

Vegetable Garden Pest Control



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GUIDE TO UNDERSTANDING THE CHEAT SHEET

Section 1: Understanding the root cause of the pests, and being able to address the issue.

Pests are always a symptom of something more fundamental that is going on in your garden. In fact, by the time the pests show up, something has already been wrong for a while. This section will show you what to focus on, so that the pests don't even get started in the first place.

Section 2: Review of organic pest control options.

We will overview the tools you need in your organic pest control kit, so that you are prepared when the problem arrives. Every gardener should keep these around, so you aren't caught unprepared and can act quickly before a pest infestation can get fully established in your garden.

Section 3: A pest-by-pest guide to identify and know what to do with each insect or other pest that comes your way.

This will show you the actual pest so you can identify what you have in your garden, and tell you exactly what to do to conquer them.

Ready? Let's jump right in!

SECTION ONE

How to Prevent Bugs Before They Get Started

Be Plant Positive

The key to successful organic growing is to always focus on the soil first, the plant second, and the pest last. When we transition from conventional growing mentality of poisoning weeds and bugs, and thinking that will make our garden healthy, we miss the real heart of organic growing. It's like hooking up a person to life support and saying that since their heart is beating, they are receiving nourishment and hydration, and are alive, that that is the optimum life. But we all know it isn't. The life support may be necessary, but the goal is to get them off life support and back home, sustaining themselves. Organic gardening is just like that. We want a good, healthy ecosystem in our garden, where the beneficials keep the harmful in check, the health of the soil provides the nutrients and living relationships your plants need, and the plants can thrive and be filled with both flavor and nutrition.

Stress = Pests!

Pests are nearly always a symptom of an unhappy plant. When plants are robust and healthy, they transform simple sugars into complex carbohydrates, which in turn make them so healthy for us to eat! However, when they are stressed, they have more difficulty accomplishing that conversion, and simple sugars are sitting there available in higher quantities for bugs to find. To the bug, this is like

offering them ice-cream and fries instead of a salad bar. It's their fast food, and they swarm that direction.

If we use a spray, even an organic one, it's like bringing the cops to chase the fast-food customers away. But unless that restaurant is changed into a salad bar, the customers will come right back as soon as they can. This is why building up the health of the plant and reducing stress must always be the number one priority!

Soil Health

Soil health is the foundation of plant health. The soil is the plant's diet; and as such, if the soil is depleted, the plant will be malnourished and susceptible to disease. But when we provide a plant with a healthy diet, it will grow strong, robust, resistant to disease, and higher in nutrient density. On Bountiful Blessings Farm, my family used to have a problem with Japanese beetles coming in droves and chomping on their crops. But after years of building up the soil, that is no longer the case. The incidental Japanese beetle comes by, feeds a bit, and moves on, in search of better "fast food".

We strongly encourage getting a [soil test](#) (we recommend the [Complete Soil Analysis](#) by Peaceful Valley unless you are growing in containers) and amending your soil in an educated way using the recommendations they give on what it specifically needs. Besides that, always add good, thoroughly decomposed organic matter in the form of compost to your soil before you plant / transplant a crop.

Keep Your Garden Well Watered

Water stress is one of the number one causes of several pests in the garden, most notably aphids. Any dehydration takes a toll on your plants, and that becomes even more critical if your soil is not well balanced and healthy. If you are wondering if the garden needs more water, push your finger down into the dirt and feel the moisture content. The soil should never feel completely dry.

Watering in the morning is our preference, because it gives the plants a good drink at the beginning of the day, especially if the day will be hot. And secondly, it gives the very top of the soil a chance to dry out by nightfall when temperatures drop, thus discouraging the spread or growth of disease.

Keep Your Garden Clean!

Debris means rot, rot means pests and disease. Always keep the garden free of debris, weeds, or decomposing material. Remove old plants, trim diseased leaves, pick up any fallen fruit. Also, maintain good airflow between plants by not crowding them too closely together, or thinning them if necessary. Check out our suggestions on plant spacing in our [Ultimate Garden Cheat Sheet](#).

Remember, a healthy garden equals a happy garden. And a happy garden equals unhappy pests. Exactly what we are looking for!

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SECTION TWO

Organic Pest Control Toolkit

Even though the ideal situation is to have so healthy a garden that the bugs choose other plants to chew on, it's just the reality - eventually something will happen to stress the plants in a garden. That may be drought, heat, cold, failing soil health, or perhaps there is a boom of a particular bug one year and they move over your garden. There are tools every organic gardener should have always on hand so that when the time comes, you can intervene quickly before they can establish.

But remember, when dealing with insect pests always dig down to the root cause and reverse it. Sure, pull out your resources to deal with the bugs. But even more importantly - make sure to give them a good drink of water, give them a fertilizer boost, give them some extra love!

If the bugs are attacking and you need to deal with them RIGHT NOW then we have a special little formula that we call our organic 3-step proven "NOW" formula. Here it is in a nutshell:

1. **N**uke 'em (using a natural pest solution of course)
2. **O**rganically fertilize
3. **W**ater it in

The key here is not to stop with simply getting rid of the pesky bugs. Make sure you are giving your plants an immune boost at the same time otherwise you might be fighting those bugs for a long time...

And now, here's what you'll want to keep in your toolkit (and some extras):

PHYSICAL BARRIERS:

Row Covers: Sometimes just keeping the plants out of sight and flight range can protect your plants. For instance, when planting potatoes in the spring, you can cover with a light row cover, and use sand bags to weight it down tightly. If you leave the potatoes covered, it will take much longer and may even prevent potato beetles from finding them. For many crops you'll need to remove the cover when the crop flowers for pollination purposes. But even then, the row cover will delay insects and give your plants a chance to grow and become strong without the pest pressure. My cousin Jonathan sells awesome [row covers here](#).

Mesh: If your difficulty is with larger pests such as birds, row cover might not be needed. In such case a more coarse mesh may suffice to keep them off your plants while they grow.

Collars: A collar can be made of anything from a paper or plastic cup with the bottom cut off to foil gently wrapped around the stems of larger plants. You can get creative!

SPRAYS:

Insecticidal Soap: In a pinch, you can use a squirt of dish soap (usually not completely organic) in a bottle. But we encourage you to use an [organic insecticidal soap](#). These work wonderfully! But remember that they work only as a direct contact agent meaning you need to spray it directly on the insects.

BT Spray: BT is a naturally occurring soil bacteria that breaks down the guts of the insects that ingest it. It can come either in a liquid to be sprayed or as a powder. When sprayed it will continue to be effective even after it dries. However, it rinses off the plant easily and if there is a rain or you top water your garden, you will need to reapply. By then, we encourage you to focus on the health of your plant so you will not need BT on your plants in the first place! You can get [Monterey BT here](#).

Neem oil: Neem oil is another organic pesticide, that we did not use very much until more recently. It can be effective against many pests, but you may want to do some research on it yourself before using it. You can get [Neem Oil here](#).

