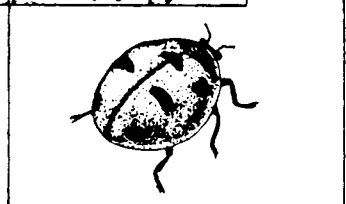
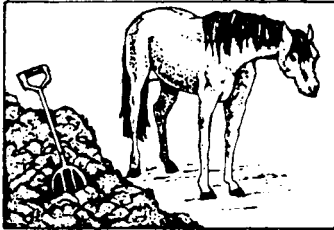


Organic Gardening



The Vermont and New York Master Gardener Programs, supported by the University of Vermont and Cornell Extension and Lake Champlain Sea Grant, support the objectives of the Lake Champlain Management Plan and Basin Program. This factsheet is intended to help prevent or reduce pollution coming from residences within the Lake Champlain Basin.



In a time of increasing ecological awareness, organic gardening has engaged the attention of home gardeners as a way of addressing both health and environmental concerns. Organic gardening practices are quite simply good gardening practices. Efforts to rebuild soil and handle insect and disease problems in the least toxic way can also produce successful flower and vegetable gardens, as well as lawns. The homeowner's choices about lawn care and gardening techniques have significant impact on soil, water, and wildlife. The average homeowner uses up to 10 times more chemicals per acre than farmers, so organic methods are appropriate to consider in our own yards and gardens.

Protect soil structure

Soil provides the basis for healthy plants and gardeners spend much time building soil. Soil is composed of about 25% air, 25% water, and 50% organic matter, minerals, and living organisms. Protect the soil. First, *don't step on the soil*. Soil compaction ruins the soil structure and the porosity of (ability for water to pass through) the soil, which can take years to correct. To avoid this problem, improve garden layout and tilling practices. Raised beds are a fine technique, whether enclosed in boards or stone or simply formed by hoe or rake. Maintain permanent paths between planted areas, and practice shallow tilling to protect the soil structure and reduce the likelihood of stirring up dormant weed seeds. Ideal gardens consist of soil that is fluffy, with high organic matter; non-crop areas are mulched, with permanent paths between beds, and the garden needs little, if any, tilling.

Organic gardening principles for lake-friendly gardening include three elements:

- **Rebuild the soil:** Using soil without rebuilding it leads to poor soil structure, erosion, poor fertility, and added expenses for topsoil and fertilizers. Organic gardeners solve most soil problems by constantly adding organic matter, including compost, grass or leaves, rotted manure, or green manures. Help keep excess nutrients out of our streams and lakes.
- **Use no pesticides:** Organic gardeners do not use herbicides or insecticides (with the possible exceptions of some biological toxins or sulfur/copper-based fungicides.) Reasons for pesticide avoidance include concerns for contaminated groundwater and food crops, and protection of birds, beneficial insects, and other organisms that are an integral part of organic pest control.
- **Use no synthetic fertilizers:** Most organic gardeners avoid synthetic fertilizers because of the concern for residual chemicals (salts), their effect on plant growth, and their negative effect on earthworms and other microbial life. Organic fertilizers are applied only when needed, based on a soil test.

Add organic matter

Organic matter added to the soil helps improve soil structure, increases the soil's ability to hold air and water, and helps drainage. Organic matter also provides a home for helpful microorganisms and earthworms. The ideal level of soil humus (decomposed organic matter) depends on soil type. Clay will allow for higher levels than sandy soils. You may use any of the following:

- **Compost** is the best single additive because it offers all the benefits of organic matter in a decomposed form that plants can use, plus it has the additional ability to help fight some soil-borne diseases. Composting helps the environment, too—by using up kitchen and yard waste that might have been land-filled.

- **Kitchen scraps** including eggshells, coffee grounds, tea leaves, and chopped fruit and vegetable scraps can be added through compost or directly into the soil. Exceptions are meat or fatty products. One method of using kitchen scraps is called trench composting—putting the collected scraps directly into the vegetable or flower garden, into holes or trenches, and covering with 6 inches of soil.

- **Leaves, twigs, and grass** can be added directly to garden soil as mulch. Spreading leaves or grass clippings on exposed soil as mulch acts to block weeds and retain soil moisture during the growing season and then decomposes during the winter.



