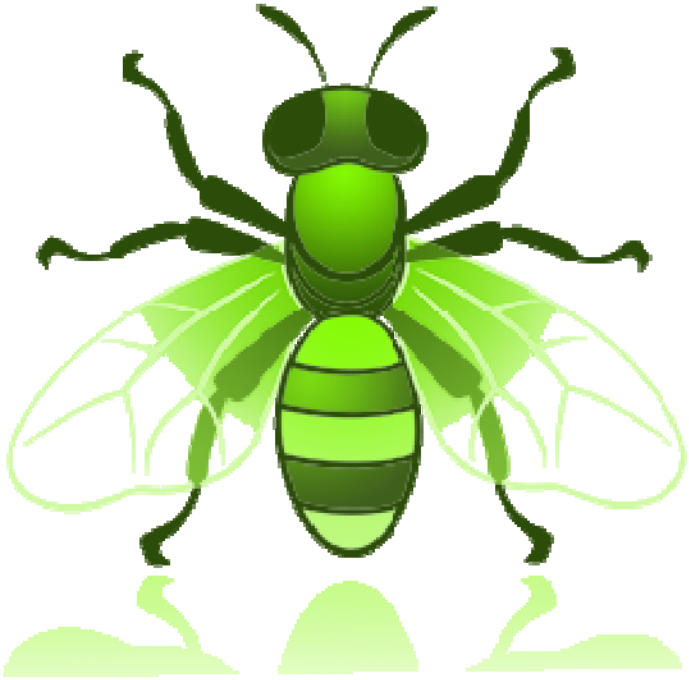
BACKYARD
VEGETABLE GARDENING



A Guide to Managing Insect Pests of the Backyard Vegetable Garden

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2011

CAPE COD COOPERATIVE EXTENSION
www.capecodextension.org

ABOUT THIS GARDENING GUIDE…

This booklet is designed to aid the backyard gardener who would like to grow home vegetables, but is frustrated by the never ending attack from seemingly dozens of insect pests, by the puzzling array of products developed to thwart this assault and by the glut of information about the topic of gardens.

The guide is based upon principles of Integrated Pest Management, or IPM. Simply, this concept combines various types of pest controls such as chemical, mechanical and physical into a management scheme that can be modified as newer products become available. You create your own IPM program by identifying what pests are damaging your vegetables, by selecting an appropriate control method, by applying the control, then by recording how well it worked. After adding a few appropriate notes, you will have a nice record of your vegetable growing successes!

This guide is organized as nine vegetable charts arranged in broad categories. For instance, the first chart includes five insect pests that attack the crucifer group; the crucifers include cabbage, kale, broccoli, cauliflower, mustard greens, radish, rutabaga and turnips. Other vegetable groupings include the green leaves, umbellifers, solanaceous, cucurbits, allium, legumes, corn, and lettuce/asparagus.

Each chart features includes information about when a pest could be present, what kind of damage it does and a 'damage threshold' to help you decide if you should treat. The pest drawings may aid in identification, but confirm pest identity with color photographs.

Four categories of control options are listed in each chart.

1) BIOCONTROL: release or conservation of beneficial organisms. (N) occurs naturally, (C) commercially available,
2) TRAPS: devices that can attract and capture a pest. Traps can include pheromones, a chemical scent that will lure a pest to the trap.
3) BARRIERS: row covers that prevent the pest from reaching the plants,
4) APPLICATION: a spray treatment New products reach the commercial market each year. In this guide, we have listed products that are safe to handle and will still get the job done.

When selecting any chemical for pest control, be sure to <u>read the label.</u> Generally, a pesticide product is developed for certain pest types, and will not work effectively against unlisted pests. See if your pest is listed.

'ROW COVERS' includes all types of floating row covers, ultra-thin row covers or fabric cloth intended for agricultural use.

'APPLICATION' includes all CONTACT OR REPELLENT insecticides, including NEEM, pyrethroids, botanicals, and pepper sprays.

'OIL/SOAP' includes soap and oil-based products that disrupt the skin or breathing of the pest.

'MICROBIAL' includes products formulated with bacteria, such as *Bacillus thuringiensis* (Bt) and fermentative by-products such as spinosad. Bt must be ingested to be effective. Spinosad is more effective when ingested by does have contact activity.

Finally, key tips are included that will aid pest control. These tips are found associated with each plant group and for a particular pest.

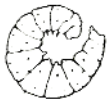
The very last page is an updated resource guide that includes a list of several catalogs, websites to help aid identification and local resources.

Please note, no product endorsement is implied nor is discrimination intended against similar materials.