POWDERS / GRANULES:

Diatomaceous Earth: Usually coming in the powder form, apply by putting in a sock and beating the sock over the plants. Diatomaceous earth has small crystals in it that get into the frame of bugs with an exoskeleton, and they die after a few days. The bugs will need to crawl directly through the diatomaceous earth, so reapplication will be necessary after any rain or strong wind that might remove it. Diatomaceous earth is also a garden amendment, so it will strengthen your garden while dealing with the bugs! You can [get Diatomaceous Earth here](#).

Milky Spore: Effective for grubs, milky spore enters into a grubs feeding in warm soil. Within the grubs, the spores multiply, killing the grubs and spreading further. When milky spore levels have built up in a lawn or garden, it will keep grubs (and their adult beetle

populations) in check for many years. Milky spore is completely harmless for pets, children, and beneficial insects. You can [get Milky Spore here](#).

Sluggo & Sluggo Plus: Sluggo, and its enhanced cousin, Sluggo Plus, function in much the same way as milky spore or DiPel. When the slugs (or additionally earwigs, pill bugs etc., in the case of Sluggo Plus) partake of the iron phosphate and spinosad (in Sluggo Plus), they cease eating and die. However, it is said to be harmless to pets, children, or other animals. Unfortunately there is controversy over whether this product is truly organic (even though it is OMRI listed) and is as harmless as it claims. Because of this we encourage you to please do your own research and use it at your own discretion. You can [get Sluggo here](#) and [Sluggo Plus here](#).

Kaolin Clay: Kaolin Clay is a naturally occurring mineral clay that clings to the leaves of garden plants when applied. It serves as a frustration and deterrent to chewing, biting insects, while being non-toxic and harmless to pets, children, and beneficial insects. You can [get Kaolin Clay here](#).

BENEFICIALS:

Beneficial insects/organisms are the good guys you want in your garden. Wide usage of pesticides and insecticides hurts these little guys and they end up leaving. In their absence, the bad guys run rampant and have population booms. If you are transitioning towards organic growing or know that insecticides have been used in your garden area in the past, OR if you just want to encourage

your beneficial population, several beneficial insects/organisms can be purchased online and released into your garden.

Nematodes: Many people have experience with how destructive nematodes can be in the garden, but there are also beneficial nematodes that go after the ones that hurt our gardens! Besides building up good soil health and encouraging biodiversity in the soil, adding [beneficial nematodes](#) to the soil can be the best defense against not only pest nematodes but can also keep pest larvae in check as well.

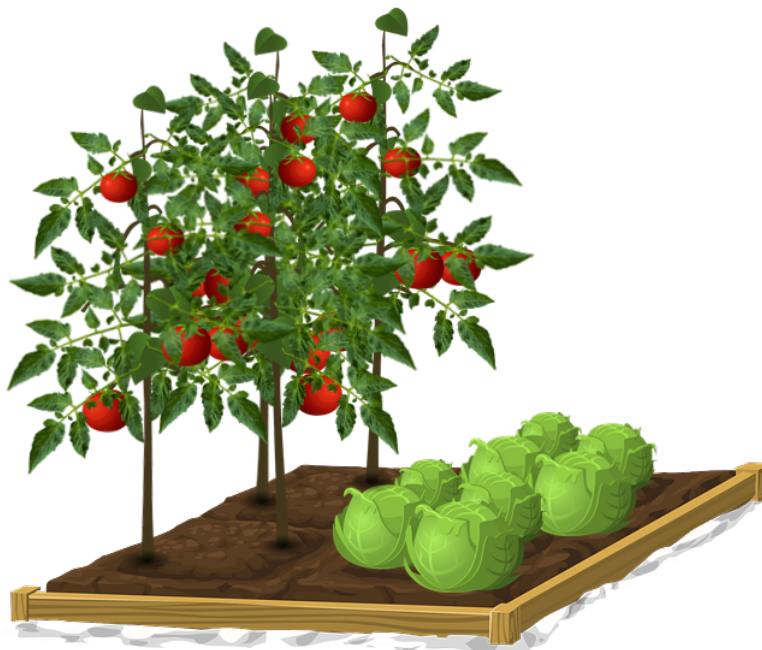
Parasitic Wasps: Despite the intimidating name, [parasitic wasps](#) are some of the organic gardener's best friends. Much smaller than the wasps we fear, they do not sting humans and are not aggressive. Instead, they go around laying their eggs into the pests that destroy our gardens... Which spells the end of that pest, and a larger beneficial wasps population. Win-win for the gardener!

Ladybugs & Lacewings: Both [ladybugs](#) and [lacewings](#) eat many eggs and small pests that cause damage in the garden. You can purchase and release these wonderful beneficials into the garden, but remember also that you'll want to make it a place where they'll want to stay: no sprays that will kill them. And beware, that diatomaceous earth (which is first line defense against beetles) unfortunately is effective against ladybugs also. So don't purchase ladybugs and dust diatomaceous earth at the same time.

Poultry: This is not a workable solution for everyone, but it is a good one to keep in mind if it might work in your situation. Chickens, ducks, or guinea hens can be very beneficial in eating

insects in your garden that you don't want. The flip side is that they can harm small plants by stepping on or pecking them, so releasing them among more mature plants is the usually the better plan. Many insects can be kept in check by poultry predation that may be difficult to control by other means.

As always, remember that a strong healthy garden is the best deterrent to pest activity. Just because everything we are recommending is *organic*, doesn't mean you want it everywhere. It may be naturally occurring, but remember there are naturally occurring toxins that you don't want to be spraying and ingesting. These should be used just as emergency pest control when they are getting out of hand, while focusing on building up the health of your garden and addressing the root cause of the pest problem in your garden.



SECTION THREE

Organic Pest Solutions

BEETLES & BUGS:

ASPARAGUS BEETLE



Characteristics: Asparagus beetles come in several different color patterns, and are about 1/4" long. We have included two examples here - the Spotted Asparagus Beetle (orange with black spots), and the Common Asparagus Beetle - to give a good idea of body shape. If you suspect what you have may be an asparagus beetle but their coloring is slightly different, double check by a quick google search.



What they do: Asparagus beetles and / or their larvae feed on the asparagus spears as well as on the asparagus ferns later in the season. Feeding on the spears will cause them to curl or bend over at the top (known as Shepherds crook) and adults will lay their eggs on the asparagus spears as well which makes them less attractive to eat! If defoliation of the ferns becomes too widespread or serious, it can weaken the asparagus in the long term.

How to deal with them:

- Keep garden clean of debris to prevent overwintering.
- Brush larvae off onto the ground with a soft brush. The larvae are vulnerable and many will die before getting back up to the plant.
- Crush eggs on spears.
- Hand picking of adults can be effective in a small plot of asparagus.
- Dust with [diatomaceous earth](#).
- Poultry predation.

