

Introduction

The following document is information compiled by UVM Extension Master Gardener Interns from University and government websites across northeastern North America with information pertaining to our region and the insects we are likely to encounter here. This document is meant to act as a guide to insects identified with photographs on a corresponding poster (also available online) and is intended for use in the Burlington Area Community Gardens and surrounding areas to identify insects. Further research may be required for certain insects and symptoms beyond what is provided here and gardeners are encouraged to pursue and share information.

We also encourage community gardeners to buy starts for transplanting locally to avoid the introduction of pests and diseases from afar. We are lucky in Vermont to have cold winters and so avoid many of the infestations more southerly states suffer. However, we are susceptible to their pests and diseases so buying from growers out of state, especially from box stores that import from far and wide, is asking for trouble!

Vegetable Garden BENEFICIAL Insects

Ground beetles

Family *Carbidae*

Almost ALL ground beetles are beneficial including the larva. Those that are not predatory rarely attack our garden plants and should never be harmed when found in the garden. Some even eat slugs. Definitely in the top ten most beneficial insects! A pair of adult ground beetles can eat 300 gypsy moth caterpillars a year! Over 2,000 species in USA and Canada.

Usually black, shiny, somewhat flattened and easy to see they may also display metallic colors. Adults have long legs for running (they move fast!) and usually have ridged wing covers. First segment of hind legs extend backwards over the first abdominal segment. Pronotum is always wider than the eye area of the head. Pronotum--The upper surface of the first thoracic segment, which looks like a plate or saddle over the thorax. Head is narrower than thorax. Larvae are segmented and taper from head to tail. Head large with well-developed jaws. Larva have short legs and elongated segmented bodies.

Thrive in moist environments such as a well-watered garden. Adults feed at night and can be found hidden under boards and rocks (and scuttling in-between if disturbed) during the day. So, provide cover and provide water to attract ground beetles to your garden. Cutworms also feed at night and ground beetles are an excellent defense, especially the larva which eat far faster than adults. Life cycle usually completed in one year (one generation per year) and some adults live up to 3 years! Eggs are laid shallowly in or on the soil and usually underneath the same sort of objects they hide under during the day like wood or stones or rarely moved man-made objects. The eggs are placed individually and not in groups! Some species are equip with strong chemical defenses, usually pungent odor.

<http://www.biology.duke.edu/dnhs/pics/Pasipunct.jpg>

<http://bugguide.net/node/view/186>

<http://ento.psu.edu/extension/factsheets/pdf/ground-tiger-beetles>

Parasitic or Parasitoid wasps

Families *Chalcid*, *Ichneumon*, *Braconid*, *Trichogramma*

Parasites live at the expense of their host but do not necessarily kill whereas parasitoids almost always kill the host. Often released to control populations of corn-earworm as well as cotton and sugar-cane

pests they are purposed to control cutworms, cabbage loopers, codling moth, leaf rollers, corn earworms, and tomato hornworms as well. These wasps lay eggs in the host and liquify their insides to provide food for hatching larvae. Hosts can be the eggs and/or caterpillars of wasps and a beneficial emerges from this process instead of the pest. Some of these wasps attack pests in all stages. Usually far smaller than the wasps we think of avoiding so as to not get stung, these wasps may be mistaken for some sort of fly at first glance. Many are even smaller than the head of a pin so we don't even know they are there but we can thank them for a LOT! The few that are larger or that may seem intimidating are also often beneficial so unless they are threatening your living space let them go about their predatory business! They are host specific so each wasp attacks only one kind of pest. The potential Integrated Pest Management applications are impressive. It is far better to be specific with a biological control (or any control for that matter) than use a blanket method that could kill off any number of other beneficial insects and bacteria. Adults of certain parasitic wasps and predators feed on pollen and nectar. Clovers, Queen Anne's lace and plants in the *Umbelliferae* family, such as dill, fennel, anise, and sea holly are good nectar sources. Also sweet alyssum which is a gorgeous and sweet honey-scented annual. The following website lists what plants attract which beneficial insects.

<http://ucanr.org/sites/scmg/files/29781.pdf>

Usually long and slender and often with a protruding ovipositor from the abdomen.

Identification of specific species is extremely hard but it is unlikely that one would be tempted to chase down and kill these quick, tiny, flying wasps so better yet, just try and plant flowers that will attract them!

