

Ideas for Successful Organic Gardening at the Wagner Farm Arboretum Community Garden

brought to you by the Organic Committee 2007-2008:

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Introduction

“Wise garden makers are mindful of the natural world they inhabit. They use ‘sustainable’ methods in order to maintain a healthy environment. They rotate crops, conserve soil and water, use biological controls. It’s what organic gardening is all about—working with nature.”

(The Complete Vegetable & Herb Gardener)

Here are some guidelines to help you create your garden in accord with principles of organic gardening. Remember that organic gardening requires organic inputs—chemical pest control and fertilizers are NOT organic, and not permitted in the garden. But there are plenty of practical organic solutions to most gardening problems and we’ve tried to outline as many as possible in this document.

Please keep in mind that this is by no means

the last word. The Organic Committee is composed of gardeners just like you. Some of us have lots of experience, others are experiencing organic gardening for the first time. We don’t know everything, but we will certainly try find out answers to any questions you might have. You can contribute, too, by sending the Organic Committee (organicquestions@wfafnj.org) information on your own experiences and favorite resources. E-mail us anytime!

Soil Preparation

1. *Soil testing for type of plants being grown*
2. *Digging, double digging, rototilling, raised beds*
3. *Adding amendments*
4. *pH adjustments (lime, garden sulfur), fertilizers*
5. *Organic matter (humus, leaf mold, compost, manure, peat moss)*
6. *Raking level*
7. *Mulching*

Organic gardening is not a “fast-food” system. It takes some work. If you plan and prepare ahead of time you will have much more success.

First, determine what you want to plant. Most vegetables require a pH of about 6.0 to 6.8 but will tolerate about 5.5 to 7.0. Without technical explanation, pH basically is a measure of acidity of soil, lower numbers being acid, higher alkaline. Different plants can only absorb nutrients within a certain range of pH. Some plants enjoy more alkaline soil; some, such as blueberry bushes, require acid soil. With a little research, you will know what pH range and specific nutrients are needed for the plants you wish to grow.

Second, you may wish to have your soil tested to find the pH and the level of fertility of the soil. The whole garden was tested in Oct. '06 and was limed and fertilized bringing it up to specs. The last two tests in the fall of '07 of the Giving Gardens, both in cultivated and unused areas, and the wildflower areas, were relatively consistent. The pH was 6.0 to 6.25. Nitrogen was needed, potassium optimum, and phosphorus adequate on the low side. Calcium and magnesium were high. Micro-nutrient levels were adequate to high. If your garden will include plants with requirements

outside these test results, amend the soil accordingly. Plants growing in soils high in organic matter have more tolerance to lower pH levels and less than optimum conditions.

To get readings for your own plot, a soil test kit may be purchased from any county Rutgers Cooperative Extension Service. To collect soil for the test, dig a trowel full of soil and put aside. Insert trowel in soil next to the hole and remove this slice of soil to a clean coffee can. Repeat in various parts of plot, thoroughly mix soil in the coffee can, dry it, and place about 2 cups of the soil into the plastic bag in the soil kit. Mail it and an accompanying questionnaire to the pre-addressed location. Complete directions accompany the kit. Results and recommendations will be mailed to you. For more information read Fact Sheet FS797 from www.rce.rutgers.edu or pick up a copy from your local county Rutgers Cooperative Extension Service office.

Begin preparing the planting bed. Good bed preparation is essential because healthy, well-grown plants will recover better from insect attacks and be less susceptible to disease, as well as produce a larger crop. There is great biodiversity in healthy soil. Various good microbes, fungi, and soil organisms that help protect the plants inhabit the soil and in their

life processes break down organic matter and make nutrients readily available to plants.

When working the soil, it should be on the dryish side (at least not muddy). Wet soil compresses when dug, worked with machinery, or walked on. Exclusion of air spaces at roots limits their ability to carry out their growth functions and remain healthy. Try not to stand or walk on garden too much. Stand on a board to spread your weight.

One of the following methods of preparing a bed may be used.

1. Dig each row and turn the soil over, incorporating organic matter and amendments into the planting bed. A turning fork may be easier to use than a shovel. This method is better used on established gardens.

2. Double dig: This creates a good foundation for the garden and doesn't have to be done every year. To begin, dig down about 1 foot for one or two rows across, depositing each shovel full of soil into a wheelbarrow. Break up the subsoil in the hole somewhat and add some organic matter. Then when digging the next row, deposit each shovel full of soil into the hole of the previous row. Break up the subsoil at the bottom of the resulting hole somewhat and again add some organic matter. Continue this way, and after the last row is dug, deposit the soil from the wheelbarrow into the last row.

3. Rototil: Mechanically tills the soil. It does not usually go to the depth of hand digging, and may compact soil if it is too wet, but is easier on the back. See "Miscellaneous Organic Gardening Tips" (p. 17) for contact details

if you want to hire someone to rototil your plot.

4. Raised beds: These may be four or more inches up to a foot or two above the ground level. They should be about 4 ft. wide so they are accessible without stepping in the bed. Raised beds may have wood (no pressure-treated lumber, please!), composite plastic, or other material for the sides. Advantages are that they warm up faster in the spring, drain better, and you seem to have more control over the condition of the beds. The garden soil is incorporated with copious amounts of organic matter and hand dug to raise the level. Raised beds keep soil from compacting because you do not step in them.