BEAN LEAF BEETLES



Characteristics: Bean Leaf Beetles are small, usually less than 1/4 inch in length. They come in several different color variations, most being red or yellow with black spots.

What they do: As their name would suggest, Bean Leaf Beetles like to feed on legumes.

However, they can also be found feeding on the cucurbit family (pumpkins, squash, cucumbers, melons). Seedlings or young plants will be especially vulnerable to them.

How to deal with them:

- Dust plants with [diatomaceous earth](#).
- Hand pick or vacuum them (gently so as to avoid hurting plants!)
- Spray adults with [insecticidal soap](#) (this may or may not be practical depending on how thick your concentration of adults are).

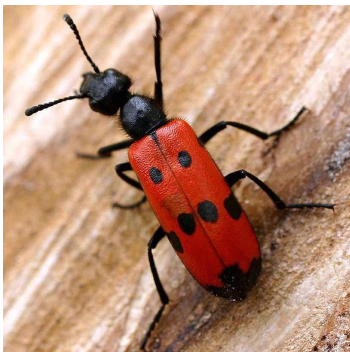
BLISTER BEETLE



Characteristics: There are thousands of different blister beetles worldwide, with tremendous variety in color, ranging from solid colors to spotted, striped, or dusted looks. In addition to the examples given here (Black, Desert, and Orange Blister Beetles respectively), they can have yellow, drab browns and grays, or even metallic green.



What they do: Blister beetles release a toxin upon being handled that will cause blistering and discomfort, so never touch a blister beetle without hand protection.



They will often fly in large numbers and settle on the garden, eating whatever they find. If you have a large supply of bugs and can't discover exactly what they are, do a quick google search on blister beetles to see if you have different variety.

How to deal with them:

- Place a pail of water with [insecticidal soap](#) beneath the plant, and gently shake the plant to cause the blister beetles to drop (their natural response to disturbance).
- **Do not** handpick with bare hands, as blister beetles live up to their name! Any handpicking should be done with gloved hands.
- Spray the plants with an organic insect spray that includes spinosad.
- Dust garden area with [diatomaceous earth](#).
- Poultry can be used as living predators.

CUCUMBER BEETLES



Characteristics: Cucumber beetles are small and narrow, usually 1/4 inch long or less. They can vary in color from the common Stripped and Spotted Cucumber Beetles shown here, to being green with orange spots in other varieties.



What they do: Cucumber beetles are a pest not only because they eat the stems, leaves, and flowers of the cucurbit family (cucumbers, squash, melons), but also because they transmit bacterial wilt, which can easily kill the plant off even if the beetles themselves do not do enough physical damage to kill the plant. The larvae can also burrow into the ground and eat plant roots.

How to deal with them:

- Row covers can be used early in season.
- Dust plants with [diatomaceous earth](#).
- Hand pick adults (can be difficult as cucumber beetles will fly when disturbed!)
- Yellow sticky traps can be used.
- Plant cucurbit varieties that are resistant to bacterial wilt.
- Clean up debris and remove infected plants to prevent overwintering of bugs or further transmission of bacterial wilt.

FLEA BEETLE



Characteristics: Flea beetles come in a variety of appearances. They are tiny (picture shown is significantly enlarged) and generally metallic colored. Some may have stripes. As is reflected in their name, flea beetles can jump, but can also fly or walk. They like summer heat and are often most vigorous in their activity on hot days when the sun is out.



What they do: Adult flea beetles eat on leaves and flowers. Because they are so tiny, the damage may only look like traced paths across the top of the leaves; but as the infestation gets worse, tiny

holes appear in the leaf until, progressing until it looks like mesh. (Flea Beetle damage pictured.) Flea beetle larvae will eat on the roots of the plant.

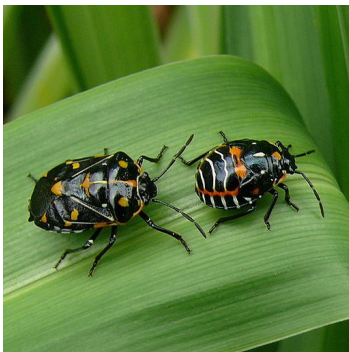
How to deal with them:

- Water and fertilize - strong plants can easily withstand flea beetles.
- Transplant instead of direct seeding your plants, as larger, healthy plants are more resistant.
- Use row cover early in the season to keep flea beetles off. If using this option you should not uncover frequently, only occasionally to check the status of the plants.
- Spray them with [insecticidal soap](#) (may be challenging if the flea beetles are jumping and flying).
- Spray plants with a garlic-pepper spray.
- Plant a trap crop of radishes. Flea beetles love the leaves and will flock to them, removing the pressure on the other plants. The radishes will still be good when they come to maturity.
- Plant later in the season after a mild winter (harsh winters cut back on flea beetle populations).

HARLEQUIN BUG



Characteristics: Harlequin bugs are 1/4 inch or larger, come in several colorations, and often appear in large droves. In warmer climates, they can have several generations in one season which can make them a real nuisance. Harlequin bugs are part of the stink bug family, and as such are often not targeted by natural predators.



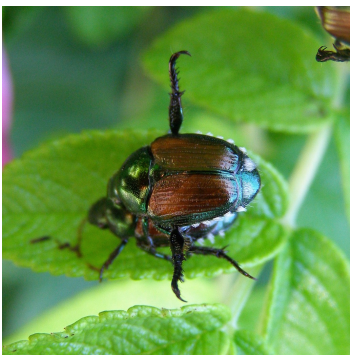
What they do: Harlequin bugs particularly love to munch on broccoli, kale, mustard, turnips, and radishes, but will eat other plants as well when their favorites aren't around or there are too many bugs present. They eat the foliage, stems, and also enjoy certain flowers. In large numbers, they can destroy crops very effectively. The nymphs (pictured right, in the second photo), eat just like the adults, adding to the destructive power of the group.

How to deal with them:

- Hand pick adults & nymphs and drop in container with soapy water.
- Crush any eggs you can find.
- Use row covers before they arrive.
- Poultry can be used as living predators.
- Spray with [insecticidal soap](#) (direct contact).

- Keep garden clean of debris to prevent overwintering.
- Dust plants and bugs with [diatomaceous earth](#).
- Dust plants with Kaolin Clay.

JAPANESE BEETLES



Characteristics: A notorious garden criminal, Japanese beetles are about 1/2 inch in length with metallic browns and greens on their shell.

What they do: Japanese beetles munch very indiscriminately, though they do have their favorites, attacking the leaves of fruit trees and flowers besides garden vegetables. They avoid the veins of a leaf, eating around them, leaving a skeletonized leaf in their wake. Their larvae will eat the roots of plants and grasses. Japanese beetles can easily come in large numbers, leaving destruction in their wake.