<http://insects.tamu.edu/extension/bulletins/b-6071.html#introduction>

<http://www.sciencedaily.com/releases/2010/01/100114143016.htm>

<http://www.uvm.edu/vtveganberry/factsheets/beneficialsGH.html>

<http://www.matrixbookstore.biz/tricho.htm>

Lady beetle *Coccinella septempunctata*

There is much that varies about these beetles such as number of spots and coloration which vary depending on temperature during development and also diet. Darker orange or red beetles are feeding primarily on aphids and lighter or more yellow lady beetles are eating more pollen. The larva looks nothing like a lady beetle so watch out for them. The eggs, unfortunately, look a lot like the eggs of that most loathsome pest the CO potato beetle. This is really unfortunate as lady beetles are also a great control for CO potato beetle eggs! CO potato beetle eggs are slightly larger and more orange/red than lady beetle eggs but don't let color be the decider because eggs change color with age as well. Be smart about where you find the eggs. Pests are going to be found on or around the plants they attack like potatoes and eggplant—which also make for a good deterrent if you can spare a few—whereas lady beetle eggs will be found wherever prey is present. Lady beetle egg stage typically lasts five to seven days. Shortly before eggs hatch, the color becomes more grey. Lady beetles most often visit and use shallow flowers that are accessible to their mouthparts, such as dill, coriander or alyssum. Artificial foods, such as sugar-water sprays or mixtures of sugar/water/yeast, are sometimes used to retain lady beetles in a garden.

<http://www.uvm.edu/pss/ppp/pubs/el53.htm>

<http://eap.mcgill.ca/publications/EAP53.htm>

<http://www.ipm.msu.edu/natural-enemies/beetles.htm>

Spined soldier bug *Podisus maculiventris*

Another true bug (of the order *Hemiptera*) and type of stink bug that is actually beneficial (one of only a few). May excrete nasty smell when handled. Feeds on caterpillars and the larvae of leaf eating beetles such as Mexican bean beetle and Colorado potato beetle in almost all stages of life! Eggs are approximately 1 mm in diameter, with long projections around the operculum and are laid 17 to 70 at a

time in loose oval masses. Two generations per year and adults hibernate thus living more than one year and going through 5 instars. Adult shoulders are pointed sharply. Tibia has a noticeable spine in the front. Wings extend beyond the abdomen.

<http://www.entomology.umn.edu/cues/Web/267Insecta.Hemiptera.Pentatomidae.pdf>

http://entnemdept.ufl.edu/creatures/beneficial/podisus_maculiventris.htm

<http://ag.udel.edu/extension/horticulture/pdf/bi/bi-2.pdf>

Praying mantis or mantid *Stagmomantis*

Simple metamorphosis: the immature stages resemble the adult which is usually 3-4 inches long in New England. Both larvae and adults are beneficial predators and have a wide range of prey the adult waits to happen by then grasps in huge serrated forelegs. A huge appetite for insects from moths to beetles and allegedly has been known to grab at hummingbirds! In the autumn months, the female adults will lay their eggs on tree twigs, plant stalks and on the underside of leaves (glued in place with a gummy substance) and die shortly thereafter. Considered by some to be too ferocious as they are not selective and will eat other beneficial insects. Their population, however, is usually so spread out that their effectiveness, against moths in particular, may still be noted. Females have six abdominal segments and males have eight.

<http://ag.udel.edu/extension/horticulture/pdf/bi/bi-14.pdf>

<http://www.entomology.cornell.edu/cals/entomology/extension/idl/upload/Beneficial-Insects.pdf>

Minute pirate bug *Orius tristicolor*, *O. insidiosus* Hemiptera:Anthocoridae

True bug that uses characteristic piercing-sucking mouthparts on pests instead of plants! Can complete a life cycle in 3 weeks. Eggs are deposited in plant tissue. Feeds on virtually ANY soft bodied insect unless prey is unavailable then they resort to flower pollen and can be attracted to a garden with such. They are good at hunting down prey even when the population of pests is low. Often found in corn silks they can reduce corn earworm eggs as well as many flower thrips that can inhibit fruit production. Adults are small (2-3 mm long), oval-shaped, black bugs with white markings on the wing patches. The wings are longer than the body and extend beyond the abdomen. Nymphs are tiny and tear drop-shaped. Hatchlings are colorless and then darken to yellow, and later brown as they grow and molt. Both adults and nymphs have a piercing-sucking beak, which is used for sucking juices from the bodies of prey. Adults can be confused with plant bugs in the family Miridae, which are generally larger, have longer antennae, and only have one or two closed cells in the tip of their forewings. All stages move fast, like ground beetles. They migrate out of the woods and into the fields in mid-late summer and can actually have a pretty painful bite like assassin bugs and sometimes even the pesty squash bugs (which are all part of the same order) but are uncommon enough not to worry.