<u>GOOD LUCK AND HAPPY GARDENING !!!</u>

THE CRUCIFER GROUP

**Cabbage, Broccoli, Cauliflower, Brussels Sprouts,
Collards, Kale, Mustard Greens, Radish, Rutabaga and Turnips**

PEST	FLEA BEETLE	CABBAGE WORM	ROOT MAGGOT	CABBAGE APHID	CUTWORM
					
WHEN PRESENT	Late April/May and August	May, then summer to fall	Early May	July through September	April and August
PLANT DAMAGE	Many pinholes in leaves	Large holes in developing leaves	Transplant collapse; tunnels in roots, with decay	Masses of aphids beneath leaves, yellowing	Young stems cut at soil; leaves removed
DAMAGING LIFE STAGE	Adult beetles (larvae feed on roots)	Caterpillars	Maggots	All stages	Caterpillars
THRESHOLD	About 5 holes per leaf	3 holes per leaf	Previous damage	40% of plants affected	25% of plants affected
BIOCONTROL	--	Paper Wasps, Hornets (N)	Nematodes (C)	Ladybirds, Lacewings (N and C)	Paper Wasps, Hornets (N)
TRAPS			Yellow Sticky	Yellow Sticky	Pheromone
BARRIER	Row Cover	Row Cover	Row Cover	Row Cover	Stem Collars
APPLICATION	Pyrethroid/NEEM	Microbial (BT)	Pyrethroid?NEEM	Soap/Oil	Microbial (BT)

TIPS!

FLEA BEETLES are most troublesome on early transplants in April and May. Either place your row covers immediately after planting, or apply a contact spray (NEEM or pyrethroids), and continue weekly.

CABBAGE WORMS are a pest of developing head cabbage and particularly, late kale, although their presence on any leaf is enough! Spray the microbial BT if small holes are noticed in larger leaves; mix with soap liquid to get better coverage.

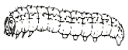
ROOT MAGGOTS are most damaging to early plantings, but will persist and feed on larger plants. Damage is usually seen as a wilted plant, but then it's too late! Check for tiny (1/8") maggots.

CABBAGE APHIDS build up beneath leaves; especially, check kale in August. Spray underneath!

CUTWORMS are early season pests. Damage will be seen as missing plants in a row or large holes in leaves. Check around stems in the day by brushing away soil and finding large caterpillars. They are the culprits!

THE LEAFY GREENS

Spinach, Swiss Chard, Beet Greens, Mixed Oriental Leaves

PEST	Leaf Miner	Springtail	Beet Armyworm	Beet Leafhopper	Aphids
					
WHEN PRESENT	May, August	April, August	July-August	June-August	April-August
PLANT DAMAGE	Tunnels or blotches <u>within</u> leaves	Tiny pocket pin holes in leaves	Large holes in leaves	Stunting and yellowing of leaves	Yellowing and stunting
DAMAGING LIFE STAGE	Maggots in leaves	Adults and immatures	Caterpillars	Adults and nymphs	Adults and nymphs
THRESHOLD	Mines in 10% of leaves	If present 10% of leaves	20% of plants affected	20% of plants affected	20% of plants affected
BIOCONTROL	Hand pick infested leaves	--	Wasps (N)	--	Ladybirds, Syrphid flies
TRAPS		Yellow Sticky	Pheromone	Yellow Sticky	Yellow Sticky
BARRIER	Row Cover	Row Cover	Row Cover	Row Cover	Row Cover
APPLICATION	Spinosad	Soap/Oil	Soap/Microbial	Soap/Oil	Soap/Oil/Water

TIPS!

<u>LEAF MINER</u> eggs are little white clusters on leaf undersides. Check for them in early spring when leaves are unfurling. Crush the eggs or pick infested leaves and discard, then shelter emergent leaves with row cover; pick the leaves as you need, and replace the row cover.

<u>SPRINGTAILS</u> are extremely tiny and jump like fleas (but don't bite!). They will hop off leaves if disturbed or if a shadow passes. A repellent substance will be more effective than a contact insecticide.

<u>BEET ARMYWORM</u> may be numerous and thus may appear unexpectedly.

<u>BEET LEAFHOPPERS</u> are quick to jump. Damage is less obvious as these pests are sucking type insects.

ROW COVERS are a great control against all these leafy green pests.