How to deal with them:

- Row covers (before the beetles arrive). Keep the row covers weighted down carefully. This will not completely conquer them, but can delay / reduce the damage.
- Japanese beetles are very slow and inactive **in the morning**, but will be out all over the plants they are eating. Hand picking is highly effective at this time! If you wait until later in the day, they will fly away when disturbed.

- Place cardboard or a sheet beneath the plant (again, in the morning), and gently shake the plant. The beetles will fall down, and you can then dump them into soapy water to kill them.
- Poultry predation is highly effective with Japanese beetles, as long as they aren't out of reach of the fowl. Shaking them off in the morning will place them in reach if you have poultry present.
- Japanese beetle traps. While these are effective, they can potentially draw more beetles to them. Hence, it is highly important to place the traps **away** from your garden plot, so that any area beetles that are drawn in will not find your garden a convenient stop over.
- Beneficial nematodes and milky spore are effective in killing off larvae. Because of the prolific reproduction of Japanese beetles, you will need to use them extensively throughout your yard / garden. This is a good plan especially if you have a recurring issue with Japanese beetles, as it can reduce their numbers over time.
- [Insecticidal soaps](#) can be effective, but are often unrealistic due to their frequently large numbers and the fact that the spray must be direct contact.

MEXICAN BEAN BEETLE



Characteristics: Mexican bean beetles are small, about the size of a ladybug, with a similar body shape and appearance, causing some to confuse them as a “yellow ladybug”. They are completely different beetles however, being a pest rather than a beneficial beetle, and can do considerable damage to crops.

What they do: Mexican bean beetles defoliate leaves while avoiding the stems, leaving a skeleton effect in the leaf after they are done. While they do love legumes as their name suggests, they will help themselves to other garden plants as well, doing considerable damage to them. Their larvae eat on the plants as well.

How to deal with them:

- Clean debris to prevent overwintering
- Hand pick the larvae and adult beetles. Be sure to check undersides of the leaves!
- Crush any eggs you can find.
- Use row covers to protect your plants early in the season.
- Plant early to give plants a head start, as Mexican bean beetles are most active in the middle of the season
- Poultry can be used as living predators.

- Dust plants with [diatomaceous earth](#).

POTATO BEETLE



Characteristics: The Colorado Potato Beetle (commonly simply called the Potato beetle), is a small beetle ranging from about 1/4" to just under 1/2" long. Their brightly colored bodies are easy to spot on the green foliage they are eating. In addition, the larvae are even brighter orange with soft bodies (see second picture), making them easy to see when checking the undersides of leaves.



What they do: As their name would suggest, Potato beetles love to eat the foliage of potato plants; but they can also be found eating other garden vegetables at times. They lay their eggs underneath the leaves, which in turn quickly hatch and the larvae vigorously eat until they pupate. Thus both the adult beetles and larvae can quickly reduce the foliage of the potatoes to nothing, stunting the growth of the plants and the development of the potatoes underneath the soil.

How to deal with them:

- Cover the potatoes with row cover, weighting down the sides thoroughly. This can delay the onset of the potato beetles.

- Plant varieties of potatoes that mature early, or plant fall potatoes to avoid the intensity of the pest pressure.
- Crush any eggs and kill any larvae that you find.
- Hand pick adults. This can be challenging since they will drop quickly to the ground when disturbed, and if the potato plants are large or bushy it can be difficult to reach them. Carefully sliding a piece of cardboard under the potato foliage, and then disturbing the plants, can catch the falling adults. Drop them into a bucket of soapy water.
- [Monterey BT](#), or another spray with bacillus thuringiensis can be effective to kill the larvae, but must be sprayed when the larvae is very young. B.T. spray will not be effective with adults.
- Poultry can be used as living predators.
- Dusting with [diatomaceous earth](#) can also be effective.

SQUASH BUG



Characteristics: Squash bugs are notorious enemies of squash, but can also sometimes attack cucumbers and melons. They are about 1/2 inch in length, and are thinner and longer than their cousins in appearance, the stink bug.

What they do: Squash bugs descend on plants, vigorously eating and are thought to be possible vectors in Yellow

Vine disease, a virus that kills the squash plant. But even aside from that, the squash bugs themselves easily stunt or kill the plants themselves with their intense feasting. They also reproduce rapidly, causing their numbers to quickly climb. The nymphs, small and gray, hatch quickly out of the eggs and become an army of eaters themselves, easily becoming unmanageable for the home gardener.

How to deal with them:

- Clean debris to prevent overwintering, and do not plant squash in a location where there was severe squash bug problems the year before.
- Remove and destroy squash plants immediately when finished harvesting fruit.
- Use row covers, thoroughly weighting down sides so that squash bugs cannot find their way inside. This will delay the onset. Also remember that you will have to either remove the row cover when the squash flowers, or pollinate them by hand.
- Place “trap boards”. Lay a board on the ground next to the plants while nights are still cool. Early the next morning, go and lift up the board and remove and kill the squash bugs that collect underneath, as they will naturally seek the board out as a protected place to keep warm.
- Dust plants with [diatomaceous earth](#).
- Hand pick adults, dropping them in a bucket of soapy water.
- Crush or remove any eggs.

- Make a wad of duct tape, sticky side out, and use it to collect eggs and nymphs off of the underside of leaves. Can also be effective for adult bugs. (Many thanks to [Reformation Acres Blog](#) for this brilliant idea!)

(As with any pest, if you have bad squash bug issues focus on building up the health of your plants (fertilize) and work aggressively on building up the soil. This will reduce the squash bug problem more effectively over time than any organic control.)

STINK BUG



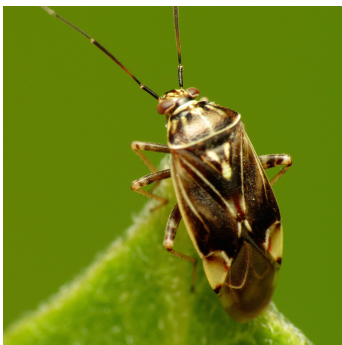
Characteristics: There are many varieties of stink bugs, ranging in color; greens, grays, browns, blacks, and variations in between are not uncommon. Stink bugs are sometimes confused with squash bugs, but they are shorter and wider, creating a more stocky appearance. In keeping with their name, they give off an offensive odor when disturbed. In addition, they feed much more freely beyond the squash family and are found gladly eating legumes, tomatoes, fruit, and other plants.

What they do: Rather than being a biting, chewing beetle, stink bugs use their proboscis to suck juices from the plants. Hence, if their population isn't too high, the damage will generally be cosmetic in nature. However, they can reproduce prolifically, causing their numbers to grow rapidly; and if there are too many of them, they can kill the host plant.

How to deal with them:

- Remove debris to prevent overwintering, and keep weeds and other vegetation cut down around your garden/
- Use row covers early in the season.
- Hand pick or vacuum adults (with a glove, to prevent their odor from getting on your hands).
- Dust plants with [diatomaceous earth](#).
- Spray them with [insecticidal soap](#) (direct contact, may not be realistic with large populations).
- Crush eggs and remove nymphs (see suggestions in squash bug section for convenient removal).
- Spray plants with Kaolin Clay.