<http://pubs.ext.vt.edu/3002/3002-1437/3002-1437.pdf>

<http://www.hort.uconn.edu/ipm/general/htms/pirbug.htm>

Damsel bug *Nabis kingbergii*

Enlarged front legs and slender bodies, and about 10 to 12 mm long.

Nymphs look like the adults but without wings.

Eats pest eggs, soft bodied insects (lots of aphids) and small caterpillars.

<http://www.npwrc.usgs.gov/resource/distr/insects/dfly/vt/toc.htm>

Syrphid fly *Diptera: Syrphidae*

This is a large group of medium to large flies, ranging from 1/4 to 3/4 inch long. Most adult hover flies are black or brown with yellow banded abdomens and body markings, superficially resembling bees and wasps except that they have only two wings that are not held over the back of the body when at rest. Larvae are predaceous and feed on aphids and thrips. Adults emerge in April and May and eggs

are laid on plants already hosting pests that are their larva's prey.

<http://uspest.org/mint/syrphidfact.pdf>

<http://eap.mcgill.ca/publications/EAP53.htm#Syrphid%20Files%20%28Hover%20Flies%20or%20Flo wer%20Flies%29>

Tachinid fly

Hugely beneficial parasitic fly attacking pests from Japanese beetles to armyworms similarly to parasitic wasps. The following website lists what plants attract which beneficial insects.

<http://ucanr.org/sites/scmg/files/29781.pdf>

<http://www.britannica.com/EBchecked/topic/579949/tachinid-fly>

Green lacewing *Chrysoperla carnea* spp.

Larvae is the only stage the green lacewing is predatory and feeds on many different pest insects. In general, they attack the eggs and the immature stages of most soft-bodied pests such as: aphids, thrips, spider mites, sweet potato & greenhouse whitefly, mealybugs, leafhoppers, and the eggs and caterpillars of most pest moths. They are prized for the hundreds and hundreds of aphid they can consume. Eggs are laid individually at the ends of long hairlike stalks (to keep the larva from cannibalizing one another after hatching) in groups on leaf surfaces and hatch in 4-10 days. Similar to lady beetle larvae lacewing larvae are 3/4" long and of a different color (light brown). They also have large 'hooked jaws' protruding out in front of their head which lady beetle larva do not.

<http://www.uvm.edu/pss/ppp/articles/beneficials.html>

<http://theselfsufficientgardener.com/episode-52-green-lacewing-beneficial-series>

Two-sided bugs:

Assassin bug *Zelus renardii*

A scary looking true bug that can eat other predaceous insects so may not be your favorite beneficial. Assassin bug females deposit masses of brown, cylindrical eggs periodically. Immature nymphs resemble adults but are wingless and develop through five molts (instars) into adults in about two months. Nymphs of the spined-shouldered assassin bug are distinctly swaybacked.

Pill bugs, Rolly-pollies, Sow bug *Armadillidium vulgare*

Not really insects at all. These guys are closer to crustaceans. Great for your soil health as they perform fabulous decomposition. However, if overpopulate they will eat fruits and veggies touching ground in which they live and reproduce. Damage is usually limited to southern states and greenhouses. Overall they are beneficial to us here in Vermont as they feed on decaying matter.

Immature stages look much like the adult. Breathe with gills so are found in moist soil out of the sun such as under rocks and logs.

<http://insected.arizona.edu/isoinfo.htm>

Nematodes

Also not insects but non-segmented, colorless worms. Some live inside and rot roots and others attack bad insect larva in the soil where they reside (unless they end up in the roots of your plants).

Here in New England the detrimental species are usually a problem in orchards.

Microscopic as well you will symptoms before you ever ave cause to look for these worms.

There are beneficial species that attack the white bloated grubs of Japanese beetles and have been more effective in our area than milky spore which is not recommended.

Root-knot nematode *Meloidogyne hapla* is the most destructive to pepper as well as other vegetable crops. Root-knot is also the easiest nematode problem to recognize because they cause galls on the roots.

Lesion nematode, *Pratylenchus penetrans* prefers potatoes and strawberries and populations tend to increase on them. They also use many grasses and weeds and can be a turf concern. Plants may seem stunted, wilt in the heat and produce less. Infected roots may be underdeveloped, especially fine roots, and looking real close reveals small lesions. The lesions provide avenues for root infecting fungi.