Whatever method you choose, while preparing the bed, remove large stones and rocks, as well as weeds and grass clumps. Nut sedge, grass and other perennial roots will resprout if not completely removed. Shake off the soil clinging to the roots back into the bed before discarding, taking them home and putting them in the trash or in locations that may be temporarily designated for weeds. Removed rocks may be spread in the field outside the fence where the future parking lot will be located.

Break up clumps of soil. Incorporate organic matter: compost, leaf mold (decomposed leaves), manure, peat moss or peat humus. Add lots of organic matter. It loosens clay soil and creates air spaces for roots so they don't smother and rot. Organic matter holds moisture, and releases both moisture and nutrients at a graduated pace so plants are less stressed.

Determine what amendments are needed to bring soil up to pH and approximate fertility for particular plants you want to grow. If the pH needs to be changed, use lime to make more alkaline, garden sulfur to lower the pH. If nutrients are deemed necessary for the plants you are growing, you may also incorporate the correct amounts of organic fertilizer following the directions on the package for the proper amount. Adding more than the recommended amount of fertilizer often leads to problems with the plants becoming leggy or growing weakly and becoming more susceptible to insects or diseases. Better to err on the lesser side, since you can't remove fertilizers. Evenly spread amendments over the bed and dig them into the top 4 to 6 or 8 inches of the bed.

Some fertilizers include:

(N) Nitrogen

Blood meal, bird or bat guano, fish meal

(P) Phosphorus

Bone meal, rock phosphate

(K) Potassium

Green sand, wood ashes, kelp meal

Micronutrients, mycorrhizal fungi, bacteria, and other beneficial soil organisms should already be in a healthy soil and are not necessary to add. Chemical fertilizer/herbicide/pesticide use kills these organisms; all such chemicals are prohibited from use in the garden.

Later on in the season plants may be sidedressed with additional fertilizer, or try using diluted solutions of liquid kelp, fish emulsion, seaweed extract or compost tea at any time.

Rake the bed smooth to break up clods of soil and level it so when it rains, the water sinks in rather than runs off. A level bed is advisable if planting seeds to have an even depth of planting and insure even seed germination.

Either before or after bed is planted, mulch to keep soil from eroding, retain moisture, and also to discourage weeds. Mulches are covered in the Rutgers Cooperative Extension Fact Sheet FS058, attached at the end of this document.

Planning Your Planting

1. *Make a list of plants you want to grow.*
2. *Research the plants on your list* in some of the great books on organic gardening listed in the Resources section. Search out disease resistant varieties. Once you've made your selections begin taking notes. Do the plants prefer cool weather (cool-season crops) or warm (warm-season crops)? How long do the seeds take to germinate? Should they be started ahead of time, or can you plant the seeds di-

rectly into the garden? Or if you prefer to purchase plants, find out when the transplants should be planted into the garden. When should you expect to harvest? What sort of conditions do the plants favor? How far apart do they need to be planted?

3. *Make a rough sketch of your garden plot* (photos that you took the previous season can be of enormous help here!). There's a sample planting plan on page 6; other layout

ideas will be posted to the Wagner Farm Arboretum's web site. Be sure to include places to walk, since once you've done a thorough preparation of the soil, you don't want to walk on it again. Many gardeners find beds to be more efficient, while others prefer rows. If you choose to create beds make sure you can reach to the middle from each side and that you have access from all sides. Space rows so that you have access for weeding (a critical ongoing chore). Consider planting your perennials in one section and your annuals in another and allow for future "crop rotation" (it is rarely a good idea to plant the same plant in exactly the same spot from year to year).

4. *Make a realistic final plant selection,* keeping in mind that you can plant more than one plant in a single bed, if one crop finishes before the other needs to go in (succession planting). Carrots and lettuce like to go in early, while tomatoes and peppers need warmer conditions. Some crops can co-exist: radishes can go in with the squash; lettuce doesn't mind the shade cast by tomatoes, etc. Check reference sources for more ideas. But, if you're not a terribly experienced gardener don't try to tackle more than you can handle at first.

