Naut'sa mawt Tribal Council
Community Food Network Presents:

Who's Eating My Garden?

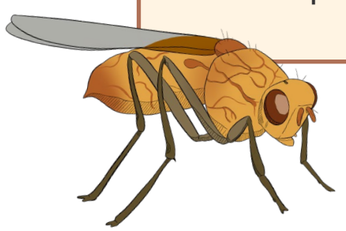
With Elder Thalia

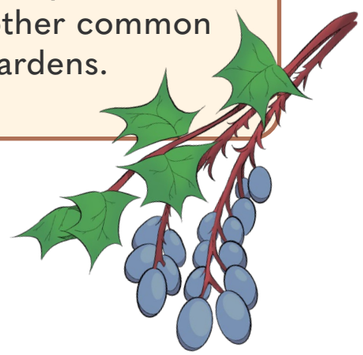
Artwork by:
Bayja Morgan-Banke

Who's Eating My Garden?

With Elder Thalia

This booklet has been prepared by Naut'sa mawt Tribal Council's Community Food Network, at the request of our members. We hope this booklet can provide gardeners with a fun and informational way to learn about some of the pests, diseases and other common problems that may plague your gardens.





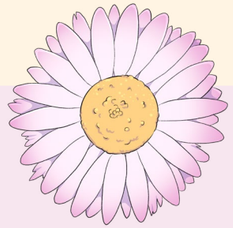
Naut'sa mawt
WORKING TOGETHER AS ONE

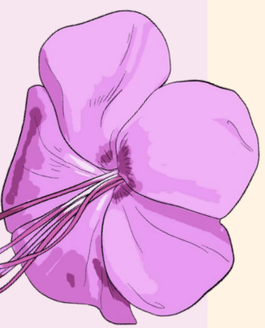
"Hello friends and family! Elder Thalia speaking, Have you noticed the holes in the leaves? How about the big ol' chomps out of your fruits? Who could possibly be behind all of this?! I think it's time I strap on my garden boots and arm myself with all the tricks in the book.

What book? This one of course, silly! Let's work together to get to the bottom of the million dollar question: Who's Eating My Garden?"

Pollinator Stewardship

Since plants cannot move, they rely on wind, insects and animals to spread pollen from the male parts of the plant to the female parts of another plant. It is estimated that 90% of wildflowers and 75% of food crops require pollination to produce seeds and fruit. Sadly, pollinator populations are declining across the globe.





Help Your Garden, Help Pollinators

- Plant clumps of the same plant so pollinators have easy and abundant access to what they like.
- Plant a diverse range of shapes and colors of flowers to benefit a range of pollinators.
- Plant early, mid and late blooming flowering plants so there is a continual supply of pollen throughout the season.
- Plant Native species.

Neonicotinoids

Neonicotinoids are a type of pesticide that have been proven harmful to bees and other pollinators. Once they are applied to the plant or soil, they spread. Pollinators ingest and absorb the pesticide while they are pollinating and feeding. Even in low doses, they can harm pollinators' immune systems and foraging abilities.

Tips to avoid neonicotinoids: avoid buying plants and seeds from large garden centres, save your own seeds, start you own seedlings, and avoid using pesticides in your garden.

Create Pollinator Habitats

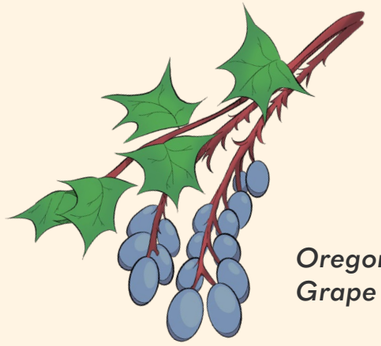
Natural Pest Control

Focus on Prevention, Observations and Careful Intervention When Needed

- The goal is not to reduce ALL pests, but to keep their population in check and maintain a balanced ecosystem.
- Use preventative measures: select the correct variety of plants, rotate your crops each year, keep your growing area clean from diseased plants, use physical barriers like floating row cover or netting, and encourage beneficial predatory insects and birds.
- Monitor your garden regularly for signs of an overabundance of pests and correctly identify a pest when you do notice one. Tip: keep a journal!
- Use non-toxic methods to manage pests: some common methods include garlic, neem oil or soap spray, diatomaceous earth, planting flowering plants that deter pests and/or attract beneficial birds and insects and creating habitat for beneficial creatures.

Predatory Insects

And the flowers they like!