Stubby root nematode, *Paratrichodorus minor* can infect grasses, corn, and other various veggie crops. Feeds starting at the root tip and along the surface of the root as opposed to tunneling inside like the others. With high populations, above-ground symptoms include stunting and poor vigor. "Root systems are reduced and become course, or stubby with extensive short branches and necrosis".

Marigolds, *Tagetes patula* *T. erecta* will reduce populations of root-knot and lesion nematodes when interplanted or used in rotation. Adding a lot of organic matter into soil will introduce nematode-pathogenic fungi, and will reduce nematodes but will not provide significant control when a highly susceptible crop is planted into nematode-infested soil.

<http://www.hort.uconn.edu/ipm/veg/htms/mnrdisppr.htm>

Vegetable Garden PESTS

Japanese (and other Asiatic) Beetles

Most varieties of Asiatic beetles are harmful to our veggie crops. All have shiny metallic wing covers and are around ½ an inch long. The two species we are most likely to encounter here are the Asiatic Garden beetle (AGB), *Maladera castanea*, and the dreaded Japanese beetle, *Popillia japonica*. The grubs (c-shaped with brown heads and fat white bodies) and life cycles of the two are similar but in Vermont the destruction of the Japanese beetle far exceeds that of the AGB. Feeding on everything from beans to roses these pests aggregate in great numbers on host plants and skeletonize leaves making them impossible to miss. Feed on over 300 different plant varieties including the roots (larva), foliage and blossoms. One generation per year. 3rd instar larva overwinter and pupate in late May. Adults live about 30 to 60 days (through July and August) and reproduce the entire time.

Organic Management: squish bugs by hand or drop in a jar of water with a few drops of soap in it (this negates surface tension and assures the beetles will drown). Pheromone traps are NOT recommended in the community gardens as they will simply attract more beetles to your area and have only been useful in large scale agricultural production.

<http://www.uvm.edu/pss/ppp/pubs/el247.htm>

http://ipm.illinois.edu/fieldcrops/insects/japanese_beetles/

Spotted Asparagus beetle *Crioceris asparagi*

Life cycle: over winter as adults in plant debris near host. In spring both beetles and their grubs feed on emerging asparagus spears and adults lay their black, elongated, oval eggs on them singly or in rows of two or eight. Holes are chewed in the plant and brown discoloration of tissue is caused. Grubs are olive green/grey with black legs and head. Most severe damage occurs early to new shoots and buds. Two or more generations are possible per year. Organic Management: Harvest spears as early as possible. The beetles are attracted to plants with lots of foliage, so leave the foliage on a small percentage of your crop to concentrate the damage and harvest the rest. At the end of the growing season clear the garden and surrounding areas of all plant debris to prevent the beetle from over

wintering. Predated on by a parasitic wasp *Tetrastichus asparagi*.
<http://www.uri.edu/ce/factsheets/sheets/asparagusbeetles.html>

Colorado potato beetle (CPB) *Leptinotarsa decemlineata*

Life Cycle: overwinter as adults, emerge in spring looking for a host plant (potato, tomato, eggplant). Once host plant is found, they mate and lay their eggs on the underside of the plant's leaves. Check for bright orange oval eggs in clusters. Unfortunately, our friendly lady beetles have eggs that look very similar and there is no fool-proof way to tell them apart. One thing to keep in mind is that CPB eggs will always be laid on host plants while lady beetle eggs can be found anywhere (especially near aphids). The CPB eggs hatch in 4-10 days and the larvae begin feeding on the plant. They feed for 2 to 3 weeks before going into the soil and pupating. After 5 to 10 days they emerge as adults, to feed and mate. Very distinct beetles. If you find one more are near and they aggregate quickly and heavily! There can be up to 3 generation in a single growing season. Damage appears devastating (and can be without control) though potato plants can sustain about a 30% loss of foliage without affecting yields! Feeds mostly on nightshades: potato, tomato, pepper, and eggplant.

Organic management: Crop rotation, trap crops (ie: plant eggplant near potatoes as a distraction), squishing/drowning, *Bacillus thuringiensis* (BT).

<http://www.maineipotatoipm.com/ipmfactsheets/cpb.pdf>

Aphids

Usually less than 1/8th inch, some with very long legs, light green and/or translucent. Found in great numbers, never alone. Some are general feeders and others are host specific. In gardens they are usually wingless unless a plant becomes overcrowded in which case some will develop wings to transport them to a neighboring host plant. Often a greenhouse

Feeds by sucking juices from vascular plant parts (foliage almost exclusively).