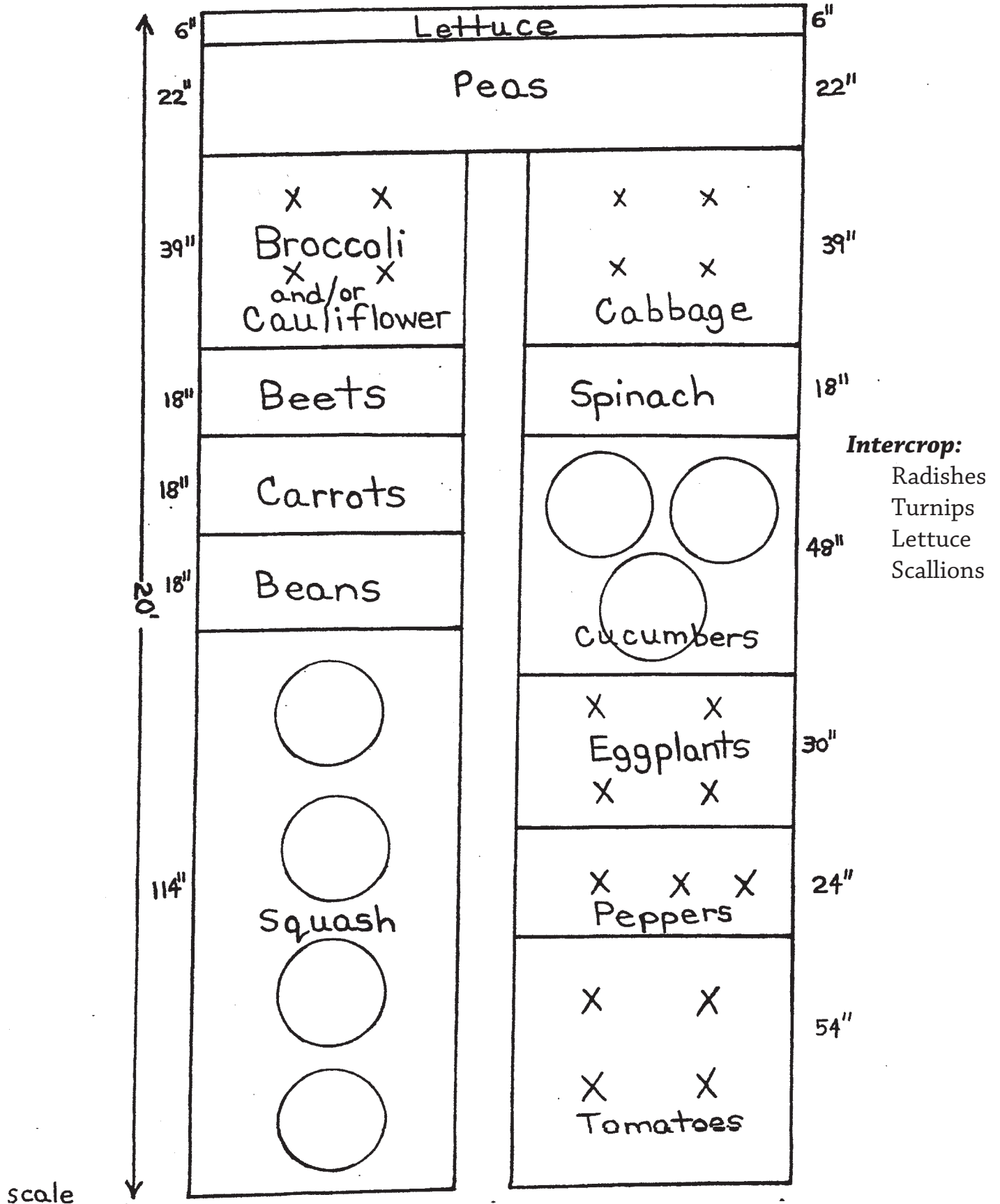
5. *Get a calendar, your final list, and your plot diagram* and put it all together. Assign each crop to a bed or section of your plot, and remember that if you've prepared your soil well for organic gardening, you can probably pack the plants more closely than is usually recommended (again, refer to the excellent sources on organic gardening in the Resources section). Make provisions to stake floppy plants and tame wanderers (the squash family loves to go exploring and sunflowers are

notorious for toppling) or place them where they will not disturb others; it is important to keep the wood-chipped paths along the perimeter of your plot clear! Make notes on the calendar when you want to start seeds and plant transplants. Our average first frost-free date is May 15, according to the Rutgers Cooperative Extension. Remember that garden centers may have plants available long before they should be put in the ground, so plan your purchases according to when the plants should be planted, or make provisions to house them in a protected place until you can set them out. Often you can plant warm-season crops a week or two earlier, if you are willing to keep track of the weather and protect young plants with quilted floating row covers or Walls O' Water (found in many gardening catalogs—Park's Seed has them at an inexpensive price) if temperatures drop.

6. *A garden journal is an excellent tool*—you can just jot notes into your calendar, or you can keep a notebook handy. Consider keeping track of various events in your garden, a first bloom, your first harvest, and successful insect abatement strategies. Take periodic photos too. Next year, refer to your journal to start the process all over again!

Reminder: the Wagner Farm Arboretum has a plant sale each year in mid-May. At this time you will be able to put warm-season plants directly into the garden.

Sample Planting Plan



Managing Weeds in the Vegetable Garden

Weeds are plants that grow where they are not wanted. They compete for water, nutrients, space and light. The best way to control them is to dig soil deeply before planting, and to remove them upon sight after desirable plants get established.

They are classified as:

Annual—grows in one season; produces seeds that will germinate the following year or if seeds lie dormant will germinate second or third, etc. year. Example: chickweed.

Biennial—develops large tap root first year; second year flowers and produces seeds. Example: Queen Ann's lace.

Perennial—lives more than two years; reproduces by seeds and rhizomes (under-ground stems) storing food over the winter sending up new shoots when conditions are right. These weeds should not be put in a compost pile as they may grow again when compost is spread. Examples: dandelion, yellow nut sedge, Canada thistle.

Yellow nut sedge thrives at Wagner Farm

Description: grass-like, triangular-shaped stems, yellow green in color. Yellow nut sedge grows prolifically in wet conditions with poor drainage. Because this plant spreads by rhizomes as well as seeds it is extremely important to consistently and completely remove it as soon as it appears. This aggressive plant can be controlled and possibly eventually eradicated if *everyone* works on removing it as soon as it appears.

Methods to control weeds

Mulch. This deprives the weeds from light and helps soil retain moisture. See attached Rutgers Fact Sheet 058 for more information.

Maintain good sanitation practices. This needs to be done while preparing the garden, during the growing season and cleaning up for the winter. Weeds lying in a pile can provide a place for diseases to fester and insects to hide waiting for the right time to harm the targeted healthy plants and soil.

Pull weeds by hand. Best done when soil is moist. If weed is firmly established or has a deep taproot, use a trowel to dig down to loosen root and bring it to the surface.