- **Newspaper**, as well as computer paper, can be shredded into the compost or used as mulch for blocking weeds early in the season, and will later decompose. Avoid shiny magazine-style papers. Small pieces of newspaper can blow away and become unsightly.

- **Animal manures:**

Horse, cow, pig, poultry, or other animal manures are excellent organic material to add to any garden, but should be aged before direct contact with plants. Manure contains many weed seeds, so it is best to thoroughly compost it before adding to soil. Animal manures mixed with bedding (straw, sawdust, etc.) are ideal for composting. Heavy, wet manures will need mixing with straw or leaves to prepare compost. Cat and dog wastes are not recommended.



- **Wood ashes** (also known as potash) may be used in small amounts, with the warning that they raise pH and may cause the garden or lawn to become too alkaline.

- **Wood chips and sawdust** are best used in small amounts in compost. While organic, these high-carbon substances decompose too slowly to use directly in the soil and may tie up nitrogen during decomposition, keeping it from the plants that need nitrogen.

- **Green manures** are cover crops that are often underused by home gardeners. A very efficient way to enrich the soil and prevent compaction is to plant a cover crop in the fall or whenever soil is bare. Choices include the nitrogen-fixing legumes such as clover or alfalfa, and the grains or grasses such as buckwheat, annual rye, winter rye, and oats. A variation on the practice is intercropping, in which a cover crop is used in between other plants to block weeds and enrich soil.



- **Black plastic mulch**—while neither organic nor soil enhancing—is often useful as a heat-retaining mulch, which also retains moisture and suppresses weeds (especially when starting a new bed).

Improve soil fertility

A healthy soil contains all the minerals, organic matter, and microorganisms required to provide nutrients in a form that plants can use. Plants need nitrogen (N), phosphorus (P), potassium (K), calcium, and magnesium. Sulfur and also some minor nutrients are provided naturally as minerals in the soil or through the decomposition of organic matter. Microorganisms, insects, and earthworms carry out this decomposition. Our work as organic gardeners is to provide a healthful environment for these creatures in the soil. This means that corrective measures or additional fertilization are rarely needed.

Excess phosphorus is entering Lake Champlain and causing serious water quality problems. Improper use of fertilizers contributes to this problem. Before adding fertilizer, especially synthetic fertilizer, be sure to check for any nutrient deficiencies through a soil test. Soil testing is done at the UVM Agricultural and Environmental Testing Laboratory on the UVM campus (802-656-3030). There is a \$10 charge for a basic lawn and garden test. The Cornell Soil Test Laboratory conducts similar tests for New York residents; Clinton and Essex counties charge \$13 for soil tests. Contact the Master Gardener Programs or Extension Service offices in your area for information on how to get soil tested.

In case of a nutrient deficiency, organic gardeners do not choose synthetic fertilizers as the solution. Studies have found fewer earthworms present in soil fertilized with standard N-P-K synthetic fertilizers. Another reason is the concern for residual salts or chemicals reaching streams or groundwater. Organic gardeners also avoid the quick-release, nitrogen-rich fertilizers especially because they tend to allow for “lazy” plants with poor root systems and weak top growth. This holds true for lawns as well, because overfed grasses have no need for roots to penetrate the soil in search of nutrients. The result is a lawn full of weak plants and frequently thatch buildup.

Organic fertilizers include manure, alfalfa meal, soy meal, and blood meal, which are all high in slow-release nitrogen. Phosphorus fertilizers such as rock phosphate (slow-release) and bone meal (quick-release) are also used by organic gardeners. Sul-po-mag or greensand can be used to supply “organic” potassium. (These products can be found at your local garden center.) However, a garden that is continually enriched with organic matter is likely to be well balanced and fertile, reducing the need for purchased fertilizer.

Earthworms enhance soil fertility, typically releasing the equivalent of $\frac{1}{3}$ pound of balanced N-P-K fertilizer per worm per year. In addition, earthworms aerate the soil, provide drainage, and decompose organic matter, including thatch. Gardeners can increase the worm population by increasing organic soil content, using fewer chemicals, and tilling less or not at all, tilling shallower or when earthworms are less active (later in fall and earlier in spring.)