Encourage natural enemies such as parasitic wasps, lady bug, and lacewing by planting sweet alyssum and other beneficial-friendly plants (see "beneficials" section).

<http://www.uvm.edu/pss/ppp/pubs/el60.htm>

Mexican bean beetle *Epilachna varivestis*

Feeds on all types of beans and other legumes. Both adults and larva will feed on the underside of leaves where the surface then dries up and falls through leaving large ragged holes. If well populated they will feed on pods and stems as well. This pest is a type of lady beetle and looks quite similar, so proper identification is important! The good kind of lady beetles are always a variation of orange-red whereas the bean beetle is a slightly metallic copper-brown color. They have 16 black spots (not four like the bean leaf beetle). Also there will be evidence of their round yellowish pupae on the underside of host leaves with the spiny cast off skin of the larva attached to it. Here in Vermont we can expect one full generation and half of a second. Adults overwinter on the soil surface amid debris or en masse in nearby hedgerows. Most damaging in July and August. Pole beans are less susceptible than bush beans. Find eggs early, especially if they have been a problem in the past and you know what to look for. Hand squishing/picking effective, also predated on by spined soldier bugs and some parasitic wasps.

<http://140.254.84.215/cached.jsp?idx=0&id=209025>

Cucumber beetle (striped) *Acalymma vittatum*

1/4 inch long adults have black undersides. Larvae are white and wormy, 3/8 inches long, and have three tiny pairs of legs. Comes out of overwintering spots in early spring and feeds on wild flower pollen. Once cucurbit crops emerge or are transplanted they migrate into gardens to feed and mate so they begin the season concentrated at garden margins and spread out from there. Preferring primary

leaves (cotyledons) and tender young stems they use pheromones to call other beetles to an acceptable food source. Aside from this damage they can transmit the pathogen *Erwinia tracheiphia* which causes bacterial wilt. Eggs are laid at the base of host plants near soil surface. Protect seedlings with row covers until they have at least three “true” leaves (leaves that emerge after the cotyledons). Rarely a problem in the north spotted cucumber beetles (*Diabrotica undecimpunctata*) have 12 black spots on their wing covers and a lime-green thorax. They feed on a larger variety of cucurbits with little preference whereas the striped ones prefer summer squash, blue hubbard and acorn winter squashes.

<http://www.hort.uconn.edu/ipm/veg/htms/cukbtltcrop.htm>

<http://www.uvm.edu/vtvegandberry/factsheets/PerimeterTC.html>

<http://attra.ncat.org/attra-pub/cucumberbeetle.html#species>

Coddling moth *Cydia pomonella*

A pest on fruit trees, particularly apples in its larval stage.

Larvae are pink with a brown head capsule. The moths are ½ inch long, gray-brown with a copper patch at the tip of each wing.

<http://orchard.uvm.edu/uvmapple/pest/BacktoBasics/Arthropods.htm>

Flea beetle (mainly *Phyllotreta* and *Psylliodes* species on *brassicae*)

An early season pest, they are a dark, shiny blue-black, 1/16 of an inch long, and jump like fleas. No catching or squishing possible. Feed on corn, strawberries, cucurbits and nightshades but are most damaging to brassicas like cabbage, kale, arugula, radish etc. especially when they are young. Adult flea beetles overwinter under the soil in brushy or woody areas on the outskirts of gardens. They come out when temperatures reach around 50 degrees Fahrenheit and lay eggs at the base of preferred plants. Larva feed on roots and adults feed on tender leaves. Once plants are established and have a number of secondary leaves they become waxy and difficult to feed on, essentially outgrowing the damage caused by the beetles. However, in early Spring whole crops can be destroyed before they have a chance.

Planting/transplanting later after adults have emerged and/or utilizing row covers can deter flea beetles as can hardening off well, and growing larger, transplants. Foliage spray made out of crushed garlic (must be reapplied after rain) and wood ash around plants are among reported home remedies.

<http://www.uvm.edu/pss/ppp/pubs/el71.htm>

<http://www.uvm.edu/vtvegandberry/factsheets/fleabeetle.html>

<http://www.uvm.edu/vtvegandberry/factsheets/PerimeterTC>

Stinky Squash bug *Anasa tristis*

A true bug of the order *Hemiptera*: often characterized by crossed wings and piercing-sucking mouthparts. Squash bugs are related to, and share many characteristics with, the arguably beneficial assassin bugs addressed in the last section. There are many bugs in this order and some are rather two-sided. Piercing-sucking mouthparts are often responsible, like with the squash bug, for introducing toxins that severely damage plants. Other true bugs are predatory in the garden and help fend off other common enemies like aphids and the larva of other pests. Squash bugs are also known as a type of stink bug due to the odor they give off when threatened or crushed. These guys are pests of cucurbits like pumpkins and melons by sucking juices from the plants and injecting a toxic substance which wilts and eventually kills them. This may be an isolated event where plants die off completely right next to healthy ones. Usually these bugs are found on the underside of host leaves and will run for cover if exposed. The best management comes from the parasitic Tachnid fly. Encourage them by planting their preferred plants (see beneficials section).