Hoe. Done when weeds are small and few when soil is dry. Pull the hoe through the top layer of soil to uproot the weeds that are visible.

Pathways are to be kept weeded at all times

The pathways between the gardens are to be kept "weed free." Put down either cardboard or at least five layers of newspaper before covering with provided woodchips. You are responsible for the paths on the south (towards Mountain Ave.) and West (barn side) edges of your plot.

Disposing of weeds

Take them home to your compost pile, or dispose of in the debris bins located just outside the north garden gate.

Insect control

1. *Inspect plants before bringing them to the garden*

If you see aphids or little itty bitty spider mites, rinse the plants thoroughly before bringing them to the garden. Be sure to check the undersides of leaves for insect eggs. Remove all insects! We all must take responsibility to avoid introducing new insect problems.

2. *Monitor & identify*

Figure out what the pest is—ask a neighbor or trap unfamiliar insects and take them home for further research, or take them to your local Rutgers Cooperative Extension for identification. I've ripped out the little illustrated Insect ID section from one of my Garden's Alive catalogs (web site listed in "Resources," p. 18) and keep it in the bag I always carry with me at the garden (along with my sunscreen).

3. *Decide where to draw the line*

Most healthy mature plants can take a quite bit of insect damage; after you've spotted a pest, you do have time to investigate further. How serious is the damage? Do you really need to do anything at all? Ask your neighbors; check out some of the resources listed at the end of this document.

4. *Start at the bottom of the toxicity scale*

Be sure to use the most appropriate control. Insecticidal soap won't faze a Colorado potato beetle—in fact, I was very surprised to learn (since I had routinely soaped up insect-damaged plants in my landscape) that you have to actually douse an insect with the soap for it to be effective.

Toxicity scale

1. *Hand pick and destroy (only the bad insects!)*

Knock insects off into a container of soapy water, if you're not into physical contact. They say you can even use a hand vacuum to capture fast-flyers (like cucumber beetles); empty into a zip-lock bag, take them home and put them into the trash since some insects can spread diseases even when dead.

2. *Encourage beneficials*

Lady beetles, lacewings, and others, will be happy to help reduce your pest population; remember that using any sort of insecticide may harm beneficials as well as pests. The key to attracting and keeping beneficials is to devote a small patch to host plants that they favor (list below); many of these will also be in our wildflower meadow. Provide a small dish with some pebbles and water in it, so that they can get the water they need.

There are also beneficial organisms such as BT (*Bacillus thuringiensis*); the San Diego variety is effective against Colorado potato beetles. Parasitic nematodes may also be introduced (when the soil is at least 60 degrees) to combat various grubs and maggots.

3. *Plant deterrents*

Scientific evidence hasn't proved that certain plants deter certain bugs, but many gardeners have found that when they plant marigolds the whiteflies vanish (chart below). Some plants attract pests away from crops, while others seem to discourage them entirely.

4. *Plant traps*

This involves planting sacrificial plants before you plant your main crop, to deliberately lure pests away from your vegetables. Once they have been infested, you remove the plant and destroy it and the bugs (chart below).

5. *Physical traps*

Beer attracts and drowns slugs. Potatoes impaled on sticks and buried 3 inches down collect wireworms. Pheromone traps are tricky and should be avoided, as they tend to attract more of the insect than they catch, unless there are a whole lot of the traps. Yellow sticky traps can be effective, but be sure to place them deep amongst the foliage of the plant you are trying to protect; they can also trap desirable insects, so use them carefully. Please remember to take all captured pests home and dispose of them in your trash.

6. *Barriers*

Floating row covers can help reduce insect damage on young plants in the cucumber/squash/melon family, though most must be removed when the plants flower to allow for pollination (see “Cucumber Beetle & Squash Bug Battleplan,” p. 11, for details). Collars can be made of many different materials to deter cutworms; pantyhose wrapped around squash vines keep the squash vine borers away. Diatomaceous earth can be effective against a number of pests, but it only works when dry and must be reapplied after rainfall. Don’t use it on a windy day, and be sure to protect your eyes and lungs when applying.

7. *Pesticides (yes, there are organic pesticides)*

READ THE LABEL! None of these preparations are good for humans to ingest. Wear

gloves, long sleeves, and spray with the wind (or use a face mask). The following lists the pesticides in order of toxicity. It is important to match the pesticide to the pest (and to its particular life cycle stage) and to follow the application directions *exactly*. Also, it is much more effective to treat the specific plant/pest than to indiscriminately apply any insecticide. Remember, the goal is to kill the bad insects and preserve the good insects; even the mildest pesticide may have an effect on good insects, so use as sparingly as possible.

a. Insecticidal soaps

Very low toxicity; must come into contact with pest in order to be effective. Use against slow-moving soft-bodied insects, such as aphids, whiteflies, spider mites, etc.; a good first line of defense. One homemade version, recommended by *Organic Gardening* magazine, adds garlic and cayenne to create an all-purpose spray. “Chop, grind, or liquefy 1 garlic bulb and 1 small onion. Add 1 teaspoon of powdered cayenne pepper and mix with 1 quart of water. Steep 1 hour, strain through cheesecloth, then add 1 tablespoon liquid dish soap to the strained liquid; mix well” (*The Organic Gardener’s Handbook of Natural Insect and Disease Control*). The mixture will keep for 1 week in the refrigerator. Don’t drink it and don’t get it on your skin or into your eyes. Affix a warning label in **LARGE** letters to the container. This and other pepper-containing concoctions also work as deterrents—they don’t kill the pests, but encourage them to dine elsewhere.