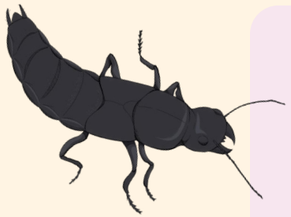


Oregon Grape

Yellow Jacket

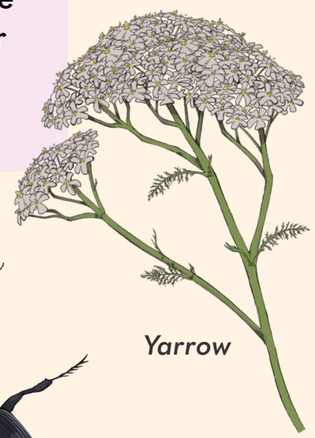
Goldenrod

Predacious Thrip



Rove Beetle

These predatory insects will feast on pests in your garden. There are lots of plants you can add to your garden and surrounding area to attract them.



Yarrow

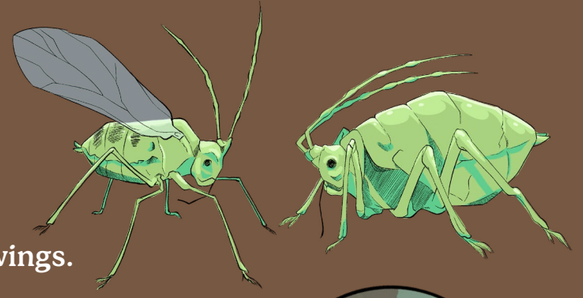
Red Flowering Currant

Mud Dauber

Ground Beetle

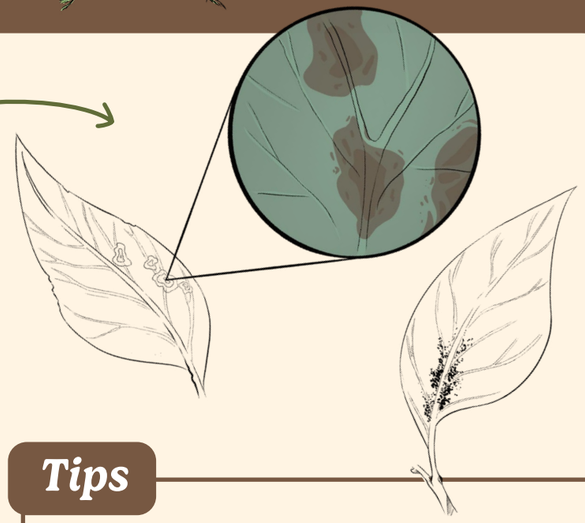
Keep your eyes out for these common and helpful insects throughout this booklet!

Aphids

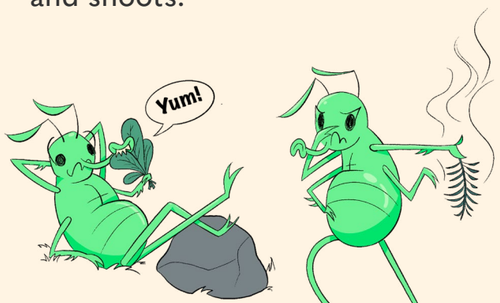


✳ A group of small soft-bodied sap-sucking insects with or without wings.

What To Look For



- Discolored leaves.
- Aphid cluster on underside of leaves and shoots.



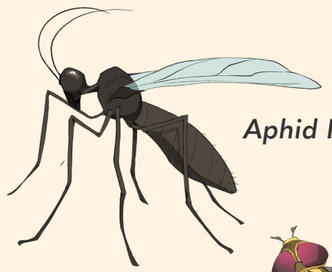
Tips

- Small amounts of aphids can be squished by hand.
- Aphids are mostly controlled by natural predators.
- The easiest way to manage aphids is spraying down infected plays with water or spray plants with soapy water, neem oil or a garlicy mix of oil and water. Spray plants twice, 2-4 days apart to get rid of any survivors.

Did you know...?

Aphids are not selective and will eat most plants except strongly scented plants like dill and petunias.

Insects That Eat Aphids



Aphid Midge

Hover Fly

Ladybug

Ladybug larvae

Ladybug larvae eat lots of aphids. Don't squish them!

Slugs + Snails

!! Arion Rufus Round Back !!

Pacific Side Banded Snail

Banded Garden Snail

Invasive

Banana Slug

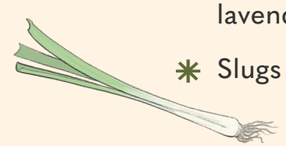
What To Look For

- Look out for them in the cool, moist weather.
- Small, round, translucent eggs in the soil.
- Large, rough-edged holes chewed in leaves and shoots of emerging plants and traces of their slime on damaged leaves.

What Do They Eat

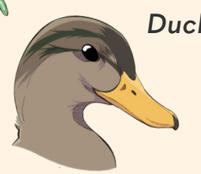
- They especially love tender-leaved plants and seedlings.

- They don't like onions or woody herbs like lavender and rosemary.



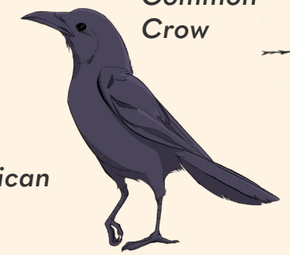
- Slugs cannot eat ferns!