TARNISHED PLANT BUG



Characteristics: Tarnished plant bugs are small, growing up to about 1/4 inch long as adults. Despite their small size, they can do considerable damage, especially in large numbers. The nymphs are similar in appearance, but smaller; and they damage the host plants as well.

What they do: Tarnished plant bugs damage the host plant by piercing into them and sucking the plant juices. This damages the plant and can cause stunting and deforming of plants. The bugs seem to especially enjoy fruit and flowers, and will often lay their eggs directly into flowers. The nymphs, when they hatch, start their feeding right where they are, directly impacting the formation of the fruit.

How to deal with them:

- Remove debris to prevent overwintering, and keep area around garden mowed down to prevent the bugs from finding habitat there.
- Hand picking can be effective in smaller patches.
- Spray them with [insecticidal soap](#).
- White sticky traps have proven rather effective for tarnished plant bugs.

GRUBS, MAGGOTS, & NEMATODES

GRUBS



Characteristics: Grubs are the larvae stage of any of several types of beetles. Grubs can be very small, or can grow very large, depending on the type of grub and where they are in the growth stage. Their coloration may be slightly different depending on the grub type, but are typically a creamy color with a darker head and have soft

bodies. No matter what kind of beetle larvae they are, the treatment is the same.

What they do: The grubs themselves live beneath the soil, eating plant roots and growing steadily until they pupate. If the grub population is high enough, the plants will begin to be stressed and appear as if they have water stress without watering relieving the symptoms. This is due to the root damage. In addition, there may be a problem with digging in the garden by grub predators (raccoons, skunks, armadillos, etc.), who are in search of the grubs. If that is the case, resolving the grub population will likely resolve the digging by the predators.

How to deal with them:

- Turn over the soil frequently in early spring, exposing the grubs and allowing the cold temperatures at night to kill them.
- Solarizing the soil for a couple months in the middle of the summer can also be effective in killing off the grub population (thereby reducing the beetles you'll have to deal with later!)
- Milky spore is effective in killing off grubs.
- Beneficial nematodes can be effective at attacking the grub population.

MAGGOTS (Onion Root and Carrot Rust Fly)

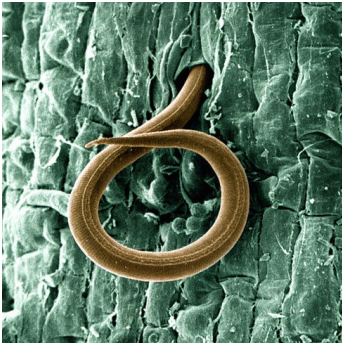
Characteristics: Maggots are the larvae of flies, which generally live in the ground or other decomposing matter. Both onion root and carrot rust maggots are small, creamy colored, and grow to only about 1/3 inch long.

What they do: The adult flies of both onion root maggots and carrot rust fly maggots, (which are harmless to the crop themselves in the adult stage), will fly around looking for onions or carrots respectively. When they find a suitable location, they will lay their eggs right into the greenery of the plant close to the ground. Upon hatching, the maggots move down into the soil, feeding upon the roots, tubers, or stems, until they pupate. By the time the onions or carrots are ready for harvest, the damage is already long done as the maggots have already been feeding for weeks / months.

How to deal with them:

- If you have had issues with maggots in the past, it is particularly crucial to observe a good crop rotation plan.
- Row covers are the ideal control during the early months of the crop. This prevents the flies from laying their eggs in the greenery in the first place.
- Apply beneficial nematodes to deal with larvae in the ground.
- Sticky yellow traps can capture adults that are flying around.

NEMATODES



Characteristics: Nematodes are one of the most common creatures on earth. Some are very nearly microscopic, while other nematodes can be much larger. They have been found in every climate, from ice to desert, and amount for about [80% of individual animals on earth](#). The Root Knot nematode, pictured entering a tomato root, is greatly enlarged.



What they do: Nematodes can be both harmful or beneficial in the garden. Harmful nematodes generally either enter into roots, harming them, or feed on the roots. The damage on the roots can be severe, resulting in stunting, wilting, or death of the plant. Nematode feeding on the roots can also make plants more susceptible to various diseases as they weaken.

How to deal with them:

- Beneficial nematodes can be purchased online. These are nematodes that attack and consume the nematodes that are attacking the plant. Repeated applications may be necessary depending on how severe the nematode problem is.
- Build the health of the soil. For sandy soils, add a healthy amount of organic matter. The healthier the soil, the healthier the plant; and the more able it will be to withstand nematode action on its roots.

- Plant out strong, healthy transplants. New seedlings are the most susceptible to damage of their root system.

CATERPILLARS & WORMS

ARMYWORM



Characteristics: Armyworms describe the larvae of any of several different moths. Primarily, they get their name from the fact that the caterpillars stick together, like an army, traveling from place to place and eating down what they find.



What they do: Because armyworms travel and eat together, the damage they produce can be extensive. They prefer to eat at night, but since they will all eat on one plant, they can do noticeable damage by the next morning. They like to eat grains the

best, but if they do not have any available, they will eat nearly anything in the garden.

How to deal with them:

- Keep weeds mowed and debris cleared, to discourage the parent moth from laying eggs near the garden.

- If you suspect armyworms, check your garden at night. If you find them, then you can collect them all (or at least most of them) at once, since they stick together. Drop them into a bucket of soapy water.
- DiPel, or another spray with bacillus thuringiensis, can be effective at controlling the caterpillars, but the younger the caterpillars are when they eat the DiPel the more effective this treatment will be.
- Spray plants with an organic spray containing spinosad.

CABBAGE WORMS



Characteristics: Cabbage worm is a generic term to refer to the larvae of several moths who are attracted to lay their eggs on plants in the brassica family. The caterpillars can vary in appearance depending on the parent moth; some are velvety green (see pictured under the caterpillar section on page 37);

some are more translucent, some have black and white stripes on their bodies. Some eggs are small and yellow, while others are a more neutral pale green which is hard to decipher at a glance on the back of a brassica leaf.

What they do: The moth parents generally lay their eggs in a hidden location, frequently the underside of leaves of a brassica, then going their way. The young hatch out and begin eating right where they are, eating with increasing vigor as they grow. They will eat the flesh off

the leaf while avoiding the stems, leaving a skeletonize look when they are through with a leaf.

How to deal with them:

- Keep the soil healthy, the plants well watered, and well fertilized. The moths tend to target weaker plants to lay eggs on and a healthy patch of brassicas will easily hold its own against cabbage worms.
- Row covers can keep the moths off the plants and prevent them from laying eggs; but if the plants are healthy enough in the first place this is probably not necessary.
- Remove or crush any eggs by hand.
- If the worms are already hatched and munching, spray the brassicas with DiPel or another spray containing *Bacillus thuringiensis*. The caterpillars will stop eating within a few hours to a day, and die sometime after. DiPel will have to be reapplied if it is washed off the leaf, as it would during rain.
- After applying DiPel, fertilize and water the brassicas to boost their health. The health of the plant is the best deterrent to cabbage worms.