b. Horticultural oils

Low toxicity for mammals; not so great for fish. They usually only control a specific life stage of an insect, so must be applied at

the right time. Not all are suitable for vegetables. Read the label.

c. *Neem and neem oils*

Neem is relatively safe for mammals and effective on many different sorts of leaf-eaters. It biodegrades in a week or less and persists in the soil for up to about two weeks. Some evidence suggests that it does not harm bees and some beneficial insects; but it will harm others, so only apply if you really need it. Don't use on beans. Be sure to buy a version that includes Azadirachtin as one of its active ingredients. Most of the neem formulations found in local garden centers do not include it in sufficient concentrations—one source that sells several different strengths is *GrowOrganic.com*. Used as a soil drench (mix it up in a watering can you bring from home and just water the soil), neem is reputed to be effective against the eggs and larvae of cucumber beetles.

d. *Pyrethrin*

Derived from pyrethrum daisies, this is a very effective, though indiscriminate, killer of insects, which works on all life stages. It kills good insects as well as bad, and is also not so great for fish. However, it degrades rapidly in the sun (4 hours), so should not be able to get to the river. Do not apply just before a rainstorm. A product of last resort, please apply only very specifically, and according to the directions.

e. *Rotenone*

Although an organic pesticide, this is just too toxic, particularly to fish, to recommend. Please don't use. It may also be implicated in Parkinson's Disease.

Plants loved by beneficial insects

Marigold, aster, fleabane, alyssum, coriander, daisies, yarrow, catmint, tansy (*Tanacetum vulgare*), white cosmos, bachelor's buttons, bee balm, sunflower, butterfly weed, coreopsis, mountain mint (*Pycnanthemum* sps.), Queen Anne's lace, dill. Many of these will be growing in our wildflower meadow.

Cover crops are useful later in the season to attract beneficials: buckwheat, oats, kale, red clover.

Protective plants are believed either to repel the target bad insects or to attract them away from your crops. Plants that are believed to repel bad insects (focusing primarily on insects that have been reported in the garden):

catnip	flea beetles
garlic	aphids, Japanese beetles
horseradish	Colorado potato beetles
marigold	bad nematodes, whiteflies
nasturtium	squash bugs
tansy	cucumber beetles

Also note that many of these plants also attract beneficials.

Plants good to use as traps:

nasturtium	aphids
black nightshade, eggplant	Colorado potato beetles
radish	cucumber beetles, flea beetles, squash bugs
bok choy, Chinese cabbage	flea beetles
flowering tobacco	whiteflies

Cucumber Beetle and Squash Bug Battleplan

The most destructive pests we ran into in our first season at the Community Garden were cucumber beetles and squash bugs. Here's a list of remedies that are reputed to help protect your plants.

1. ***Stack the deck in your favor*** by selecting varieties of squash, cucumbers, cantaloupes, watermelons, other melons and pumpkins (collectively known as cucurbits), that are known to grow well despite beetle/bug damage, or those that can pollinate themselves under row covers.

2. ***Start from seed*** (usually in June) directly in the garden for the healthiest plant.

3. ***Use lightweight row covers***, but only if you are planting your cucurbits in a bed that they weren't grown in last year because overwintering insects will be trapped under the cover to infest this year's crop. It is important to keep the edges of the cover secured, so using some sort of structure is a good idea. 9- or 10-gauge wire, or small diameter PVC pipe can be used as hoops, or they can be purchased from various garden suppliers, to support the row cover. Staple molding strips or other thin light wood to the edges; old socks filled with pebbles also make easily removable weights to hold down the edges. Check plants regularly to make sure insects have not gotten in, and to make sure the plants are getting enough water. Leave the row covers on until the flowers need to be pollinated (or consider hand-pollination). Row covers work!

4. ***Interplant*** nasturtium, marigolds, bee balm, and catnip as deterrents; use radish as

trap crop to lure bugs away from the cucurbits. Interplant buckwheat to attract tachinid flies, which are parasites of the squash bug.

5. ***Garlic/Red pepper spray*** (see recipe in previous section) is effective as a deterrent, if applied daily.

6. ***Support vining squash on trellises*** to discourage squash bugs.

7. ***Squish*** any bugs or beetles you see. Check the underside of leaves for eggs, and scrape them off into a container of soapy water.

8. ***Deep straw mulch is recommended to discourage cucumber beetles, but not recommended because it can shelter squash bugs.*** If you use row covers, generous mulch of some type is necessary to keep weeds down.

9. ***Squash bugs are most susceptible in the nymph stage;*** adults are extremely difficult to get rid of, except by squashing. Monitor plants and spray nymphs with cedar oil (Cedar Gard is one brand name; another is Cedar Zone, sold at *GrowOrganic.com*), or neem that contains Azadirachtin, which is said to work against cucumber beetles as well (also available at Peaceful Valley). Diatomaceous earth applied after misting the plants with water to coat the plants is also said to work against both squash bugs & cucumber beetles, but also kills beneficial insects. Kaolin (Surround) sprayed to coat plants is said to work against cucumber beetles, but is not as effective as row covers against squash bugs.