Who Eats Them



Ducks

American Robin



Common Crow

Ground Beetle and their Larvae

Garter Snakes and other Reptiles

Tips

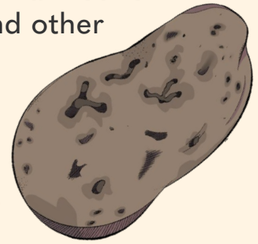
- Spread a barrier around your plants of material that is irritating to slug and snail skin: salt, ash, diatomaceous earth, rough sand, or copper wire.
- Keep mulch away from seedlings until they are well established.
- Line your garden with orange peels, as slugs love to eat but they are toxic.
- Seaweed and kelp mulch can deter slugs and snails due to its high levels of minerals.
- Hand pick slugs from the garden with chopsticks or tongs at night.
- Water your garden in the morning.

Wire Worms

✳ Wire worms are the larvae of Click Beetles, who can spend 2-6 years in their larvae stages feeding on roots in the soil.

What To Look For

✳ Narrow tunnels or small round scars in potatoes and other root veggies.

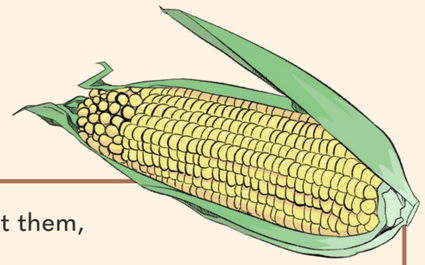


Who Eats Them

✳ Some species of soil dwelling nematodes, stiletto fly larvae, and some ground and rove beetles.

What They Eat

✳ Their preferred food is corn and potatoes, but they will feed on a wide range of plants including beans, beets, cabbage, carrots, cucumbers, lettuce, melons, leeks, peas, and radishes.



Tips

✳ The best line of defense is to monitor and prevent them, especially if you've had them in the past.

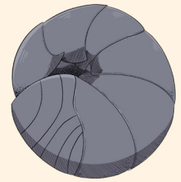
✳ Bait them: dig a little trench in the soil prior to planting and place chunks of cut potato or germinating peas or corn inside the trench and cover with cardboard, then remove the cover every 2-3 days and kill all wire worms.

✳ Provide good drainage for your soil.

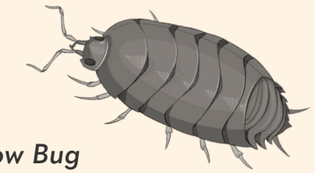
✳ Rotate your crops each year, and if you've had a severe infestation in one particular crop, take one year off from growing it.

✳ Plant your seeds and seedlings later in the season. The faster your seeds germinate, or seedlings establish themselves, the less time there is for the wire worms to damage them.

Pill Bugs + Sow Bugs



Pill Bug
Hard exoskeleton



Sow Bug
Soft exoskeleton

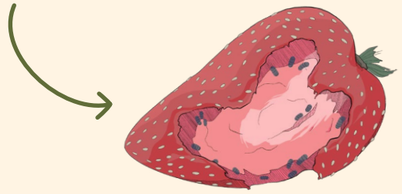
✳ Pills bugs and sow bugs are invertebrates commonly found living in decaying material like wood, compost, and leaves.

What To Look For

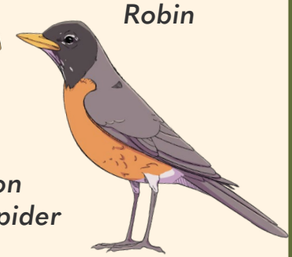
✳ Tiny seedlings damaged or eaten entirely.

✳ Bean seedlings with leaves chewed away.

✳ Stems of cucumber and melon chewed at the soil line, and fruit with shallow scars.



Who Eats Them



✳ Plus lizards, newts, other birds and small mammals.

Did you know...?

Sows bugs and pill bugs are crustaceans!

Tips

✳ The most effective management is reducing their habitat around plants and increasing habitat nearby for their natural predators.

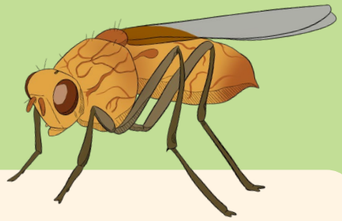
✳ Keep rotting wood and mulch away from seedlings until they are well established.

✳ Sow beans and peas indoors before transplanting.

✳ Keep cucumber and melon fruit off the soil (you can use old yoghurt containers and other recycling to place cucumber and melon fruit on).

✳ Sprinkle diatomaceous earth barriers around plants.