<http://bsciencecenter.wordpress.com/2009/10/21/what-are-those-strange-insects-squash-bugs/>

<http://pubs.ext.vt.edu/444/444-031/444-031.html>

<http://pubs.ext.vt.edu/444/444-621/444-621.pdf>

Tarnished plant bug *Lygus lineolaris*

Native to North America this true bug (order *Hemiptera*) is detrimental to a wide variety of crops in New England. Active as soon as it warms in Spring. With a staggering 3 to 5 generations possible in a single year they feed on 300 different plants and introduce toxic saliva similar to squash bugs but far more widespread both in symptoms and in hosts. Researching them reveals papers written on their detriment to everything from field grown flowers to dill to apples to amaranth. Toxins cause leaf distortion, black joint, scarring, discoloration, bud abortion, necrosis at feeding site, and dwarfed or pitted fruit. This is the bug that causes those puckered, unformed strawberries and the weird splotchy yellow dots on tomato fruit as well as many other malformations. Adults are ¼ inch long, oval, flattened, brown with white or yellow Y in relief (3-D) on thorax. Wing coverings similar to beetles with . Nymphs are greenish-yellow with four black spots on the thorax and one on the abdomen and feed the same way adults do. Quick to take-off. Eggs are laid in flowers or on leaves. Seemingly immune to native parasites and partial to foreign crops. Very difficult to control. The best prevention is weeding well!

<http://www.uri.edu/ce/factsheets/sheets/tarnplantbug.html>

<http://www.ct.gov/caes/LIB/caes/Documents/Alternatives/Session4TPB.pdf>

<http://ento.psu.edu/extension/factsheets/tarnished-plant-bug>

<http://orchard.uvm.edu/uvmapple/pest/BacktoBasics/Arthropods.htm#Tarnished%20Plant%20Bug>

http://www.umass.edu/umext/floriculture/fact_sheets/pest_management/tpb_cutf_pests.htm

Leaf hopper *Hemiptera: Cicadomorpha: Cicadellidae*

Another true bug that feeds by sucking the sap from vascular plants. One of the largest families of plant feeding insects. Found from the tropics to the tundra. Size ranges from 2 to 30mm. Distinctive spines are present along the tibiae. Eggs are laid in the tissue of host plants. They can transmit pathogens while feeding as well as deplete nutrients just like other true bug pests. The leafhopper we are most likely to encounter in our gardens that will be detrimental to our crops is the potato leafhopper, *Empoasca fabae*, which overwinters only in the south on pine trees and then blows into Vermont on storm fronts in a mass migration around June. Primarily effecting potatoes they also may attack snap beans and eggplant and lettuce. Small and well hidden at just about 1/4" long they are easily overlooked but are yellow-green and will fly up from the foliage when it is disturbed (like white flies). They tend to move sideways like a crab upon the leaf surface. No pathogens are known to be transmitted by this particular hopper however both nymphs and adults cause damage by introducing a toxin while feeding that causes yellowing of veins and curling of leaves in potatoes and mottled brown in beans which then kills them outright. A very small population may do severe harm. Check underneath leaves and watch for insects flying up from disturbed foliage.

http://www.umassvegetable.org/soil_crop_pest_mgt/insect_mgt/potato_leafhopper.html

<http://www.nysipm.cornell.edu/factsheets/vegetables/potato/plh.pdf>

Wire worm (*Limonius canus* and *Agriotes sputator* are the most common species)

Larva of the click beetle that lives for several years in the soil before pupating into benign adults. A tan-brown, hard-shelled larva with three pairs of legs that preys on tuber and root crops by boring as well as being a turf pest to the roots of all sorts of grasses including related vegetable, corn. Eggs are laid in grassy, weedy areas and wireworms can enter a garden from nearby sod or hay fields. Often concentrated in moist soil with high organic matter content, these pests should rarely be a big problem for the community gardener in Vermont.