Prevent insect pest problems

Insect problems are best handled through prevention rather than by waiting for and treating a large infestation. Organic gardeners need to know the potential pests, their life cycles, and natural predators in order to work with nature for a healthy garden. The optimum condition is a yard or garden teeming with life: animals, birds, snakes, toads, insects, flowers, and crops all dependent on and complementary of one another. In fact, a minimum number of garden “pests” (potato bugs, aphids, caterpillars, etc.) are actually desired in such a scheme, because they provide enough food to lure and maintain a population of their natural predators. When a non-selective pesticide is used, insect predators are usually killed along with the target insect, so that future infestations have no natural predator and the cycle of spraying must be perpetuated.

Organic gardeners preventive measures include the following:

- Floating row covers are “cloths” that cover such crops as cabbage, broccoli, kale, and Brussels sprouts to prevent egg-laying or insect attack (e.g., cabbage moths leading to worms on broccoli, flea beetles, etc.) Note: Covers are removed for those plants that need pollination or when temperatures rise too high under them.
- Cutworm collars—made of paper, tin foil, plastic, cans, or cups—protect young transplants such as tomatoes from cutworm destruction.
- Sticky traps and chemical lures, sometimes used in combination, contain pheromones (sex hormones). Food lures can also be used to attract and trap pests, such as the apple maggot or Japanese beetle. Note: Placement is critical, as Japanese beetle traps can in fact lure a large population to your garden if placed too close!
- Trenches lined with black plastic can trap Colorado Potato Beetles after they over-winter.
- Timing of plantings can be planned to minimize the damage of certain pests. For example, carrot maggots may be prevented by planting carrots in June rather than earlier in the season, to avoid the insect’s egg laying and emergence cycle. Knowledge is the key to success in this area. Delayed potato planting avoids Colorado Potato Beetle emergence in early spring.
- Sanitation prevents the build-up and over-wintering of insects, diseases, and weed seeds. Destroy, rather than compost, plants that were diseased or infested. In spring and summer, practice regular inspection, and handpick pests or destroy infected plants early. Remove weeds before they go to seed.

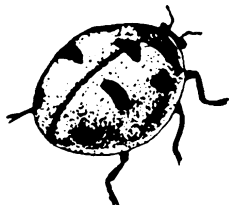
Rotate crops to prevent disease

In the home vegetable garden, crop rotation is important for replenishing soil nutrients and preventing disease. One approach is to rotate heavy and light “feeders” with cover crops (e.g., corn, leafy vegetables, clover). Another choice, particularly when there has been a problem, is to rotate plant groups according to susceptibility to various insects or diseases.

Use companion planting and beneficial insects

Some plants (herbs, flowers, vegetables) work well together for a variety of reasons, and organic gardeners take advantage of this compatibility, particularly when it helps with pest control. Some plants repel pests and others attract,

house, or feed the beneficial insects. There are some structural and physical reasons for companion plantings as well. For example, it's a good idea to plant tall plants next to shade-lovers (broccoli/lettuce), deep-rooted plants next to shallow roots (carrots/lettuce), bulbs at different depths for sequential bloom (tulips/scilla), or climbing plants leaning on tall, supporting ones (pole beans/corn).



Beneficial insects need certain flowers and herbs for shelter or food, as well as water, if they are to remain in our gardens to prey upon pests. Some helpful plants include tansy, Queen Anne's lace, parsley, dill, yarrow, buckwheat, nasturtiums, and members of the daisy family. These provide nectar, breeding and hiding places for insects such as spiders, ground beetles, ladybugs, lacewings, syrphid or hover flies, braconid or parasitic wasps, and many others. Generally, maintaining a continuous flowering throughout the garden of both daisy-shaped and lacy flowers plus a ground-level water dish greatly encourages beneficial insects.



Help wildlife to help the garden

In addition to our earthworm and insect helpers, many animals provide pest control as well—especially toads, bats, birds, snakes, and lizards. Even skunks and moles eat huge numbers of grubs and larvae (but may cause other problems). Providing water for birds in summer as well as winter is a smart way to reduce insect pest populations.



Toads will remain near the garden if you offer water (in low dishes) and “houses” (inverted clay pots with chipped edges for entry). Snakes will be encouraged by piles of stones or wood. Generally, attracting a natural balance of insect, bird, and animal life to your yard will result in fewer insect pests and a rich and interesting environment.



Master Gardener Program

University of Vermont Extension: (800) 639-2230; <http://pss.uvm.edu/mg/mg/>
Burlington area: (802) 656-5421

Cornell Cooperative Extension: Clinton County: (518) 561-7450; Essex County: (518) 962-4810

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