Carrot Rust Fly

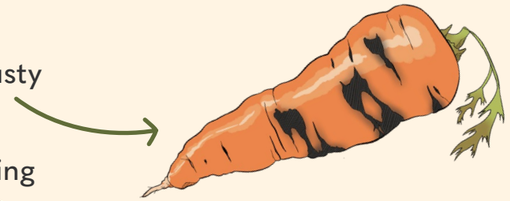


- **The carrot rust fly is a tiny fly whose larvae are a serious and common pest on the West Coast.**

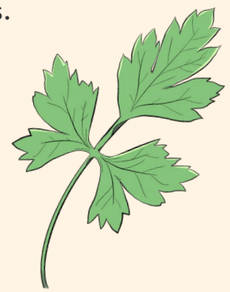
Larvae

What To Look For

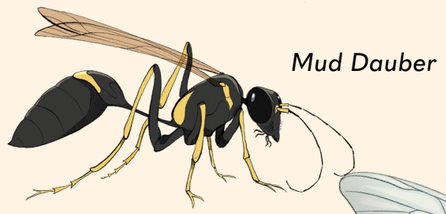
- The tiny white maggots tunnel through carrots leaving crumbly, rusty brown material.



- Yellowing and dying leaves and wilting plants, and bulbous or forked roots.
- They primarily attack carrots but will also eat the roots of celery, parsley and parsnips.

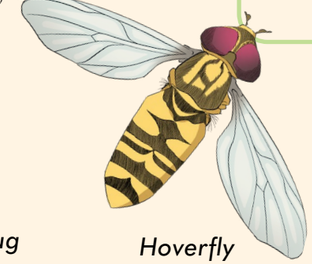


Who Eats Them



Mud Dauber

Ladybug



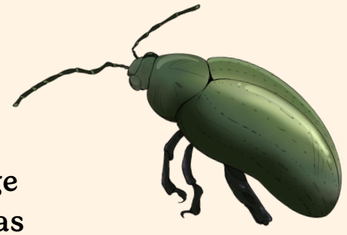
Hoverfly

Yellowjacket

Tips

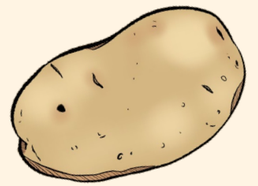
- The best control is to use floating row cover over carrots to prevent adults from laying eggs on the soil beside the carrot stems.
- Crop rotation: plant your carrots in a different spot each year.
- Remove any plants that attract the adults from near your garden, especially wild carrot.
- If you've had bad infestations in the past, don't leave any carrots in the ground overwinter.
- Plant dill, marigolds, onions and calendula throughout your carrot crop to discourage the adults.

Flea Beetles



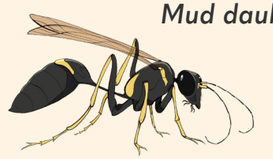
- **Tiny, shiny-coated black beetles with large rear legs that allow them to jump like fleas when threatened.**

What To Look For



- Tiny round holes or pits chewed through leave of potatoes, tomatoes and other night shades
- Dark shallow pits on the skin of potato tubers.

Who Eats Them



Mud dauber

Ladybug

Yellow jacket

Did you know...?

They won't attack plants in the bean or carrot family.

Tips

- Destroy any potato plants that come up in the spring from left over potatoes (as larvae can overwinter in them).
- Crop rotation works very effectively to keep infestations down.
- Plants can generally tolerate a small population of flea beetles.
- Use floating row cover on potato crops and young tomato transplants.
- Spray soapy water on plant leaves.
- Yellow sticky traps can be used to catch them as they jump.

Cabbage Maggot

- Cabbage maggots are the larvae of a fly. The adult fly lays eggs on the soil beside the stems of plants beginning in April, and the larvae (maggots) feed on the roots for about three weeks before pupating and then the cycle repeats throughout the summer.

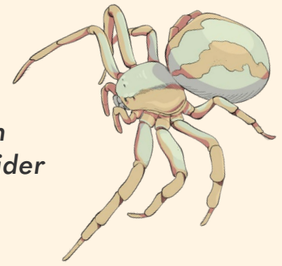
What To Look For

- Plants wilting in the midday sun despite being well-watered, as the maggots eat the root system of plants. The maggots are hard to see in the roots but obvious in turnips (look for tunnels and distortions).

Who Eats Them

Hummingbird

Dragonfly



Common Crab Spider

Yellow Jacket

Ladybug

Mud Dauber

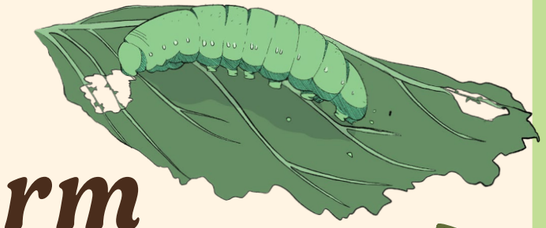
What They Eat

- Cabbage, cauliflower, broccoli, and Brussels sprouts, turnips and radish.

