

TUFTONBORO COMMUNITY GARDEN INTEGRATED PEST MANAGEMENT

Introduction

The objective of this plan is to identify various garden pests and to provide a variety of measures to control them. Integrated Pest Management (IPM) utilizes a combination of tactics in order to keep pest populations at acceptable levels. IPM is used in all types of agriculture. The integrated approach reduces the dependency on chemicals, while relying on a variety of sustainable and environmentally-minded practices, thereby encouraging a healthy ecosystem with robust biodiversity, and often reducing costs. Pest populations are kept in check by natural predators and parasites, along with crop selection and proper rotation. Weeds are controlled by a combination of cover crops, mulching, minimal soil disturbance and manual techniques. Minimizing the use of pesticides and herbicides while reducing soil tillage encourages the presence of natural predators and parasites in the garden, while reducing harmful pollutants and carcinogens in our soil, groundwater, and in the food we grow.

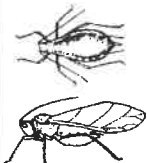
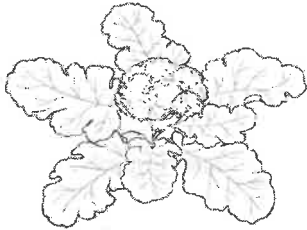
The following charts list various pests (insect pests; animal and bird pests) and methods to control them. In addition to using this information, consider approaching each step of gardening with Integrated Pest Management in mind. From crop and seed selection, to soil preparation and garden layout, to timing of plantings, and to crop rotation, cover crops, and mulches - each step and each decision, impacts the outcome, the amount of work, and the effects of pests and weeds.

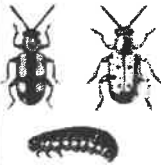
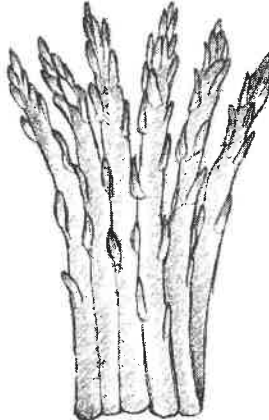
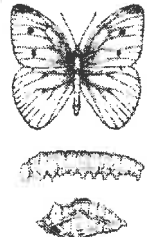

COMMON GARDEN PESTS - INSECTS

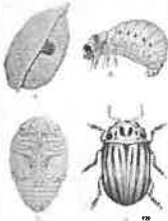
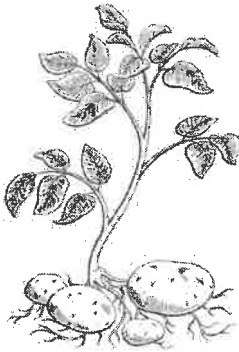
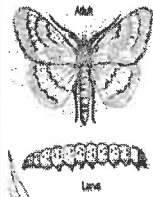
Scouting/Monitoring and Action Threshold:

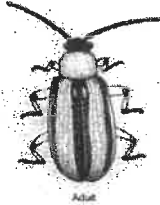
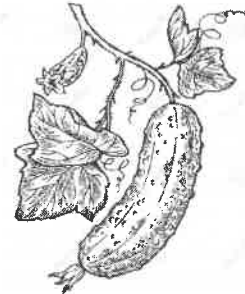
- > Each time you visit your garden plot it is essential to scout for and monitor pest presence and levels of infestation.
- > Record any pest presence and / or damage observed as well as any action taken.
- > Routine scouting, monitoring and recording should be ongoing regardless of pest presence or infestation.

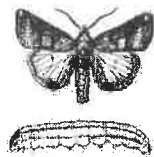

Attracting native predators and parasites by planting a diversity of pollen and nectar plants helps control pest insect populations. The wildflowers and perennials planted at the Community Garden are an element to this integrated approach.