http://www.umassvegetable.org/soil_crop_pest_mgt/insect_mgt/wireworm.html

<http://www.acornorganic.org/cgi-bin/organopedia/insectdisplay?397>

<http://pubs.ext.vt.edu/2812/2812-1026/2812-1026.html>

Onion (and brassica) Thrips *Thrips tabaci*

Some thrips are plant parasitic and some are beneficially parasitic. Here in New England the biggest problems come from thrip species that attack fruit flowers, especially pears. In our vegetable gardens we may encounter onion thrips. They also feed on brassicas like broccoli and collards. Immature they are very small (0.5 – 1.2mm) have obvious eyes, cannot fly and are usually white/yellow or translucent like some aphids. Adults range in color from black to yellow. Found in large populations (eggs are microscopic) on and between the leaves of host plants especially the newest leaves. They winter as adults in crop remnants, greenhouses, and weeds in borders. Rasping mouthparts tear open plants cells to feed on juices. Symptoms include silver lines, tip die-back, white patches, curling, stunting of plants, bulbs, overall yields. Young plants the most sensitive. Don't plant onions near crops that may harbor thrip populations like alfalfa, clover, cucurbits, or brassicas. Thrips prefer hot, dry weather. Sticky traps are effective.

<http://web.entomology.cornell.edu/shelton/veg-insects-global/english/thrips.html>

http://www.umassvegetable.org/newsletters/documents/july12newslettermax_000.pdf

This last website covers a number of these other pests as well.

Cabbage (root) maggot *Delia radicum*

A fly larva that feeds on all cruciferous (includes brassica) crops (broccoli, cabbage, turnip, brussels, radish etc.) as well as on beets and celery. The onion maggot adult is nearly identical to the cabbage maggot though both are host specific. Traps are used to monitor the presence of adult flies (yellow sticky tape or yellow container with water). The maggots feed on the host plant's feeder roots and then burrows into the taproot. Overwinters as pupae and emerges mid-May preferring cool weather similar to flea beetles. Planting later than sooner may be helpful. 2-3 generations per year but due to their temp preference the first is the most damaging. Protecting the stem can be an effective deterrent of egg-laying which occurs on the stem or around the stem on the soil surface. Also, row covers will keep adult flies out. Be careful of weeds that may act as alternative host plant such as wild mustard and other crucifers.

http://www.umassvegetable.org/soil_crop_pest_mgt/insect_mgt/cabbagemaggot2.htm

[http://www1.agric.gov.ab.ca/\\$department/newslett.nsf/all/snack17689](http://www1.agric.gov.ab.ca/$department/newslett.nsf/all/snack17689)

Squash vine borer *Melittia satyriniformis*

Significant pest of squash and pumpkin and a lesser pest of other cucurbits and melons. Eggs are flat, oval and brown about 1mm. Adult has wasp-like appearance with opaque fore wings and transparent rear wings. Hairy hind legs are reddish orange and abdomen ringed with orange and black. Larva look like grubs with white body and brown head about 1" long. Overwinters as pupa in soil and emerges in late June. One generation per year in Vermont. Eggs are laid on the stem immediately above ground surface and hatch in ten days then the larva feed for about four weeks by burrowing continually through the inside of the vine. Damaged plants wilt and shiny powdery insect waste can be seen at damage sites. Boring affects nutrient access and invites other disease. If borer holes are detected (often just above where the vine emerges from the soil) split the vine open just far enough to remove the larva from within. If caught early the plant is usually savable. Row covers can protect from moths ovipositing. Parasitic wasps are good defense against the eggs hatching.

<http://ento.psu.edu/extension/factsheets/squash-vine-borer>

http://www.urimga.org/fact_sheets/Squash%20Vine%20Borer.pdf

Leaf miner

Larva of various flies, beetles, and moths in the family *Agromyzidae*. Distinctive loopy lines appear on effected plants in patterns created by the insect feeding inside the leaf in winding trails. Damage is

clearly visible though usually the overall health of the plant is not threatened. In spinach and chard some infected leaves may need to be discarded. Not a real problem for us.

The following are all plant destroying larval forms of “harmless” adult moths (these adults being nocturnal and feeding on nectar, not plants).

European corn borer *Ostrinia nubilalis*

A pest of both corn and peppers as well as over 200 other herbaceous plants. Different strains cause different damage in corn. Eggs are laid on host plant leaves and in a white mass going through a “black head” phase where they resemble tiny tadpole eggs. Larva tunnel into corn stalks where pupae form. Here in VT we will experience between one and two generations per year. Pretassel damage is evidence of a bad infestation. In mid-July to September the second generation attacks susceptible ears. Larva and pupae overwinter inside stalks of corn so get rid of it well. It was once the law that corn fields be plowed before winter as this eliminates up to 75% of overwintering larva/pupa. Crop rotation effective as the population increases near host plants. Also wise to avoid tall weeds which they can pupate in and emerge as dull brown moths.