Tips

- It is not possible to control the maggots once they've reached the roots, so preventative action is key.
- Use floating row covers for seedlings, and for larger transplants, make flexible barriers out of heavy paper, cloth, plastic or newspaper to protect the soil around the stem from adults laying eggs.

Imported Cabbageworm



- The imported cabbageworm is the caterpillar of the white cabbage butterfly, which is an invasive species from Europe.

Who Eats Them

- Parasitic wasps and birds like swallows and goldfinches.

Yellow Jacket

Goldfinch

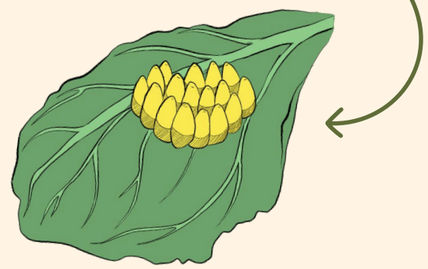
Barn Swallow

What They Eat

- They only eat plants in the brassica family: cabbage, broccoli, kale, cauliflower and Brussels sprouts.

What To Look For

- Large ragged chewed holes.
- You will spot the butterflies flying around in the day.
- Juicy green caterpillars, velvety pellets of poop, and yellow eggs on leaves.



Tips

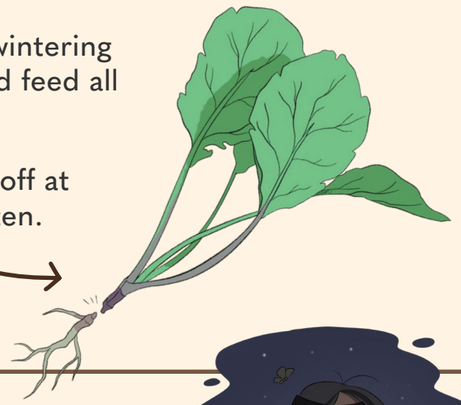
- Use floating row cover over plants.
- Hand pick the caterpillars off plants.
- Intercrop with plants that discourage them, such as lavender, thyme, dill, onions, garlic, marigolds and peppermint.
- Spray plants with neem oil or soapy water.
- Use a spray bottle or hose to wet the plant down, then sprinkle on cornmeal. ***Be generous with the amount.*** The cabbageworm will eat the cornmeal and after doing so, will swell and die.

Cutworms + Climbing Cutworms

Cutworms and climbing cutworms are a group of moth species whose caterpillars feast on garden plants.

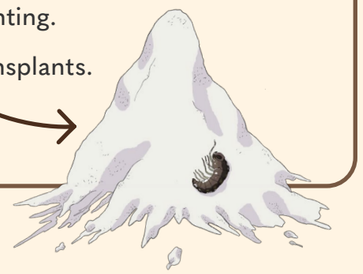
What To Look For

- Fat, gray, brown, pink or green caterpillars that curl into C-shape when disturbed. Climbing cutworms will chew large, ragged holes in leaves.
- They are particularly damaging to overwintering veggies because they are cold hardy and feed all throughout the winter to spring.
- Overnight young plants will be chewed off at the soil line or the entire seedling is eaten.



Tips

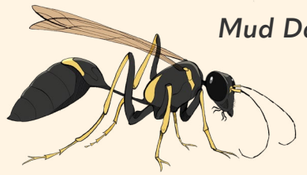
- The best management is to pick the caterpillars off. Go hunting for them in the evening when they are feeding or look for them in mulch or just below the soil level.
- The eggs can be hand picked out of the soil if you come across them too.
- Encircle each stem with a 4-inch-tall piece of cardboard or aluminum foil to help stop cutworms from reaching tender stems, especially right after transplanting.
- Spread diatomaceous earth around stems of new transplants.
- Keep grass mowed around the garden as adult moths like to lay the eggs here.



Spinach + Beet Leafminer

Spinach leafminers and beet leafminers are an early season fly pest whose pupae overwinter in the soil and once hatched, lay eggs on the underside of leaves. The hatched maggots then feast of the leaves.

Who Eats Them



Mud Dauber

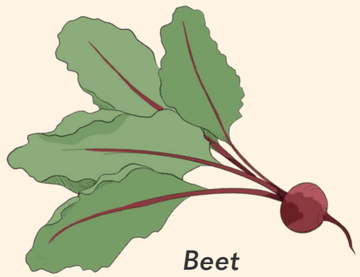
Yellow Jacket

Tips

- If you've had bad infestations in the past, cover beds with floating row cover before seeds come up to keep the adults from laying eggs in the soil.
- For minor infestations, pick off the affected leaves.
- Practice crop rotation.

What To Look For

- Brown blotches and tiny white egg clusters on the underside of spinach, swiss chard and beet leaves.