10. ***Parasitic nematodes*** (*Heterorhabditis bac-*

teriophora & *Steinernema riobravis*) defeat cucumber beetles in their larval stage; soil must be 60-65 degrees for the nematodes to become active. They do overwinter, but don't re-emerge until too late to catch the first waves of beetles, so you need to reapply annually as soon as the soil warms up enough. Over time they can help reduce cucumber beetle populations. They also prey on many other unwanted grubs and larvae. You can order them from Green Methods in NH (greenmethods.com/site/biocontrols/nematodes/).

11. At season's end leave a couple of cucurbits to collect squash bugs. Pull 'em up, shake 'em

out over a sheet and dispose of the bugs off-site; this helps reduce the number of squash bugs for next year.

12. Plant your cucurbits in a different bed next season.

13. The following web pages have everything you ever wanted to know about cucumber beetles and squash bugs: attra.ncat.org/attra-pub/cucumberbeetle.html, and attra.ncat.org/attra-pub/squash_pest.html.

14. Happy hunting!

Minimizing Vole Damage

Once the perimeter is secured the vole situation should improve enormously. In the meantime, here are a few things you can do.

✿ **Exclusion:** If you'd like to exclude voles from your plot you can surround it with a wire or metal barrier (1/4 inch or smaller mesh), with at least 12 inches extending above ground, and 6 inches buried below ground level. If you haven't yet built a raised bed, make the edges 12" high. Voles can't climb (so they say). Hardware cloth suitable for this purpose can be purchased at Agway.

✿ **Habitat Modification:** Keep your plot free of weeds and other crop litter; this reduces the places voles can hide (and is essential to successful organic gardening).

✿ **Trapping:** Small mouse traps can be deployed. Place the trap perpendicular to a vole runway with the trigger end in the runway.

Apple slices seem to work best as bait. Early in the season is most effective for traps. You MUST monitor traps daily. Please dispose of all voles outside Arboretum property.

Preventing Disease and Fungus in Your Garden

- ☼ Choose disease resistant varieties; this information is usually available on seed packets and in catalog entries.
- ☼ Don't overcrowd plants. They need air circulation to prevent damp conditions that promote fungi and other disease organisms.
- ☼ The soil shouldn't be too wet or too dry.
- ☼ Keep foliage dry; water at the base of the plant.
- ☼ Rotate crops. Move susceptible plants from year to year.
- ☼ Prune leaves or stems that are suspect and destroy cuttings. Don't put them in the compost or paths. Take them home and dispose of them in the trash to prevent spread of disease.
- ☼ Wash hands before working with plants.
- ☼ Clean tools. Disinfect from time to time with 1 part bleach to 9 parts water.
- ☼ Clean pots and flats before reusing them. (1 part bleach to 9 parts water).
- ☼ Nutritional problems, pH deficiencies or excesses of certain micro- or macro-nutrients in the soil can look like disease.
- ☼ Temperature extremes can make a plant appear diseased when it isn't. Also mechanical damage such as disturbing or killing roots makes plant appear diseased.

Organic Approach to Fungal Control

- ☼ Baking Soda—Mix 1 oz. of baking soda with 1 gallon of water and spray the foliage and soil in the morning to retard fungus. This will make the soil more alkaline.
- ☼ White Vinegar—Mix 1 oz. of white vinegar with 1 gallon of water and spray the foliage and soil in the morning to retard fungus. This will make the soil more acidic.
- ☼ Wettable Sulphur—This is not recommended since it can disrupt soil microorganisms and have a negative effect on beneficial insects.

Organic Approach to Diseases

Anthracnose

- ☼ This affects beans, cucumber, muskmelon, watermelon, fruits and tomatoes. For pictures go to www.gardeners.com.
- ☼ Humid weather encourages the disease to spread. It overwinters in plant residues in the soil.
- ☼ Enriching the soil with compost helps plants resist attack.
- ☼ Obtain disease-free seed and use resistant varieties.
- ☼ Rotate crops yearly.
- ☼ Keep ripening fruits out of contact with the soil.
- ☼ Copper fungicides are effective but build up in soil and are toxic to earthworms and microbes.

Fusarium Wilt

- ☼ This fungus lives in the soil and attacks plants' roots. Scar tissue forms, which

blocks the circulation of fluids, and the plant wilts. There is no treatment that can be applied.

- ✿ When purchasing seeds or plants, buy varieties that are resistant.
- ✿ Change location of plants from year to year.
- ✿ Pull up and destroy affected plants.
- ✿ Don't let soil become too acidic.

Downy Mildew

- ✿ Irregular brown or yellow spots on upper leaf surface. The lower leaf surface is covered with a hairy white or purple mold during humid weather.
- ✿ Fungus attacks cucumbers and muskmelons.
- ✿ Cabbage family often affected as seedlings.
- ✿ Plant in well-drained soil with good air circulation.
- ✿ Use certified disease-free transplants or resistant seed varieties.
- ✿ Remove crop residues to reduce spore production.

Bacterial Wilt

- ✿ Affects cucumbers and muskmelons, not as common in pumpkins and squash.
- ✿ Individual leaves wilt during the day and recover initially overnight. Later, all or part of the vine wilts and dies. To test, cut all or part of the vine near the base of the plant. Squeeze the sap out of the stem. If it is white and sticky and forms a thread when the knife is touched to it and drawn away, bacteria are probably present. THIS DISEASE IS SPREAD BY CUCUMBER BEETLES AS THEY FEED. IT OVERWINTERS IN

THEIR BODIES.

- ✿ Controlling cucumber beetles is key to prevention. See "Cucumber Beetle and Squash Bug Battleplan" on p. 11 for more information.