THE UMBELLIFER GROUP

Carrots, Celery, Parsley, Celeriac

PEST	Black Swallowtail	Carrot Weevil	Carrot Rust Fly	Leafhopper
				
WHEN PRESENT	July-August	July-August	July-August	June-July
PLANT DAMAGE	Leaves eaten, particularly parsley	Holes and tunnels in roots (carrots)	Tunnels and creates rot through roots	Yellowing of leaves
DAMAGING LIFE STAGE	Caterpillars	Larvae (grubs)	Maggots	All stages
THRESHOLD	Observed feeding damage	Previous damage	Previous damage	25% of plants affected
BIOCONTROL	Paper wasps (N)	Nematodes (C)	Nematodes (C)	--
TRAPS	Hand pick caterpillars	--	Orange Sticky	Yellow Sticky
BARRIER	Row Cover	Row Cover	Row Cover	Row Cover
APPLICATION	Microbial (BT)	Nematodes	Nematodes	Repellent

TIPS!

<u>BLACK SWALLOWTAIL CATERPILLARS</u> may be picked from foliage and placed on an alternate host such as Queen Anne's Lace. Theses insects are only occasional pests.

<u>CARROT WEEVILS</u> are not too much of a northern carrot crop problem, but be sure to note if you see them.

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<u>CARROT RUST FLY</u> adult flies can be trapped on sticky orange panels and are recognized by their size (1/16") and stiletto shape. Drench around plants with nematodes if flies are captured.

<u>LEAFHOPPERS</u> can transmit a disease known as aster yellows. If plants appear yellow and stunted, they should be removed and destroyed.

THE SOLANACEOUS GROUP

Tomatoes, Peppers, Potatoes, and Eggplant

PEST	Hornworms	Colorado Potato Beetle	CPB larva	Cutworms	Tomato Fruitworm
					
WHEN PRESENT	July-August	June-August		May-June	July-August
PLANT DAMAGE	Leaves eaten completely!	Large holes in leaves		Stems cut at ground level	Holes in tomatoes and peppers
DAMAGING LIFE STAGE	Caterpillars	All stages; both adults and larva feed on leaves during same period		Caterpillars	Caterpillars
THRESHOLD	Five plants attacked	Ten larvae or beetles		10% plants attacked	Two fruit damaged
BIOCONTROL	Parasitic Wasps (N)	Soldier Bugs (N) and (C)		Tricho Wasps (C)	Tricho Wasps (C)
TRAPS	Hand Pick	Hand Pick		Pheromone	Pheromone
BARRIER	--	Row Cover		Stem Collars	--
APPLICATION	Microbial	Microbial		Nematodes	Repellent

TIPS!

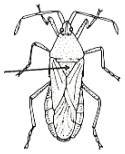
HORNWORMS will begin to feed on leaves around mid-June. Check first near the tops of tomato plants for feeding injury as bare stems, and a distinct tomato odor. If hornworms have been a pest problem, spray BT at least three times seven to ten days apart. Cover the leaf surfaces with spray. If you notice a hornworm with white 'eggs' on its body, spare the pest, because those eggs are actually beneficial wasp cocoons.

COLORADO POTATO BEETLES are a real problem on eggplant and potatoes. Orange eggs are laid in clusters, usually on the leaf underside. Several eggplants placed near rows of tomatoes or peppers will serve as a trap crop and attract many CPB. A simple control method requires only a cardboard box - walk along a row and just shake beetles and larvae into it!

TOMATO FRUITWORM can be most damaging as they feed inside tomato fruit!

THE CUCURBIT GROUP

Melons, Winter squash, Summer squash and Cucumbers

PEST	Squash Vine Borer	Striped Cucumber Beetle	Squash Bug
			
WHEN PRESENT	July-August	June-August	July-August
PLANT DAMAGE	Tunneling in stems causes wilting	Ragged holes in leaves and possibly blight	Wilted leaves due to sucking
DAMAGING LIFE STAGE	Caterpillars!	Beetles	Adults and nymphs
THRESHOLD	10% affected; prior damage	Five beetles per plant	Ten bugs per plant
BIOCONTROL	Nematodes (C)	-	-
TRAPS	-	Yellow Sticky	Flat Board
BARRIER	Row Cover	Row Cover	Row Cover
APPLICATION	Repellent	Microbial	Repellent

TIPS!

SQUASH VINE BORERS prefer Blue Hubbard, pumpkins and summer squashes. Look for small piles of 'sawdust' near main stems. The adult is a day flying black and orange moth, seen laying eggs around stems. Row covers placed over emerging vines and held until female flowers appear may prevent egg-laying.

STRIPED CUCUMBER BEETLES are wary and quick to vamoose. Spray in late afternoon or early evening and repeat several times over a week. The larvae feed on roots underground.