Beet

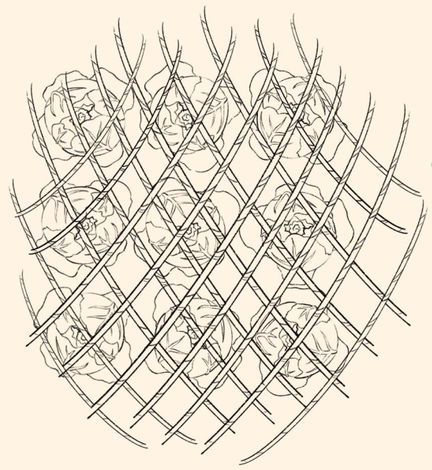
Spinach

Non-Insect Pests

* Create habitat for birds of prey and garter snakes to keep vole and mice populations in check.

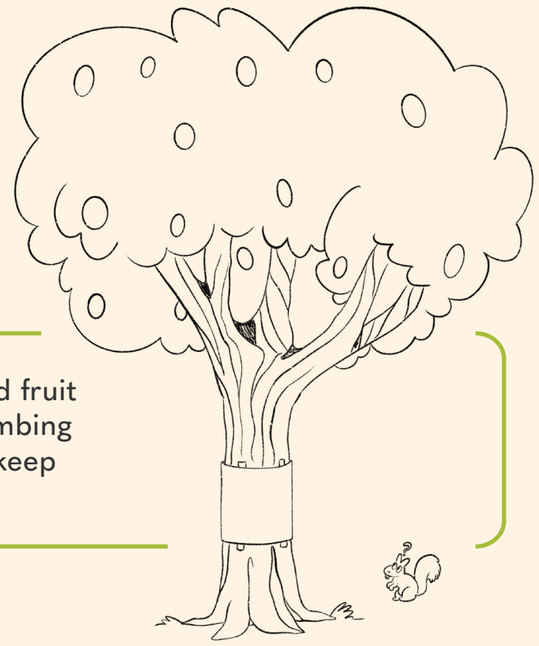
* Old CDs or other reflective material can be hung above fruit bushes to scare away birds.

* A mix of cayenne pepper and water can be sprayed on your veggies to keep squirrels and other mammals away. Just remember to rinse your veggies before eating them!

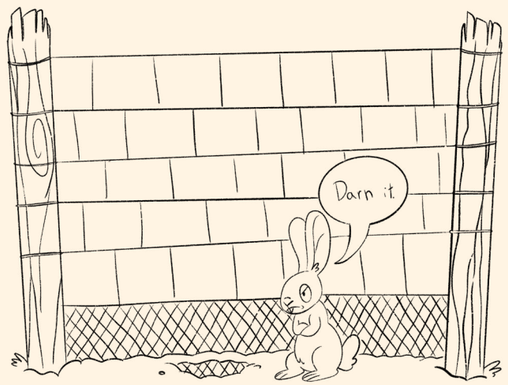


* Old fish netting draped over your garden beds works well to keep out rabbits and birds.

* If using scarecrows to keep away creatures, make sure to move it around frequently or the animals will get used to it and no longer be scared.



* Metal tree collars can be used around fruit trees to keep raccoons and other climbing critters from accessing fruit and will keep voles from chewing the bark.



* Run a strip of chicken wire along the base of your fence and bury it a couple of inches to keep rabbits from digging under your fence.

General Tips for Managing Disease

Tips

- Destroy any diseased material and do not put it in your compost if you use your compost on your garden.
- Make sure your plants have good air circulation.

- Choose disease-resistant plant varieties.
- Disinfect tools with hydrogen peroxide or rubbing alcohol after working with diseased plants.

- Buy plants and seeds from reputable sources and inspect for signs of disease before bringing them home. Avoid buying from large garden centres if possible.

Dampening Off

- **Dampening off is something that is caused by several fungi infecting germinating seeds and seedlings and can cause stem and root rot in older plants as well. It is favored by cool, wet conditions.**

What To Look For:

- Seedlings fall over and die or seeds never germinate.
- Seedling stems will appear water-soaked and collapsed at the soil.
- Can spread through an entire seedling tray.

Tips

Fungi that cause this are common so management should be focused on reducing favorable conditions:

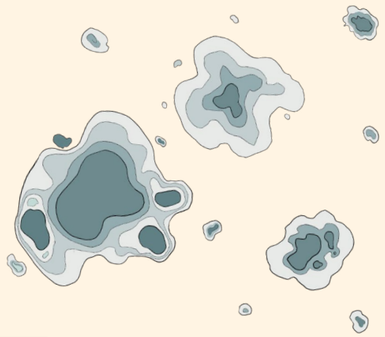
- Start seeds at the recommended soil temperatures.
- Avoid overwatering seeds and seedlings. They should be damp not wet.
- Make sure there is good ventilation and circulation around seedlings. Never cover trays!
- Use well-drained soil mixtures.
- Disinfect pots and seedling trays before re-using them (hydrogen peroxide or alcohol work well).
- Plant good quality seed at the correct soil depth.