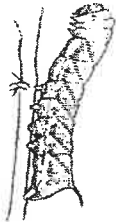
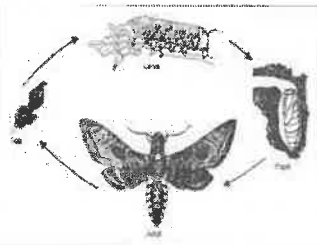
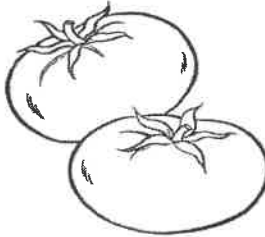

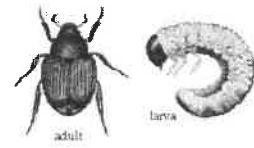
| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
|--|---|--|--|--|
| Aphids  | <ul style="list-style-type: none"> > Adults & nymphs are similar - pear shaped 1/32-1/8" with 2 short tubes projecting backward from abdomen > Long antennae > Various colors & woolly > Winged forms appear when they become crowded | <ul style="list-style-type: none"> > Eggs overwinter on woody stems hatching in spring into stem females which can give birth continuously to live nymphs without mating > Nymphs mature in 1 to 2 weeks > In fall males and normal females are born which mate and produce overwintering eggs | <ul style="list-style-type: none"> > Nymphs and adults suck plant sap from most all fruit, vegetable and perennial plants & trees > Feeding causes leaf, bud and flower distortion/drop > Secrete sticky honeydew* substance that supports growth of sooty mold > Feeding can spread viral diseases *Ants collect honeydew so ant presence often indicates aphid presence | <ul style="list-style-type: none"> > Vegetables : spray plants frequently with a strong stream of water to knock off insects  |




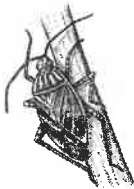
| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
|--|--|---|--|---|
| Asparagus Beetle  | <p>> Adults are 1/4", elongate shaped with red thorax, wing covers are black with white spots and red borders</p> <p>> Larvae are 1/3" plump gray with black head and legs</p> <p>> Eggs are shiny black and are found on the end of stems and young spears</p> | <p>> Hibernating adults emerge when first spears are ready to cut; feed and lay eggs</p> <p>> Eggs hatch in 1 week</p> <p>> Larvae feed for 2 weeks then burrow into the soil to pupate</p> <p>> Adults emerge in 10 days</p> <p>> 2 or 3 generations per year</p> | <p>> Adults and larvae feed on green shoots causing blemishing</p>  | <p>> In fall remove and destroy old fronds and garden litter where beetles overwinter</p> <p>> In spring cover spears with floating row cover until end of harvest</p> <p>> Handpick beetles</p> |
| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
| Cabbage Looper  | <p>> Adults are gray moths 1 1/2"-2" wingspan</p> <p>> Larvae are 1 1/2" green caterpillars with two white stripes down their backs, one along each side</p> <p>> Eggs are light green and dome-shaped Found on the undersides of leaves</p> | <p>> Moths emerge from overwintering pupae in mid-spring and lay eggs</p> <p>> Larvae feed 2-4 weeks then pupate 10 days in cocoons attached to stems or leaves</p> <p>> 3-4 generations per year</p> | <p>> Larvae chew large holes in leaves of cabbage family plants as well as other vegetable crops</p> <p>> May damage whole plant</p>  | <p>> Scout for and destroy eggs on undersides of leaves</p> <p>> Scout for and destroy adults</p> <p>> Remove all plant residue or work into soil before adults emerge in spring</p> |