SQUASH BUGS may be collected from the undersides of leaves. Try placing flat boards near plants and collect them in early morning into a can of soapy water. The nymphs, or immatures, are gray and generally cluster together.

THE ALLIUM GROUP

Onions, Garlic, Elephant garlic, Shallots and Leeks

PEST	Onion Thrips	Onion Root Maggot	Lesser Bulb Fly
			
WHEN PRESENT	July-August	May	May-June
PLANT DAMAGE	Yellowing known as 'silvers'	Feeding in bulbs below soil	Feeding in bulbs
DAMAGING LIFE STAGE	All stages	Maggots	Maggots
THRESHOLD	25% affected	Prior damage	Prior damage
BIOCONTROL	Predatory Mites (C)	Nematodes (C)	Nematodes (C)
TRAPS	Blue sticky	Yellow Sticky	Yellow Sticky
BARRIER	Row Cover	Row Cover	Row Cover
APPLICATION	Pyrethroids/NEEM	Pyrethroids	Pyrethroids

TIPS!

ONION THRIPS are very tiny and as such difficult to detect. Look for yellow steaks on developing green leaves, and shake the leaves over a white paper to see thrips.

Predatory mites may be purchased and released early in the growing season if thrips are a persistent problem. Note that it is always thrips even as a singular description, i.e., one thrips, two thrips.

ONION ROOT MAGGOTS are found frequently in rich organic soils. If infested, remove and destroy damaged plants. Consider an application of nematodes around new plantings.

THE LEGUME GROUP

Peas, Snap beans and Field beans

PEST	Seed Corn Maggot	Mexican Bean Beetle (MBB)	MBB Larva	Japanese Beetle	JB Larva*
					
WHEN PRESENT	April-May	June-August		July-August	August-June
PLANT DAMAGE	Seeds fail to germinate	Large holes (skeletonize) in leaves; soon only veins are left. Most feeding from underneath.		Holes in leaves	*Feed on <u>turf</u> roots
DAMAGING LIFE STAGE	Maggots	Beetles and larvae		Beetles	Grubs
THRESHOLD	10% plants affected	Observe >20		Observe >10	10+ per square foot
BIOCONTROL	Nematodes (C)	Parasitic wasps (C)		Milky Spore (for grubs)	Milky Spore; Nematodes
TRAPS	Yellow sticky	--		Floral lure	-
BARRIER	Row Cover	Row Cover		Row Cover	-
APPLICATION	Pyrethroids	NEEM		NEEM	

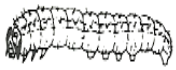
TIPS!

<u>SEED CORN MAGGOTS</u> really attack early peas. If your peas are not coming up, dig a few seeds and check for the presence of a small maggot within.

<u>MEXICAN BEAN BEETLES</u> generally do not damage the actual bean crop unless their pest population is high. Therefore, picking and discarding infested leaves is a simple and effective treatment.

<u>JAPANESE BEETLES</u> feed on soybeans. If you deploy the floral traps, NEVER put them in a food crop, including grapes, raspberries, roses, etc. Rather, place the traps upwind at least 25 feet away from the crop.

THE SWEET CORN GROUP

PEST	European Corn Borer	Corn Earworm	Armyworm	Corn Aphids
				
WHEN PRESENT	May-June mid August	mid July-September	June-September	July through September
PLANT DAMAGE	Early feeders in whorls and leaves. Later in ears	Tassels and tops of ears	Leaves, then mid ear holes	Masses of aphids beneath leaves, causing yellowing
DAMAGING LIFE STAGE	Caterpillars	Caterpillars	Caterpillars	All stages
THRESHOLD	25% plants affected	50% plants affected	25% plants affected	70% of plants affected
BIOCONTROL	Tricho wasps (C)	Tricho wasps (C)	Tricho wasps (C)	Ladybirds, Lacewings (N and C)
TRAPS	Pheromone	Pheromone	Pheromone	Yellow Sticky
BARRIER	-	-	-	-
APPLICATION	Spinosad	Spinosad	Spinosad	Soap/Oil

TIPS!

<u>EUROPEAN CORN BORERS</u> are most troublesome on early transplants in April and May. Either place your row covers immediately after planting, or apply a contact spray soon after, and continue weekly.

<u>CORN EARWORM</u>, the same pest as tomato fruitworm, attacks ears near the silk. Usually, only one caterpillar will be found per ear. The caterpillars have rows of small stiff bristles along the sides.

<u>ARMYWORMS</u> usually enter an ear through the side of the husk. The caterpillars have an inverted white 'Y' on the front of the head. Several armyworms may infest one ear.