Garlic Rust

Garlic rust is a fungus with spores that can travel long distances. This species mainly infects garlic and plants in the onion family, but there are many types of rust that will infect other plants.

What To Look For:

- Patches or spots of rusty orange on leaves of garlic and sometimes leeks, that show up first as small, blister-like spots.



Did you know...?

- It can stay overwinter on dead plant material but not on the garlic cloves themselves. And you can still eat them!
- It likes cool wet weather.

Tips

- Avoid overhead watering to prevent ideal wet conditions on leaves for infection.
- Plants overfertilized with nitrogen or under nourished may be more susceptible to infection.
- If experiencing regular infections, try planting earlier varieties of garlic like Portuguese Red.
- Destroy infected leek plants and do not put them in the compost!
- Early infections in garlic will weaken plants and reduce the size of the bulbs but late infections (late June) don't seem to affect the crop too much.

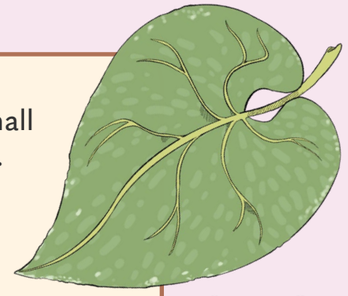
Powdery Mildew

Powdery mildew is caused by several species of fungi that, unlike other fungi, can infect plants in dry weather. The spores germinate quickly in dry humid conditions and infection can spread rapidly in late summer and fall.

Healthy Leaf

What To Look For

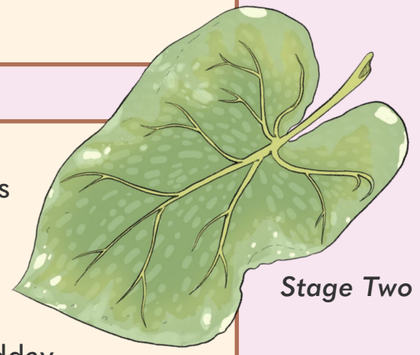
- White powdery patches on leaves starting as small round white or grey spots which quickly spread.
- Infected leaves will eventually turn brown and dry up.
- Different species attack different host plants including peas, beans, grapes, squash, cucumber, strawberries and other fruit.



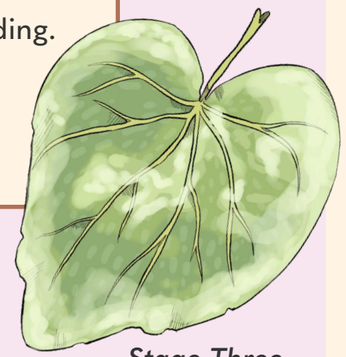
Stage One

Tips

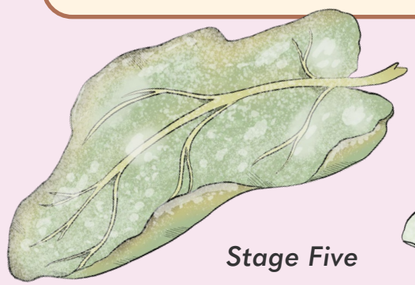
- Choose powdery mildew-resistant varieties of squash and cucumber.
- Make sure plants have plenty of airflow around the leaves.
- Rinse leaves of squash and cucumbers midday several times a week to prevent spores form spreading.
- Spray mixture of 1 part milk to 9 parts water onto squash and cucumber leaves twice a week until infection is gone.



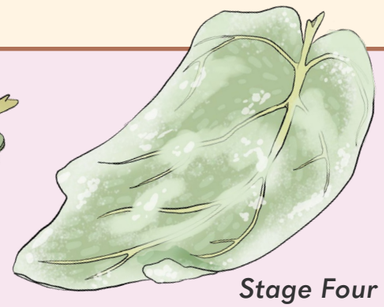
Stage Two



Stage Three



Stage Five



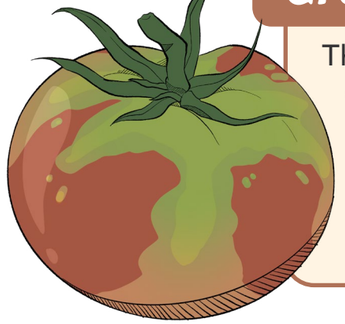
Stage Four

Not a Pest? What Went Wrong?

✳ If you've identified that your problem is not a pest or pathogen, here are some other things that can go wrong with your plants:

Sunburn

Sunburnt plants will have biscuit-colored patches on their leaves. Cucumber, melons, and squash are particularly susceptible. Sunburn damage is usually seen in new transplants that were not exposed gradually to the outdoors before they were planted. There is nothing to be done after the damage has happened, but new emerging leaves should be fine.