Powdery Mildew

- ✿ This disease affects beans, cucurbits, lettuce, and peas.
- ✿ A white powdery growth covers the upper surface of the leaves, which then turn yellow and dry.
- ✿ This usually develops late in the season on mature plants and thrives in dry and humid weather and spreads rapidly.
- ✿ Plant resistant varieties where available.

White Mold

- ✿ This attacks plants such as beans, lettuce and members of the cabbage family.
- ✿ It looks like water-soaked spots on blossoms, stems, leaves and pods that enlarge rapidly and become covered with cottony white mold. Leaves will wilt, yellow and die.
- ✿ Fungus overwinters in plant residues in the soil.
- ✿ Follow tips for prevention of diseases and fungus.

Early Blight

- ✿ This attacks tomatoes and potatoes. Plants under stress or with a heavy load of fruit are most susceptible.
- ✿ Dark brown spots with concentric rings in them form on older leaves first. Infected leaves turn yellow and die. Potato tubers are covered with brown, corky spots. Tomato fruits may sometimes be

infected; a black, sunken, leathery spot forms at the stem end. Warm moist conditions encourage disease development.

- ✿ The fungus overwinters in plant residues in the soil.
- ✿ Plant in well-drained soil where air circulation is good.
- ✿ Rotate crops and destroy any volunteer potato or tomato plants.
- ✿ Amend soil with compost and fertilize plants judiciously to maintain plant vigor.
- ✿ Use certified disease-free seed potatoes and tomato transplants
- ✿ Tomato plants with early blight can usually mature to harvest unless the infection is severe.

Late Blight

- ✿ This fungus disease attacks tomatoes and potatoes at any stage of growth.
- ✿ Irregular gray spots form on leaves. White mold grows on the undersides of these spots. Infected leaves turn brown and dry up.
- ✿ Gray, water soaked spots later turn dark brown and corky. Infected tubers are covered with brown spots where rot begins.
- ✿ Wet weather with cool nights and warm days favor the spread of this disease.
- ✿ Fungus overwinters in infected plant debris.
- ✿ Avoid applying too much nitrogen fertilizer, which encourages the disease.
- ✿ Avoid overhead watering
- ✿ For further information see *www.gardeners.com*.

Blossom-End Rot

- ✿ Affects tomatoes, peppers and cucurbits. It is caused by a calcium imbalance within the plant.
- ✿ Fluctuations in soil moisture (excess wet or dry), excessive nitrogen fertilizer, roots damaged by cultivation, very high or low pH, or soils high in salts prevent the roots from taking up enough calcium to satisfy the plants rapid cell development. The result is a water soaked spot at the blossom end of the plant.
- ✿ This is common when plants grow rapidly at the beginning of the season, then set fruit during dry weather.
- ✿ Water uniformly during season. Water deeply, to a depth of at least 6 inches.
- ✿ Apply mulch to maintain soil moisture.
- ✿ Keep pH around 6.5.

Septoria Leaf Spot

- ✿ Affects tomato plants. Symptoms first appear on oldest lower leaves.
- ✿ Gray-brown areas have gray centers and darker border. The centers may have small black spores, and sometimes a yellowish area surrounds the darkened areas.
- ✿ It usually slowly defoliates plants, but harvest is still possible.
- ✿ Aerated compost tea can be sprayed as preventive.
- ✿ Potato-leaved and rugose-leaved tomato varieties show better resistance.

Closing the garden

1. **Remove all annual flowers and vegetables from garden beds and containers**, as they're unsightly when killed by frost. Decaying plants in the garden also provide a perfect nesting site for insects and diseases to overwinter. Some perennials need to be cut back close to ground level in late fall. For a list go to: gardening.about.com/od/maintenance/a/Fall_Pruning.htm. They won't remain attractive after frost and they have recurrent problems with pests and diseases, which will overwinter in their fallen foliage and re-emerge in the spring. These perennial flowers are best cut down in the fall. If they are diseased, put the foliage in the trash, do not compost it. Weed your plot and walkways. Fall action prevents weeds from getting a head start next spring, saving you work in the long run.

2. **Dig up tender bulbs**; Cannas, tuberous begonias, gladiolus, dahlias and most other summer-blooming bulbs don't survive the winter in our USDA Zone 6. Store bulbs in vermiculite, peat moss or sand in a paper bag in a cool (65 degrees F or cooler), dry spot. Do not pile them on top of each other.

3. **Apply a winter mulch to perennials**. Mulch prevents the heaving of plants and breaking of roots in any soil that freezes and thaws. Simply lay a lightweight organic mulch, such as shredded autumn leaves, pine needles or straw, over beds to protect plants from winter's extremes. Avoid more compact mulches and whole leaves (which can mat), since they can suffocate plants.

4. **Protect your topsoil from the rigors of winter**. You have two options:

a. **You can plant a cover crop for large beds.**

Definition: Cover crops are plants that are primarily planted not to be harvested for food but for soil erosion control, weed control and improving soil quality while the garden is otherwise dormant. A cover crop is usually ploughed or tilled under before the next food crop is planted, in which cases the "cover crop" is used as a soil amendment and is synonymous with "green manure crop." In its capacity to control weeds it is designated a "living mulch."

b. **Or you can apply a mulch.** Mulching is more efficient for smaller beds. And landscapers have a ready source of mulch in the leaves that they rake. See the attached Rutgers Cooperative Extension Fact Sheet 058 on mulch.