CATERPILLARS (General)



There are many caterpillars, in general, that can attack your garden. While we could have listed more, the treatment for them will be the same, across species.

What they do: The occasional caterpillar munching on a leaf is not a problem. However, if their numbers are increasing or if you are noting damage besides the occasional nibble here or there, it is time to take action. It is better to act on the early side, particularly if the plants are in the earlier stages of their growth when the eating of the caterpillars can have more permanent damage to the plant achieving maturity.

How to deal with them:

- First, handpick or spray the leaves with any organic spray that contains bacillus thuringiensis (like DiPel or [Monterey BT](#)).
- Next, try to correct any stressors to the plants. Clear weeds or other debris, trim off dying or old leaves, and make sure the plants have good airflow between them.
- Fertilize the plants well, top dressing plants that are already established and scratching the fertilizer into the soil.
- Water the plants thoroughly, and make sure they do not experience any water stress while they are recovering.

- If applicable, you can optionally cover the plants with row cover to prevent more moths from laying eggs on the plants while they are recovering.
- Parasitic wasps can also be helpful. It is therefore a good idea to avoid sprays that will kill insects indiscriminately because you want to encourage biodiversity in the garden. If you do not have any beneficial wasps (which do not sting humans) you can purchase them online and release them in your garden.

If needed, you can also repeat the bacillus thuringiensis treatment, but focus primarily on building the health of the plant. As the plants strengthen, the crops will naturally repel pests. With optimally healthy soil, plants will remain largely pest free without the use of organic pesticide interventions.

CORN EARWORMS



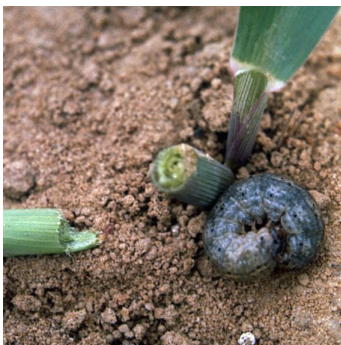
Characteristics: The corn worm is the larvae of a moth that likes to lay its eggs on corn ears. They begin a lighter, greenish color but can darken as they mature.

What they do: The moth lays its eggs either in the silk of the corn, or if they are laying their eggs before the silk has appeared, they will simply lay their eggs on the corn leaf. After hatching, the little worm begins eating at the top of the ear and continues further and further down until it is ready to pupate.

How to deal with them:

- Using a dropper, place several drops of canola or olive oil into the base of the corn silk, which will suffocate any hatching larvae. This may need to be repeated.
- *Bacillus thuringiensis* or spinosad can be used in the same location. Place several drops into the silk of the corn so that any potential larvae will eat it.
- Beneficial nematodes released into the soil will attack the pupae of corn earworms, and may be beneficial in bringing down the numbers of the soon-to-be emerging generation.
- Nematodes can also be released into the corn silk, which will attack the developing larvae before they can do much eating.

CUTWORMS



Characteristics: Cutworms refer to the larvae of any of several different species of moths. They vary in color from browns, grays, dark greenish coloration or striped patterns.

What they do: Cutworms chief crime in the garden is that they eat away at the stem of the plant, generally fairly near the soil. When they have eaten all the way through, cutting down the plant chainsaw style, they move on to the next plant, causing widespread destruction in their wake. A seedling

or young plant cut off near the ground but otherwise uneaten is a telltale sign that a cutworm is somewhere in the vicinity.

How to deal with them:

- Cultivate the soil several times before planting to disturb the life cycles of cutworms in the soil by exposing them to cold or predators.
- Transplant instead of direct seeding into the ground. Wait until seedlings are strong and healthy before setting them out, as strong plants will resist cutworms more than weak or newly sprouted plants.
- Rigid collars (perhaps 2 inches high) around the base of a new seedling will provide them with a physical barrier from the cutworms schemes. Because cutworms generally stay on the ground rather than climbing, they will often go around the barrier rather than climbing over it.
- A last ditch effort could be to spray seedlings with [Monterey BT](#) or another bacillus thuringiensis spray, focusing on coating the stems closer to the ground. While it will not save that particular plant from being cut down, it may save the rest. BT must be reapplied after several days of high temperatures (which will break the BT down) or a rain (which will wash it off).
- Protecting the plant while it is young is the main priority. Larger, more mature plants are not desirable to cutworms.

EUROPEAN CORN BORER



Characteristics: The European Corn Borer is the larvae of a moth that is primarily attracted to corn, though they will also feed on other plants within the garden. Larvae tend to be light brown or gray with a dark head, and can grow up to an inch in length before pupating.

What they do: Unlike Corn Earworms, the Corn borer is happy to feed on other areas of the corn besides the ear, though they will happily eat that too. Because of their burrowing action, they can not only penetrate leaves and crawl through the silk, but also bore through the stalks of corn, causing stunting, disease susceptibility, reduced yield, and in severe cases death of the plant.

How to deal with them:

- Destroy all stalks of old corn in a field or patch that has suffered from corn borers. Do not compost. This will help reduce overwintering.
- Control weeds near the garden or stand of corn, to reduce habitat for adults.
- Attract or purchase beneficial insects, such as the trichogramma wasps, ladybugs, and lacewing larvae, which will consume the corn borer eggs.
- Treat tassels with drops of [BT](#). This will have to be repeated every 4 - 5 days, and we consider it unideal; but it is an option.

SQUASH VINE BORER



Characteristics: The squash vine borer is the larva of a brightly colored red and black moth. The adult is small and wasp-like in appearance, only about 1/2 inch long; while the larvae is a creamy color with a dark head. The larvae can grow up to an inch long during its energetic feeding.



What they do: The moth will lay its eggs on the stem of a squash or on the ground right around the base of the squash plant. Upon hatching, the larva (or, several of them!) will bore into the stem of the plant and feed there, essentially destroying the plant from the inside out. The growth of the squash will stop and it will begin to wilt; and frequently after that the plant will die.

How to deal with them:

- Destroy all infected squash plants and remove debris from the garden.
- Till the soil in both spring and fall to expose and kill of overwintering pupae.
- Crop rotation - never plant the squash in the same location two years in a row.
- Use floating row covers *before* moths get active can prevent them from laying eggs; the only downside to this is if you have many

squash vine borers already in the pupal stage in the soil that may come up under the row covers.

- Collars around the base of the plant can be effective; wrap tin foil around the stem of the plant, protecting them from the moth laying its eggs on the vulnerable stem. When wrapping the stem, the foil should extend to about 1/4 inch beneath the surface of the soil.
- If you catch that a borer has entered your squash *very early* on in the process, you can take a small sharp knife and cut the stem, removing the vine borer. Carefully close the stem back up, and mound rich dirt up around it, and water the plant well.

