

The Organic Backyard:

A guide to applying organic farming practices
to your home or community garden



Canadian Organic Growers
Cultivons Biologique Canada
Perth-Waterloo-Wellington

This resource was created by Canadian Organic Growers Perth-Waterloo-Wellington chapter, and is based on our workshops series, *The Organic Backyard*.

The content for this workbook comes from many sources, including Theresa Schumilas, COG PWW's former organic demonstration garden manager, and developer of the original Organic Backyard workshop series.

Researchers and writers - Emily Hansen, Krista Long

Editor - Tegan Renner

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Cover illustration by Ellyn Lusi, Ellyn Lusi Illustration, www.ellynlusi.com

Inside illustrations by Emily Hansen

Graphic Design by Alpha 21, www.alpha21.ca



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Background

From 2003 to 2009, Canadian Organic Growers, Perth-Waterloo-Wellington (COG PWW) ran Diversity Gardens, an organic demonstration garden that provided hands-on support for growing fruit, vegetables, perennials and herbs using organic techniques. Backyard growers, community gardeners and organic gardening enthusiasts developed and enhanced their gardening knowledge and skills by attending the workshops we offered at Diversity Gardens.

Over the years we have been asked to develop a companion resource that captures the essence of organic agriculture on a small scale for the backyard grower, so we are delighted to offer *The Organic Backyard: A guide to applying organic farming practices to your home or community garden*.

“To forget how to dig the earth and to tend the soil is to forget ourselves.”

- Mohandas K. Gandhi

Purpose

In the spirit of our organic gardening workshops, *The Organic Backyard* will serve as an introductory guide for applying the principles and techniques of organic farming on a small scale. The principles and techniques of organic farming were developed by farmers for farmers over 20 years ago. These principles and techniques are



TIP: For more details on organic practices, permitted substances, and the definitions and terminology in organic agriculture, download a free copy of the Guidance Document to Understanding the Canada Organic Standards at www.cogwaterloo.ca/Groworganic.php

now captured in a set of standards - the Canada Organic Standards. **In this guide we have taken the key elements of organic farming principles and practices as contained in the Canada Organic Standards and made them more user friendly for you, the small scale gardener.**

Although coined *The Organic Backyard*, the content is intended to reach all growers of food on a small scale, either at home, in community gardens, across urban backyards, at schools, or in

parks and reclaimed urban lands. By furthering gardeners' ability to feed themselves organically, COG PWW hopes to engage more of the community in building the local organic food system. We envision *The Organic Backyard* spreading across our communities, turning every available space into one that produces good food that nourishes our soils, us and our environment.

Why Grow Organically?

The short answer is because you believe it is the best way to grow good food!

The long answer is because organic gardening is about growing food with an intimate understanding of the soil in the area, the plants that are adapted to those soils and the region you live in, and the natural cycles that maintain them. Organic gardening mimics natural cycles to produce food, and so creates a closer connection to your land and the greater ecosystem of which it is a part.

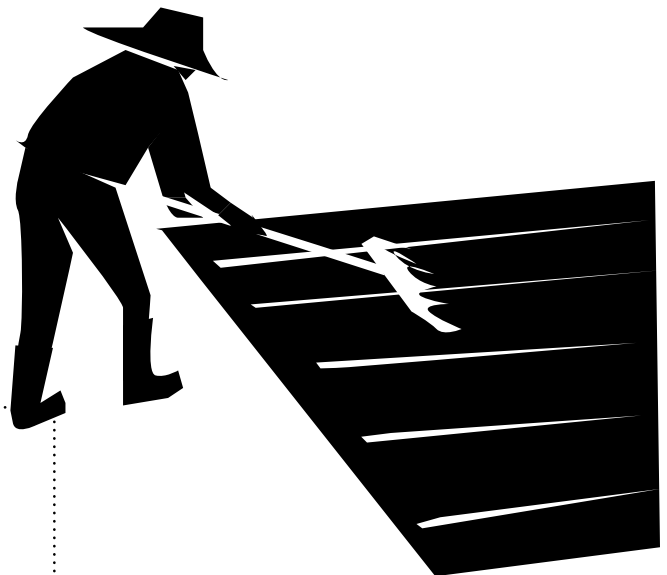
But I Already Grow Organically, Don't I?

You already garden pesticide-free, so aren't you gardening organically? And really, the cosmetic use of pesticides has been banned in Ontario, so isn't everyone gardening organically in urban areas? You are not alone in that thinking.

Organic growing is often narrowly defined by what we don't use. While the elimination of synthetic fertilizers, pesticides, and herbicides is important, **care for the entire ecosystem and most notably the soil is the basis of growing organically.**

Organic farmers say, ***feed the soil and let the soil feed the plants.***

Once you embrace this philosophy and begin to work on building the health of the soil in your garden, you are truly gardening organically.



"Growing organically is more rewarding – I learn more about the crop itself and I have a deeper respect for the soil"

– organic farmer

Notes from the Field: The Essence of the Organic Farming Principles

When asked to summarize organic production principles for backyard growers, organic farmers told us that organic farming and gardening is about:

- Understanding soil life.
- Building soil health and productivity of the land for generations to come.
- Protecting the environment by decreasing water pollution, and increasing biodiversity and pollinator habitat.
- Reducing greenhouse gas emissions by not using fossil-fuel based fertilizers.
- Protecting seed identity by not using genetically modified (GM) seed.
- Knowing the source of your garden inputs and how they affect the environment, your land and your neighbour's land.
- Recycling nutrients within your garden system through composting, crop rotation and cover crops.

