies trace minerals, including Manganese, Cobalt, and Copper.
- **Compost with Diverse Inputs**: Include fruit peels, seaweed, and legume residues to build a mineral-rich microbial environment.

Foliar Feeds

Fermented Citrus Peel Extract (Vitamin C source)

- Ferment organic citrus peels with molasses for 5–7 days. Strain and dilute 1:10 with water. Spray weekly during active growth.

Comfrey + Nettle Fermented Plant Extract (for Calcium and Manganese)

- Ferment equal parts of comfrey and nettle in water with a spoonful of molasses. Strain and dilute 1:10. Apply biweekly to soil and leaves.

Liquid Seaweed or Kelp Extract

- Provides bioavailable Copper and trace elements. Apply as a foliar spray every 2–3 weeks.

Cobalt-Fortified Compost Tea

- Brew compost tea with trace cobalt sources like aged manure from clover- or legume-fed animals. Apply as both foliar and soil drench.

Wireworms

Wireworms: Identification, Damage, and Nutrient Link

Wireworms are the hard-bodied, slender, yellow to reddish-brown larvae of click beetles. They can live in the soil for several years, feeding on seeds, roots, and underground stems of crops like potatoes, carrots, corn, and onions. These little buggers love to get in and make a mess of root vegetables. As we're planting in spring, I try to grab any I find and rip them in half. The ducks and chickens are happy to eat them, too.

Signs of wireworm damage include:

- Poor seed germination or early plant death.
- Holes in root crops or stems (often mistaken for other pests).
- Wilted or stunted seedlings.
- Crops like potatoes or carrots with deep, straight tunnels or pitting.

Plants suffering wireworm damage are often low in **Calcium** (critical for cell wall structure and resilience), **Cobalt** (important for nitrogen metabolism and rhizobial activity), and **Vitamin C** (a key antioxidant that supports plant immune responses).

Control Strategies

Companion Plants

- **Buckwheat**: Grown as a cover crop or intercrop, it suppresses wireworm populations and enhances soil microbial activity.
- **Mustard (white or brown)**: Acts as a biofumigant when incorporated into the soil before planting.
- **Chickpeas and Lentils**: Help fix nitrogen and improve soil resilience; legumes tend to enhance cobalt uptake in surrounding plants.
- **French Marigolds (Tagetes patula)**: Repel soil-dwelling pests and improve overall soil health.

Cultural and Mechanical Controls

- **Trap Cropping with Carrots or Potatoes**: Bury cut pieces of potato or carrot in the soil to attract wireworms. Remove and destroy after 2–3 days. Repeat weekly.
- **Crop Rotation**: Avoid planting root crops repeatedly in the same location.
- **Delayed Planting**: Let soil warm up before planting to reduce early-season wireworm pressure.
- **Flooding or Solarization (where practical)**: Short-term flooding or covering the soil with clear plastic in hot climates can disrupt the wireworm life cycle.

Barriers

- **Fine-Mesh Screening**: Place at the bottom of raised beds or deep containers to physically block larvae from entering root zones.
- **Row Covers**: Use early in the season to exclude adult beetles from laying eggs in the soil.

Sprays and Dusts

- **Neem Cake Soil Amendment**: Acts as a feeding deterrent and disrupts larval development.
- **Diatomaceous Earth**: Sprinkle in planting holes or seed furrows. It dehydrates larvae through abrasion.
- **Wood Ash**: Lightly dust the soil before planting. Provides potassium and deters soil pests.
- **Garlic-Chili Soil Drench**: Blend garlic and hot peppers with water, strain, and apply to root zones to repel larvae.

Fertilizer and Foliar Spray Recommendations

Soil Amendments

- **Crushed Eggshells or Oyster Shell Flour**: Rich in slow-release Calcium; improves soil texture and root health.
- **High-Cobalt Compost or Manure**: Especially from animals fed legume-rich diets (like clover or alfalfa).

- **Wood-Based Biochar (activated)**: Enhances microbial life and trace mineral retention, including cobalt.
- **Citrus Peel-Enriched Compost**: Supplies vitamin C and organic acids that enhance mineral availability.

Foliar Feeds

Fermented Citrus Peel Extract (for Vitamin C)

- Ferment citrus peels in water with a tablespoon of molasses for 5–7 days. Strain and dilute 1:10. Spray weekly.

Comfrey + Horsetail Fermented Plant Extract (for Calcium and Silica)

- Ferment chopped comfrey and horsetail together. Strain after 5–7 days. Dilute 1:10 and apply biweekly.

Liquid Kelp or Seaweed Spray

- Rich in trace elements like Cobalt. Apply every 2–3 weeks as a foliar mist and root drench.

Compost Tea Brewed with Cobalt-Rich Inputs

- Use compost from diverse sources including legumes, citrus peels, and trace mineral additives like Azomite. Apply to leaves and soil every 2–3 weeks.

Bringing It All Together

Modern gardening often teaches us to fight nature. Regenerative gardening teaches us to look closer, learn, and adapt.

Insects have co-evolved with plants for millions of years. When a particular pest shows up repeatedly, it's rarely random. It's information. Something in the soil–plant system is out of balance, and the insect is responding to that weakness. By shifting from "What do I spray?" to "What is the plant missing?", you move from reaction to regeneration.

This book isn't about memorizing pest remedies. It's about developing a new way of seeing:

- Seeing insects as indicators
- Seeing soil as a living system
- Seeing plant nutrition as the foundation of resistance

When you feed the soil, support microbial life, and provide balanced minerals in plant-available forms, pests lose their advantage. Strong plants simply aren't attractive targets.

The goal isn't a sterile, completely pest-free garden—it's a resilient one, filled with life and abundance. Pests may show up to check things out, but they don't cause significant damage, and they don't get out of control. That's what Resilient Gardening is all about – working with nature instead of trying to dominate it.

I hope you've found these guides helpful, and look forward to many more years of gardening.

Laurie Neverman, Common Sense Home