<http://www.hort.uconn.edu/ipm/veg/htms/pprborer.htm>

http://www.umassvegetable.org/soil_crop_pest_mgt/insect_mgt/corn_european_borer.html

Corn earworm *Helicoverpa zea*

The earworm is also a known pest of tomatoes and cotton. Moths migrate mid-July through September and lay eggs in the silks of developing ears. Eggs hatch in three days and larva feed for about a month. Most destructive when contended with after European corn borer. Larva varies greatly in color but adults are grey with dark dots on each fore wing. Rear wings are lighter tan color. These pests do not overwinter in Vermont. Eggs hatch in 3-10 days and larva eat their way inward to the tip of the ear where they feed on kernels and silk producing moist waste and often going unnoticed until harvest. Larva may also destroy corn silks before pollination is complete resulting in stunted, misshapen ears or none at all. Check your ears!

http://www.umassvegetable.org/soil_crop_pest_mgt/insect_mgt/corn_earworm.html

Cut worm

The larvae or caterpillars of many different types of moth (*Agrotis*, *Amathes*, *Peridroma*, *Prodenia* spp.) they cut down young plants at their base when they feed, usually destroying the whole specimen. Quite varied in coloring the caterpillars are usually stout, plump, smooth and one to two inches. The adults are generally brown or black moths with various splotches, or stripes in shades of gray, brown, black or white. Larva winter over and come out hungry and ready for young transplants. Eggs are often laid in weedy or grassy areas near stems in the soil. They feed at night and usually have only one generation per year. They may feed right through June. Sunflowers are a preferred crop and may help isolate and deter cutworms when planted in the garden. Many home remedies exist like copper or onion skin placed around stems. Turning the soil in the Fall helps because moths from buried pupae cannot escape.

<http://www.uri.edu/ce/factsheets/sheets/cutworms.html>

http://extension.unh.edu/resources/files/Resource000547_Rep569.pdf

Cabbage looper *Trichoplusia ni*

Feeds on cabbage and leaves large, irregular holes in the outer leaves sometimes eating into the head itself. Larva is light green and older ones show white lines running down their sides. Loopers move forward by reaching out with their front legs and drawing their rear up to meet them thus creating or straightening a “loop” of their bodies. This also looks like they are measuring the inches they travel.

Loopers are the caterpillar of a mottled brown moth with a 1.2" wingspan and a distinctive silver figure eight shape near the center of the front wings. The eggs are laid on the upper surfaces of host plants and hatch in three to four days and 5 instars are moved through in 3 weeks. Pupa stage is only about 2 weeks and three or more generations are possible in a single year. Clean up crops quickly after harvest. BT (*Bacillus thuringiensis*) is effective. Be careful of weeds that may act as alternative host plants such as wild mustard and other crucifers.

<http://www.uri.edu/ce/factsheets/sheets/cabbagelooper.html>

<http://www.maine.gov/agriculture/pesticides/gotpests/bugs/cabbage-worms.htm>

Tomato hornworm *Manduca quinquemaculata*

The larva of the five-spotted hawk moth reach 4 inches long, ½ inch wide with a horn at the top of the tail end and white V shaped marks along the side. These caterpillars are usually found in very small populations and cause impressive damage but to an isolated area. Appearing in late July and early August. Feeds on peppers, tomatoes, eggplant, potatoes. Tachnid fly is an excellent manager of the hornworm and uses them to reproduce by liquifying and laying eggs in their insides. No other control is usually necessary.

http://www.umassvegetable.org/soil_crop_pest_mgt/insect_mgt/tomato_hornworm.html

Some more useful links for insect identification and further research:

<http://www.ipmimages.org/browse/catsubject.cfm?cat=97>

http://pestcontrolcanada.com/Questions/pest_photos_1901%20to%202000.htm

http://www.countrybrookfarms.com/Beneficial_Insects.html

<http://www.organicgardenpests.com/organicpestcontrol3.html>

<http://nevegetable.org/>

For fun and photos:

<http://www.whatsthatbug.com/>

<http://bugguide.net/node/view/52/bgpage>

Plant parasitic heteroptera:

<http://bugguide.net/node/view/12746/bgpage>