Greenback Tomatoes

The green part of the tomato will never ripen. This is caused by exposure to strong sun or intense heat, for example, from a glass greenhouse. If you are growing tomatoes in a greenhouse, try to choose a variety that are ideal for greenhouse growing and resistant to greenback disorder.

Tomato Blight

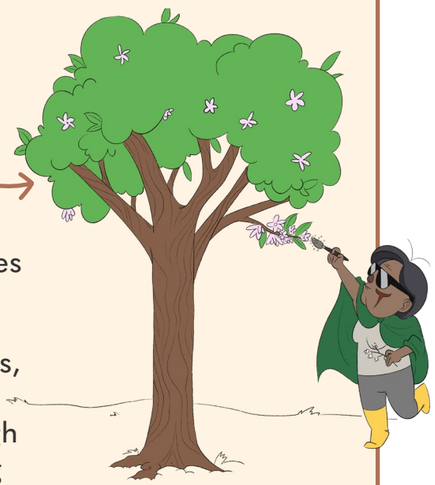
Tomato blight is a disease that attacks the leaves and fruit of tomatoes and potatoes. In can be widespread in cool, damp weather, as the spores are spread by wind and through water on the leaves. Plants will rapidly turn brown, collapse and rot. To reduce risk, plant tomatoes in the warmest, driest part of your garden, avoid getting the leaves wet when watering, and plant disease-resistant varieties.

Blossom End Rot

Blossom end rot is caused by a lack of calcium uptake, which can result from not enough in the soil, or the plant not receiving enough water to pull the calcium up. Keep your peppers and tomatoes moist or add lime, wood ash, or bone meal to increase calcium content.

Pollination Problems

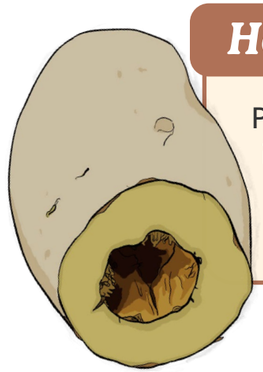
There are many things can interfere with pollination and fertilization:



✳ If tiny squash form but then fall off, they likely weren't pollinated. Try hand pollinating with a paintbrush.

✳ If tomato flowers appear but no fruit develops, it may have been too hot or too cool for fertilization to occur. Tomatoes need between 12° C and 30° C.

✳ If fruit flowers appear but no fruit develops, they may have been exposed to frost after flowering, there may not have been enough pollinators around, or they may be lacking cross-pollination.



Hollow Heart / Brown Core of Potato

Potatoes will have a hollow or black core. It is caused by irregular watering, especially during hot weather. Keep soil moist with mulch and make sure your irrigation or hand watering is regular.

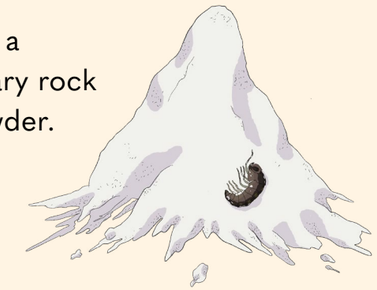
Tool Kit Checklist

✳ Elder Thalia always has these tools on hand when battling pests and problems in the garden.

- [ ] **Notebook** – it's always a good idea to track who is eating your garden and what steps you take to combat it.

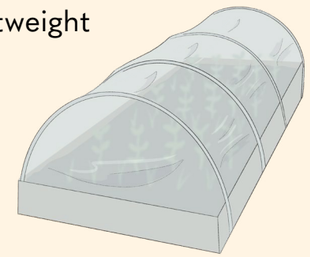
- [ ] **Spray bottle**

- [ ] **Diatomaceous Earth:** diatomaceous earth is a naturally occurring, soft, siliceous sedimentary rock that can be crumbled into a fine whitish powder. The powder gets into insects' joints and is irritating and dehydrating.



- [ ] **Gloves**

- [ ] **Floating Row Cover:** floating row cover is a lightweight material that is used to cover garden beds that lets water, air, and sun through, but keeps flying insects out. It is also great for holding moisture and warmth.



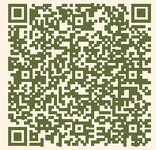
Additional Resources

✳ **Backyard Bounty: The Complete Guide to Year-Round Gardening in the Pacific Northwest by Linda Gilkeson**
See Chapter 9: Managing Pests & Problems

✳ Pollinator Partnership's Native Plant Finder –
This tool, Native Plant Finder, helps you to create customized pollinator-friendly native plant lists based on your region and requirements. It also includes planting and care guides for the listed plants, and general tips to support pollinators.

✳ Integrated Pest Management - Home & Garden Pest Management Guide For British Columbia (gov.bc.ca)

✳ Pests of Vegetables - Home & Garden Pest Management Guide For British Columbia (gov.bc.ca)



✳ Invasive and Regulated Pests - Home & Garden Pest Management Guide For British Columbia (gov.bc.ca)