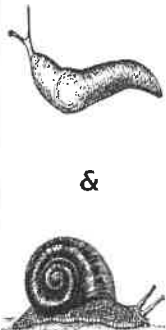

| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
|---|---|--|---|--|
| Colorado Potato Beetle  | <p>> Adults 1/3" yellowish-orange with lengthwise black stripes on wing covers, black spots on thorax</p> <p>> Larvae 1/16-1/2" dark orange humpbacked grub with a row of black spots on each side</p> <p>> Eggs are bright yellow ovals found in clusters of 1 to 2 dozen, found on the underside of leaves</p> | <p>> Overwintering adults emerge from soil in spring and feed on young plants</p> <p>> Females lay up to 1,000 eggs in lifespan of several months</p> <p>> Eggs hatch in 4-9 days</p> <p>> Larvae feed 2-3 weeks then pupate in soil</p> <p>> Adults emerge in 5-10 days</p> <p>> 2 generations per year</p> | <p>> Both adults and larvae chew leaves of potatoes, tomatoes, eggplant and related plants</p> <p>> Feeding can kill small plants and reduce yield of mature plants</p>  | <p>> Handpick and destroy adults and larvae</p> <p>> Scout for and destroy eggs on undersides of leaves (note that eggs are similar to lady-beetle eggs)</p> <p>> Mulch plants with a layer of straw at least 4" deep</p> <p>> Cover plants with floating row cover until midseason or harvest</p> |
| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
| Corn Borer, European  | <p>> Adult females are pale yellowish brown with darker zigzag pattern across wings, 1" wingspan; males are darker colored</p> <p>> Larvae are beige with small brown spots, 1"</p> <p>> Eggs are white and overlapping, laid in masses of 15 to 20 on undersides of leaves</p> | <p>> Larvae overwinter in plant residue and pupate in early spring</p> <p>> Adults emerge in June, lay eggs in late June to mid July</p> <p>> Eggs hatch in 1 week</p> <p>> Larvae feed for 3-4 weeks</p> <p>> 1-3 generations/yr</p> | <p>> Young larvae feed on corn leaves, tassels and beneath husks</p> <p>> Older larvae burrow into corn stalks and ears</p> <p>> Larvae also tunnel into stems or pods of beans, onions, peppers, potatoes, tomatoes & other crops</p> | <p>> Select resistant cultivars</p> <p>> Remove tassels from 2/3 of corn plants before they begin to shed pollen</p> <p>> Pull out and destroy all infested crop residue immediately after harvest & be sure to rotate crop</p> |

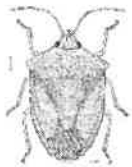

| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
|--|---|---|--|---|
| Cucumber Beetle, Striped  | > Adults are yellow with black heads and black stripes on wing covers > Elongate, 1/4" > Larvae are slender white grubs | > Adults overwinter in dense grass or leaves > Emerge in early spring to early summer > Feed on weed pollen for 2 weeks then move to crop plants > Lay eggs in soil at base of plants > Eggs hatch in 10 days, larvae burrow into soil and feed on roots for 2-6 weeks, pupate in mid- to late summer > Adults emerge in 2 weeks, feed on blossoms maturing fruit > 1 to 2 generations/yr | > Adults feed on squash family plants, beans, corn, peas and blossoms of many garden plants > Beetles swarm on seedlings, feeding on and often killing young plants > Feed on stems and flowers of older plants, eat holes in fruit > Feeding can transmit wilt and mosaic viruses > Larvae feed on roots of squash family plants only, killing or stunting plants | > Remove and destroy crop residue where adults overwinter > Cover seedlings with floating row cover (squash family plants under cover will need to be hand pollinated) > Pile deep straw mulch around plants to discourage beetles from moving between plants  |

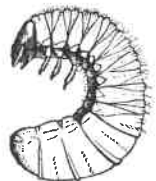
| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
|---|---|--|--|--|
| Cutworms  | <p>> Adults are brown or gray moths with 1 1/2" wingspan</p> <p>> Larvae are fat, gray or dull brown 1-2" caterpillars with shiny heads</p> | <p>> Some species over-winter as pupae, adults emerge and lay eggs on grass or soil surface from mid to early summer</p> <p>> Eggs hatch in 5-7 days, larvae feed on grass and other plants for 3-5 weeks then pupate in soil</p> <p>> Adults emerge in late summer to early fall</p> <p>> Other species over-winter as eggs that hatch during the first warm days and feed on early seedlings</p> <p>> 1 generation/yr, 2 if warm fall weather</p> | <p>> Caterpillars feed at night on stems of vegetable and flower seedlings and transplants near the soil line</p> <p>> Sever or completely consume small seedlings</p> <p>> During the day they rest below the soil surface, curled beside plant stems</p>  | <p>> Put collars 3-4" tall made of paper, plastic or cardboard around transplant stems at planting, push collars into soil until 1/2 the collar is below soil level (1 1/2-2" above soil)</p> <p>> In the morning, dig around the base of damaged transplants and destroy larvae</p> <p>> Set out transplants later in the season</p> |

| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
|--|---|--|--|--|
| Hornworms, Tomato and Tobacco  | <p>> Adults of both species are large, gray or brownish moths, 4-5" wingspan, mottled wings and dark body marked with yellow spots</p> <p>> Larvae are green caterpillars 4 1/2" long with a horn on the tail</p> <p>> Tomato hornworms have 7 yellow V-shaped marks and black horn</p> <p>> Tobacco hornworms have 7 white diagonal lines and red horn</p> | <p>> In June and July moths emerge from soilborne pupae</p> <p>> Adults lay eggs on undersides of leaves</p> <p>> Eggs hatch in a week, larvae feed for a month then pupate in soil until following summer</p>  | <p>> Larvae of both species consume leaves, stems and fruit of nightshade family plants</p> <p>> Feeding can kill young plants</p>  | <p>> Handpick caterpillars from foliage</p> <p>> Pick off and destroy eggs</p> <p>> Do not destroy hornworms that have rice-like pupae attached to their backs, this indicates the worm has been parasitized by predatory wasps</p> |
| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
| Japanese Beetle  | <p>> Adults are metallic blue-green, round, 1/2" with bronze wing covers and long legs</p> <p>> Larvae are white grubs with brown heads, 3/4"</p> <p>> Found in sod, top layer of soil</p>  | <p>> Overwintering larvae deep in the soil move toward the surface in spring to feed on roots</p> <p>> Pupate in early summer</p> <p>> Adults emerge, feed on plants and lay eggs in late summer</p> <p>> Eggs hatch into larvae that overwinter in soil</p> | <p>> Adults eat flowers and skeletonize leaves of a broad range of plants and fruit</p> <p>> Larvae feed on roots of lawn grasses and garden plants</p> | <p>> Remove beetles; shake into a container of water and cap it</p> <p>< Cover plants with floating row cover</p> |

| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
|--|--|---|--|---|
| <p>Mexican Bean Beetle</p>   | <p>> Adults are oval, 1/4" yellowish brown with black spots on wing covers</p> <p>> Larvae are 5/16" yellowish orange grubs with long branching spines</p> <p>> Eggs are yellow ovals on undersides of leaves</p> | <p>> Adults overwinter in leaf litter in nearby fields</p> <p>> In spring females lay eggs on bean plants</p> <p>> Eggs hatch in 5-14 days</p> <p>> Larvae feed 2-4 weeks and then pupate on leaves</p> <p>> 1-3 generations/yr</p> | <p>> Both larvae and adults skeletonize leaves of various pea and bean plants</p> <p>> Feed from undersides of leaves</p> <p>> Severely defoliated plants may be killed</p> | <p>> Plant early season bush beans to avoid main beetle generations</p> <p>> Handpick adults and larvae and destroy eggs</p> <p>> Cover plants with floating row cover until plants are large enough to withstand damage</p> <p>> Interplant with flowers and herbs</p> |
| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
| <p>Plant Bugs, Tarnished</p>   | <p>> Adults are 1/4", oval, mottled light green, yellowish red-brown to brown with a black-tipped yellow triangle on each forewing</p> <p>> Nymphs are generally yellow-green, wingless</p> | <p>> Some species overwinter as adults under bark and leaf litter</p> <p>> Emerge in early spring and lay eggs in leaf tissue</p> <p>> Eggs hatch in 10 days, nymphs feed 3-4 weeks then molt to adults</p> <p>> Up to 5 generations/yr</p> | <p>> Adults and nymphs suck plant juices from most flowers, fruits and vegetables</p> <p>> Causes fruit and shoot distortion, bud drop, wilting, stunting and dieback</p> <p>> Irregularly shaped fruit on strawberries, malformed leaves on leafy vegetables</p> | <p>> Cover plants with floating row cover</p> <p>> Remove weeds early</p> |

| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
|---|--|---|---|---|
| Slugs/Snails  | <ul style="list-style-type: none"> > Adults are soft-bodied 1/8' - 8" gray, tan, brown, black, green, yellow or spotted > Leave trails of mucus where they crawl > Eggs are clear, oval or round, laid in jellylike masses under stone or debris | <ul style="list-style-type: none"> > Adults lay eggs in moist soil or under rocks > Eggs hatch in 2-4 weeks > Young grow from 5 months to 2 years before reaching maturity | <ul style="list-style-type: none"> > Large holes in foliage, stems and bulbs > Feast on tender plants, may demolish seedlings > Most damaging in wet years | <ul style="list-style-type: none"> > Use copper flashing as edging for garden beds > Handpick and destroy > Attract with pieces of raw potato or cabbage leaves set out in garden, collect and destroy in morning |
| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
| Squash Bug  | <ul style="list-style-type: none"> > Adults are brownish-black, flat-backed, 1/2" > Give off unpleasant smell in defense > Nymphs are gray or green, similar shape to adults but lighter in color > Eggs are shiny yellow to brown ellipses found in groups under leaves | <ul style="list-style-type: none"> > Unmated adults overwinter under garden litter, vines or boards > Emerge, mate, and lay eggs in the spring > Nymphs take all summer to develop, molting 5 times before maturity | <ul style="list-style-type: none"> > Both adults and nymphs suck plant juices of all cucurbit crops, especially squash or pumpkins causing leaves and shoots to blacken and die back > Attacked plants fail to produce fruit > Winter squash are most severely affected | <ul style="list-style-type: none"> > Maintain vigorous plant growth > Handpick all stages of bugs from undersides of leaves > Scout for and destroy eggs > Support vines off the ground on trellises |

| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
|--|---|---|---|--|
| Stink Bugs,  (*Spined soldier bug as predator/beneficial) | <ul style="list-style-type: none"> > Adults are 1/2" shield shaped, green, tan, brown or gray > Nymphs are oval shaped and wingless, similar to adults > Eggs are barrel-shaped, fringe of spines at one end and laid in clusters | <ul style="list-style-type: none"> > Adults overwinter in weeds and waste areas > Females lay 300-500 eggs each when weather warms > Eggs hatch in 1 week > Nymphs develop to adults in 5 weeks > 2 or more gen./yr | <ul style="list-style-type: none"> > Adults and nymphs suck plant sap from leaves, flowers, buds, fruit and seeds of cabbage family crops, squash, beans, peas, corn, tomatoes and peaches > Feeding punctures in fruit cause scarring and dimpling | <ul style="list-style-type: none"> > Control weeds near susceptible crops > Remove or mow weedy areas adjacent to garden beds |
| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
| Thrips  | <ul style="list-style-type: none"> > Adults are slender 1/50-1/25" long > Color ranges from yellow to brown or black > Fast moving, flying insect > Difficult to see without magnifying glass > Nymphs are similar to small adults, green or yellow | <ul style="list-style-type: none"> > Adults overwinter in sod, plant debris or cracks in bark > Become active in early spring > Eggs are laid in plant tissue and hatch in 3-5 days > Nymphs feed 1-3 wks then rest in soil or in leaves until they molt in 1-2 weeks > 15 gen./year outdoors, continuous in GH | <ul style="list-style-type: none"> > Adults and nymphs suck contents of plant cells from a variety of garden plants, flowers, fruits and shade trees > Silvery speckling or streaks on leaves from feeding > Severe infestations stunt plants and damage flowers and developing fruit | <ul style="list-style-type: none"> < Prevent by watching for signs of thrips on plants introduced to garden < Remove infected portion of plant or entire plant |

| INSECT | DESCRIPTION | LIFE CYCLE | DAMAGE | CONTROL |
|---|--|---|---|---|
| White Grubs  | <ul style="list-style-type: none"> > Adults are 1/3-3/4" shiny, reddish-brown to black > Some wing covers have punctures or stripes > Larvae are white to bluish-white, C-shaped, 3/4-1" with brown head | <ul style="list-style-type: none"> > Varies by species > Lay eggs in soil, hatch in 2-3 weeks > Grubs feed on decaying vegetation and plant roots > Pupate in soil > Emerge in spring to feed and lay eggs > Largest broods appear in 3-year cycles > 1 generation/year | <ul style="list-style-type: none"> > Larvae feed on roots of lawn grass, corn, potatoes, vegetable plants and strawberries > Adults feed on many species of vegetables, flowers, trees and shrubs chewing irregular holes in leaves and flowers | <ul style="list-style-type: none"> > Populations of most white grubs are usually suppressed by native predators and parasites > Clean up garden debris in fall > Cultivate in fall to reduce overwintering populations > Rotate crops |

ANTS

> For the most part, ants are beneficial and very important to soil health. They move soil in the manner of earthworms as they tunnel, aerating and increasing water and air movement. They carry organic matter into the soil and clear away decomposition of plant and animal residue. Ants are important predators of many insect pests.

> Some ants tend aphids to collect their honeydew; the presence of ant colonies at or near the base of trees and shrubs can indicate a heavy aphid infestation.



Reference: The Organic Gardners Handbook of Natural Pest and Disease Control; Bradley, Ellis, Martin; Rodale