TOMATO AND TOBACCO HORN WORMS



Characteristics: Well known for their large size, excellent camouflage, and ability to create tremendous damage in a short amount of time, tomato and tobacco hornworms are the hungry larva of large moths whose wing spans can reach from 4 - 6 inches. Both tobacco and tomato hornworms look similar, with only slight variation in the markings on their back and the color of their horn.

What they do: Despite their differing names, both tobacco and tomato hornworms are happy to eat either plant and sometimes can be found enjoying other garden plants as well. After hatching, they spend their existence satisfying their voracious appetite and growing larger and larger - sometimes reaching up to six inches in length - until

they transition into the pupal stage. In the mean time, a single hornworm can easily consume all the foliage of a plant - or several plants. When finding substantial damage on tomatoes, search carefully for a worm; they are excellent at camouflage.

How to deal with them:

- Spray plants with [BT spray](#).
- Hand pick the worms (though beware, they will attempt to defend themselves with a startling, though harmless, bite).
- Encourage parasitic wasps. Never kill a horn worm that has already been parasitized (pictured). They will soon cease to eat and you will have that many more good guys flying around your garden!).
- Row covers can help while plants are still young.



WIREWORM



Characteristics: Wireworms are the larvae of the Click Beetle. They range from yellow, to rusty orange, or brown. They have a hard shell-like skin, and a dark head. True to their name, they are tough like little wires in the ground. Wireworm larvae live from 2-6 years in the soil before they pupate and emerge as adult click beetles.

What they do: Wireworms love to drill into potatoes for food, but in the absence of that they will locate young plants and drill into the root just below the surface of the soil, eating it. With the flow of water and nutrients thus interrupted, the plant will abruptly wilt and die. Upon noticing the sudden death of a young plant, carefully dig it up, and if you see nothing, dig in the surrounding areas. The orange of the wireworms skin makes it fairly easy to find. Wireworms do not like hot soil and so most of the damage they do will be in early spring while they are nearer the surface due to the cool temperatures.

How to deal with them:

- Till the soil several times to expose the wireworms before you plant.
- Follow a good crop rotation plan.
- Transplant healthy, robust transplants, having them be as large as possible before planting them into the soil.
- Keep debris and weeds away from the garden. Click beetles do not like to be in bare soil, and so they will refrain from depositing their eggs directly in the garden if it is kept well weeded.
- Beneficial nematodes can target wireworms.
- Make a wireworm trap using a potato. Cut the potato into large chunks, and stick a wire or stick through the piece of potato. Then bury the potato beneath the surface, keeping the stick up to mark the location of the trap. Remove the trap a day or two later and remove wireworms. This especially helps if they are attacking your

seedlings or transplants; a potato trap can distract them while giving you an opportunity to catch and kill the wireworms.

- Plant later in the season when the soil is warm, as the wireworms will have dug deeper to remain in cool soils by that time.

OTHER

ANTS



Characteristics: Ants range from small “sugar” ants, to red, malicious fire ants, to giant but gentle carpenter ants. Ants can be a healthy part of the ecosystem in the garden, but when their numbers become too large, they can become a real nuisance.

What they do: Most of the damage that ants do in a garden is accidental; if they have a large mound and tunnel extensively in the garden, it can cause damage to the roots of a plant. Ants can sometimes feed on the buds of plants, injuring or stunting them; but this is generally infrequent. A large ant colony can also mean trouble to the gardener that steps on their home or otherwise disturbs them. Fire ants are the most troublesome and difficult to deal with. Unless there is an obvious problem that the ants are causing though, their presence is often beneficial to the garden and should be tolerated while it is workable.

How to deal with them:

- Since ants are attracted to the sweet, sticking fluid given off by aphids, tackle any aphid population in your garden to remove that attraction to ants.
- [Diatomaceous earth](#) sprinkled along beds can kill straying worker ants, but this will not prove an effective deterrent to the entire colony.
- In the case of a large colony, mix [insecticidal soap](#) in hot water. Citrus oil can be added to the mixture to add to the potency. Disturb the colony, making holes down into the nest, and pour the hot water with insecticidal soap onto the nest. This may need to be repeated several days in a row, each time digging down further with the goal of finding and eliminating the queen.
- Avoid doing this where there are active plants growing as larger amounts of insecticidal soap can sometimes reduce the fertility of the soil in that immediate area for some time.

APHIDS



Characteristics: Aphids are tiny, sucking bugs with fragile bodies that are often filled tightly with the juice from the plants they are feeding on. They can range in color from white, yellow, green, rust orange, dark gray, and black. They live in colonies and can fly at certain stages of their lives. They



reproduce prolifically, giving birth throughout the summer to live females which grow into reproductive aged adults in 7-10 days, so their numbers can climb rapidly when they find a suitable habitat.

What they do: Aphids suck the juices from the leaves or stems of plants, which stresses the plant and, if there are enough aphids, stunts or kills it.

How to handle them:

- Spray the aphids with [insecticidal soap](#) to kill them. This kills them on contact, and will have to be repeated in any further infestations.
- Build the health of the plant. Aphids often attack plants that are experiencing water stress, so be sure that the plants are well watered.
- Fertilize the plants to build their health.
- Clear away any debris, prune old or decaying leaves, and make sure the plants have air moving between them, even thinning the patch if necessary.
- Encourage beneficial insects, like ladybugs or green lacewings.

CRICKETS



Characteristics: Crickets come in a range of sizes, from the tiny nymphs which hatch at a few millimeters in length to the adult cricket, which can reach just over an inch in length. Many think of crickets as being black but they can come in tan, rusty orange, brown, and gray as well, while some sport tints of blue and green.

What they do: Besides the well known chirps that crickets make, they usually forage around on decaying matter and other insects. However, if their numbers begin to grow, they can begin to eat plants and a large number of them can easily devastate a garden.

How to deal with them:

- Remove all decomposing debris, and ensure good airflow between plants.
- Generously dust with [diatomaceous earth](#) (reapplication will be frequently necessary in damp environments or after a rain).
- Use sticky traps with cricket bait (rotting fruit, molasses, or cornmeal) on them.
- Poultry can be used as living predators.
- [Insecticidal soap](#) can kill crickets, but this has to be direct application; and since crickets are generally nocturnal, this may not be a desirable solution.

- Semaspore bait is effective particularly with nymphs.

EARWIGS



Characteristics: Earwigs are long, narrow bugs with pincher-like forceps on the back of their abdomen. They are primarily nocturnal insects, and can live in colonies, coming out at night to eat. They produce nymphs which simply look like smaller earwigs.