<u>CORN APHIDS</u> build up beneath leaves and may cause a black mold to develop on the leaves. This is known as sooty mold, but is not related to corn smut.

THE LETTUCE AND ASPARAGUS GROUP

PEST	Root Aphid	Lygus Bug	Asparagus Beetle	Spotted Asparagus Beetle
				
WHEN PRESENT	July	All summer	April-May	April-May
PLANT DAMAGE	Root suckers	Bud suckers	Feed on tender shoots	Feed upon tender shoots
DAMAGING LIFE STAGE	Adults and nymphs	Adults	Beetles	Beetles
THRESHOLD	25% plants affected	Observe 5+	Previous damage to stalks	40% of plants affected
BIOCONTROL	--	-	Hand Pick	Hand Pick
TRAPS	Remove affected plants		-	-
BARRIER	Row Cover	Row Cover	Row Cover	Row Cover
APPLICATION	Pyrethroid	Soap/Oil	Soap/Oil	Soap/Oil

TIPS!

<u>ROOT APHIDS</u> are most troublesome on early transplants in April and May. Either place your row covers immediately after planting, or apply a contact spray soon after, and continue weekly.

<u>LYGUS BUGS</u> are a pest of new buds. Their sucking mouthparts affect the plant fluids and may cause bud dropping or distortion

<u>ASPARAGUS BEETLES</u> are most damaging to asparagus spears, the business end of the crop! Larvae are small gray hump-backed creatures that may be picked off before they feed too much. Adult beetles of both species are wary and quick to drop from plants when disturbed.

RESOURCES FOR THE 2011 BACKYARD GARDENER

GARDENING SUPPLIES

Gardens Alive! **(812.537.8650) Nice catalog featuring many pest control products**
www.gardensalive.com

Gempler's **(800.382.8473) Large selection of all types of landscaping/gardening gear**
www.gemplers.com

Harmony Farm **(707.823.9125) Seeds, control methods and information**
www.harmonyfarm.com

Peaceful Valley **(888.784.1722) Impressive list of garden supplies**
www.groworganic.com

A-1 Unique **(916.961.7945) Good source of ladybird beetles and other beneficial species**

The Green Spot **(603.942.8925) Source of many beneficial species**
www.greenmethods.com

Cape Cod Business Directory
http://www.capecodtoday.com/index.php?module=pnBizDir&func=viewlinks&browse=&sort=442&offset=0
Cape Cod Garden Stores and Nurseries

LINKS FOR PEST IDENTIFICATION AND CONTROL

www.capecodextension.org	site of Cape Cod Extension horticultural programs
www.umassgreeninfo.org	UMASS extension landscape site
www.planetnatural.com	earth friendly products for the home, garden and landscape
www.bugladyconsulting.com	friendly knowledgeable pest consulting
www.norganics.com	natural pest controls
www.gardeners.com	gardeners supply
http://paipm.cas.psu.edu	pest problem solver
http://northeastipm.org	IPM master site

REFERENCE BOOKS

GARDEN INSECTS OF NORTH AMERICA (ISBN 0-691-09560-4)
RODALE'S GARDEN PROBLEM SOLVER (ISBN 0-87857-762-9)
IPM FOR GARDENERS (ISBN 0-88192-647-7)
COMMON SENSE PEST CONTROL (ISBN 0-942391-63-2)
ASK THE BUGMAN (ISBN 0-8263-2835-0)
INSECT, DISEASE, AND WEED ID GUIDE (ISBN 0-87596-882-1)
RODALE'S COLOR HANDBOOK OF GARDEN INSECTS (ISBN 0-87857-460-3)
PESTS OF THE GARDEN AND SMALL FARM (ISBN 0-931876-89-3)
RODALE'S GARDEN INSECT, DISEASE AND WEED ID GUIDE (ISBN 0-87857-759-9)
BALL PEST AND DISEASE MANUAL (ISBN 1-883052-13-0)

LOCAL RESOURCES

Master Gardener Hot Line **(508.375.6700)**
Cape Cod Cooperative Extension **(508.375.6690) www.capecodextension.org**

Please direct any suggestions or comments about this guide to Larry Dapsis (508.375.6642) or ldapsis@barnstablecounty.org

Gardening Notes for 2011

CRUCIFERS

LEAFY GREENS

UMBELLIFERS

SOLANACEOUS

CUCURBITS

ALLIUM

LEGUMES

SWEET CORN

LETTUCE/ASPARAGUS

THE THINGS I MUST REMEMBER FOR NEXT YEAR!!