5. **Clean and store tools**. Putting them away before the harsh weather starts will prolong the life of these garden essentials. This is a good time to disinfect them too (1 part bleach to 9 parts water).

Tips & Warnings

☼ Save your favorite plants before frost hits. Small annuals and herbs are wonderful for digging up and planting in pots to spend the winter in a sunny window inside.

☼ Don't fertilize or prune plants at the end of their seasons. Either could promote tender new growth that will get nipped by cold. The exception is trimming out dead or damaged branches or foliage.

Miscellaneous Organic Gardening Tips

1. Dead head your flowers to encourage more blooms.

2. Tools needed

a. Large tools

i. Shovel

ii. Pick

iii. Fork

iv. Hoe

b. Hand tools

i. Trowel

ii. Fork

iii. Garden knife

iv. Clippers

v. Weeding tool

c. Other supplies

i. Tomato supports

ii. String

iii. Garden gloves

iv. Garden tote for tools

v. Tub, basket or bucket to carry weeds, etc. and the fruits of your labor when you harvest

vi. Water to drink

vii. Hat

viii. Suntan lotion

3. When bringing children to the garden bring toys to occupy them.

4. Do **not** drink the water from the watering system.

5. The following retailers support the arboretum, you may want to consider supporting them (discounts are available to arboretum members):

a. Hall's Garden Center, 700 Springfield Avenue, Berkeley Heights (908)

665-0331 www.hallsgarden.com

b. Fox Garden Center, Stirling Road, Warren

c. Warrenville Hardware, 61 Mountain Blvd, Warren, (908) 757-9100

6. There's a list of catalogs and web sites with a good variety of supplies and or plant material in the Resources section. Don't forget to search for discounts and promotion codes before you order.

7. If you find yourself with excess produce the Giving Garden will gladly deliver it to the needy. Place the produce in the small shed near the gate for pick up and delivery.

If you want to volunteer in the Giving Garden please contact Ernie Cottrill at (732) 560-8765.

8. Need help in preparing your plot? Last year we had a request to have someone rotate plots; the person was willing to pay for the services. We contacted one of our Giving Garden volunteers and asked him if he would be interested in providing the service for a fee. He is willing to provide the service and in exchange he would like you to make a \$30 donation to the arboretum. Make out your check to: WFAF. If you are interested please contact plottiller@wfafnj.org.

Resources

General Gardening Resources

The Complete Vegetable & Herb Gardener (aka Keith's Bible). By Karan Davis Cutler. Wiley Publishing, 1997.

Dave's Garden—An excellent Internet resource: davesgarden.com.

Master Gardener Helpline of Somerset County: (908) 526-6293; 9 a.m. to noon, M-F.

Master Gardener Helpline of Union County: (908) 654-9852; 9 a.m. to 3 p.m., M-F.

National Sustainable Agricultural Service: attra.ncat.org.

Organic Gardening magazine. Rodale, Inc. Also, www.organicgardening.com.

Rutgers Cooperative Extension: www.rce.rutgers.edu.

Rutgers Cooperative Extension web site Fact Sheets list: njaes.rutgers.edu/pubs/. Fact sheets are also available for free at the County Extension Office.

Rodale's Vegetable Garden Problem Solver. By Fern Marshall Bradley. Rodale Press, 2007.

The Vegetable Gardener's Bible. By Edward C. Smith. Storey Publishing, 2000.

Weedless Gardening. By Lee Reich. Workman Publishing, 2001.

Dealing with Pests & Diseases

Alternative Control Guide: www.agriculture.purdue.edu/acorn/acornsearch.aspx.

Biological Control: A Guide to Natural Enemies in North America: www.nysaes.cornell.edu/ent/biocontrol/.

Identifying Vegetable Insect Pests: resources.cas.psu.edu/ipm/vegpests.pdf.

Insect, Disease & Weeds I.D. Guide. Edited by Jill Jesiolowski Cebenko & Deborah L. Martin. Rodale Press, 2001.

Insect Parasitic Nematodes: [www.oardc.ohio-](http://www.oardc.ohio-state.edu/nematodes/default.htm)

[state.edu/nematodes/default.htm](http://www.oardc.ohio-state.edu/nematodes/default.htm).

Integrated Pest Management Program: paipm.cas.psu.edu/default.htm.

The Organic Gardener's Handbook of Natural Insect and Disease Control. Edited by Barbara W. Ellis and Fern Marshall Bradley. Rodale Press, 1996.

Plant Pest Identification Aid: vegipm.tamu.edu/imageindex.html.

UMD's Home and Garden Information Center's Plant Diagnostic Web Site: plantdiagnostics.umd.edu/index.cfm.

What's that Bug? www.whatsthatbug.com/index.html.

Starting seeds

Weekend Gardener: www.chestnut-sw.com/seedhp.htm.

Suppliers

(many of these have excellent supplemental information on organic gardening practices)

Gardener's Supply: www.gardeners.com.

Garden's Alive: www.gardensalive.com.

Golden Harvest Organics: www.ghorganics.com.

Lee Valley: www.leevalley.com.

Peaceful Valley: GrowOrganic.com.

Santa Rosa Gardens: www.santarosagardens.com.

White Flower Farm: www.whiteflowerfarm.com.

This page, with live links to the web sites listed here, as well as links to purchase listed books—through WFAF's affiliate program with Barnes & Noble, with proceeds benefiting the Arboretum—will be at wfafnj.org.