What they do: While typically not a garden pest, earwigs can become troublesome if their numbers are high enough and they begin to munch on garden plants. They leave jagged, half eaten leaves, or holes through the leaves, but try to keep out of the light, sometimes feeding down at the heart of a plant where they will be protected from broad daylight.

How to deal with them:

- Keep garden free of weeds or decaying matter, as this makes for an ideal habitat for earwigs.
- Keep good airflow in between plants.
- Make “traps” by laying down a piece of narrow pipe or hose, as a hiding spot for the earwigs. Check the traps daily and dispose of any hiding there.
- Sprinkle [diatomaceous earth](#) for them to walk through at night.

- Water garden in the morning, allowing beds and plants to dry out through the day, so that there isn't extra moisture for the earwigs at night.

GRASSHOPPERS & LOCUSTS



Characteristics: Grasshoppers come in a spectacular array of size and color. Ranging from solid green and drab browns to spectacular patterns with golds, greens, blues, or oranges, grasshoppers can be as short as 1/4 inch to over 4 inches in length. Frequently solitary, they make their greatest mark when they swarm, eating everything in their path. Locusts all have wings; some grasshoppers do as well, while some do not.

What they do: Grasshoppers have their dietary preferences of grasses (grains), but when they find it necessary, particularly when swarming, they will eat nearly anything. In such cases, everything in the garden is game and can potentially be severely damaged.

How to deal with them:

- Sprinkle [diatomaceous earth](#) generously
- Semaspore bait can be effective particularly with grasshopper nymphs
- Garlic and water spray can deter grasshoppers (if populations are not too high).

- Spray them with [insecticidal soap](#) (direct contact).
- Poultry can be used as living predators.
- In cases of swarming, physical barriers like row covers are most effective.

SPIDER MITES



Characteristics: Spider mites are a minute pest that are often difficult to see by the naked eye. They weave webs for protection for themselves which are easier to spot.

What they do: Spider mites suck the juices of the plants, stressing the plant. The damage will first look like small, brown spots; but as their numbers grow, leaves will curl, yellow, and die. Enough spider mites on a plant will result in stunting and death.

How to deal with them:

- Support the health of the plant, fertilize and water the plant well.
- Spray horticulture oil on leaves, especially getting the back of the leaf.
- [Insecticidal soap](#) can be sprayed on the mites.
- Remove debris or yellowing, decaying leaves or matter.

- Encourage beneficial insects such as ladybugs, lacewings, and spider mite destroyers (yup - that's an actual bug too).

SLUGS & SNAILS



Characteristics: Slugs and snails come in a large variety of colors and sizes, from tiny little critters sliming their way across a path, to foot-long monsters. They can be a light tan, brown, orange, yellow, black, as well as a mix of several colors combined into one.

What they do: Slugs and snails can be very troublesome in the garden. Snails prefer to climb and nibble on leaves or fruit. Slugs happily chomp down seedlings, eat on leaves, and leave their slime trail everywhere they go, which in turn attracts other slugs. The occasional slug or snail is not a problem in the garden, as they often feed on decomposing matter; but if their numbers climb they can create substantial damage. Besides being a pest and destroying plants, they can also carry disease, spreading salmonella and parasites that humans can contract from consuming slug slime on an unwashed vegetable.

How to deal with them:

- Clean and clear away all decaying matter or debris.
- Ensure good airflow between plants to reduce humidity and moisture.

- [Sluggo](#) or [Sluggo Plus](#) granules can be sprinkled throughout the garden. After eating the Sluggo, the slug will die. NOTE: There is controversy over this product - use at your own discretion.
- Use a barrier around the garden of copper strips. The copper reacts with the slime of the slug and deters them. Alternatively, you can wrap the stems of your plants with copper tape or mesh, to discourage the slugs from climbing the plants.
- In drier locations, sprinkle a generous amount of [diatomaceous earth](#) on the ground, which will dry the slugs out. This only works however when the ground isn't too wet, as otherwise the diatomaceous earth will soften and lose its effectiveness.
- Beer traps can be effective, but only draw from a localized area. In a larger garden several traps will have to be set out. To make a beer trap take a plastic container and cut holes near the top (in the side of the container) in a half-moon shape. Bury the container in the ground so that the entry points are about an inch above the ground. Place beer within the container and cover it. Check the trap every 1-2 days and discard the contents. Water, yeast, and flour can be used as a substitute for the beer.
- Use an abrasive mulch, such as lava rock, as a deterrent to the slugs.
- Ducks and other poultry predation is highly effective for slugs.

SOW BUGS (OR PILL BUGS)



Characteristics: Sow & Pill bugs are the common names for wood louse. With tiny, armored bodies, they appear like a bug version of an armadillo. Sow bugs and pill bugs are cousins, although pill bugs can roll up into a ball when disturbed and sow bugs cannot. They like damp conditions.

What they do: Sow and pill bugs generally feed on decomposing matter, but will help themselves to feeding on live plants as well. When they are present in large numbers, they can kill plants, especially seedlings and transplants. Because they prefer a moist environment they especially like greenhouses that potentially have higher levels of humidity than the outdoors.

How to deal with them:

- Try to keep your area dry to discourage pill / sow bug activity, as they like moisture.
- Keep garden clear of decomposing matter or debris.
- Use collars around the stems of the plants, extending into the soil about 1/2 inch and reaching up about an inch. Plastic or paper cups with the bottom cut off make great "collars".
- [Sluggo Plus](#) effectively deals with pill / sow bugs. NOTE: There is controversy over this product - use at your own discretion.
- Sprinkle [diatomaceous earth](#) generously around where they frequently crawl.

- Vacuuming can be effective if the sow / pill bugs are readily visible. In addition, sticky traps can be laid on the soil where the bugs frequently travel.

WHITE FLIES



Characteristics: White flies are a tiny relative of aphids. Often only a 1/12 of an inch long, they feed during the day on the underside of plants. White flies produce honeydew, the same sticky, sweet substance produced by aphids, which in turn attracts ants into the garden.

What they do: White flies suck on the juices of plants, and when their nymphs hatch, they do as well. When their population gets high enough, it will stress, stunt, or kill the plant. In addition, the honeydew given off by white flies, if left on the leaves, can stimulate fungal disease in the plant.

How to deal with them:

- [Insecticidal soap](#) can be generously sprayed on the white flies.
- Attract beneficial insects, such as ladybugs, lacewings, and dragonflies, which feed on white flies.
- Horticulture oil can be sprayed on the leaves.
- Keep good airflow and support the health of the plant.

SUMMERY:

With all pests, remember that the health of the soil and the plant is the most necessary and the most beneficial in the long term. When using organic methods to deal with a pest problem, always remember the underlying cause of pests and simultaneously take steps to boost the health of your plants. That is the ultimate deterrent to the pests that chew down the garden, potentially waste our work, and steal our harvests. Organic gardening ought always to be *plant positive*, and not *pest negative*.

Happy gardening! And for more gardening tips and training check out our awesome [Seedtime garden planner here](#).



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