**“Organic farming is a holistic production system
that relies on proven practices
focused on preventative strategies and soil health”**

— modified from the Canada Organic Standards

Getting Started

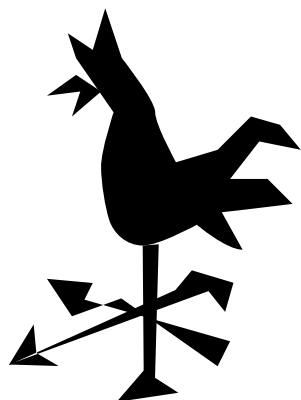
Get to Know Your Garden Site

Many gardeners start with the plants – what they would like to grow and eat. However, organic farming uses a holistic systems approach that prioritizes understanding the site and soils, allowing for the development of a farm plan that reflects this site-specific knowledge.

As organic gardeners, **step one is to have an accurate map of your site**. Your map tells you a lot of things and becomes your record of what is happening in and around your garden each year, including:

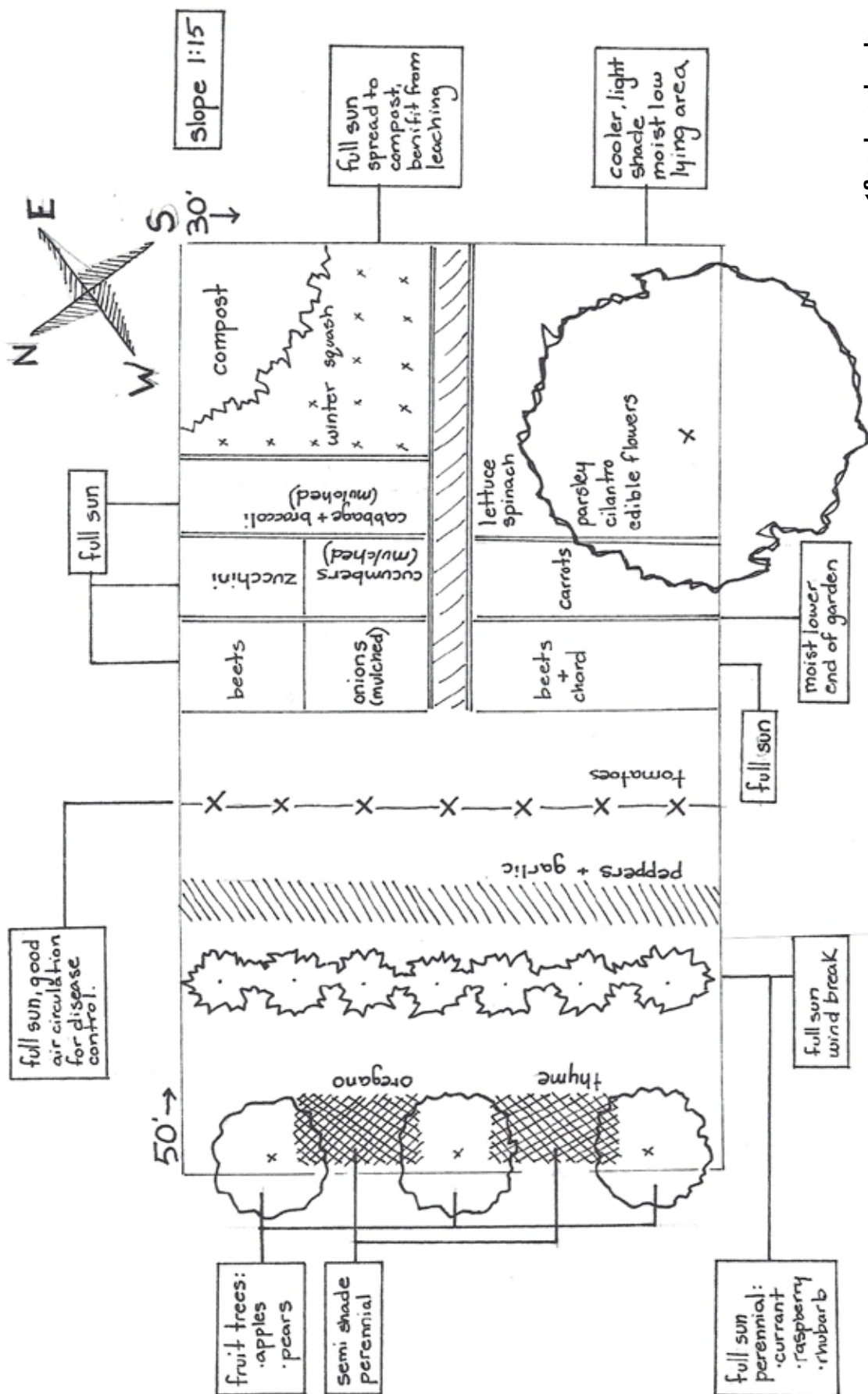
- surrounding land uses and how they might affect your garden
- low lying areas that are often wet and get an early frost
- first areas to dry in the spring
- shady and sunny areas
- areas with aggressive, perennial weeds

Why are these things important? Your map will help you choose what to plant where. Choosing where to plant things based on their needs is your best defense against pests and disease.



Notes from the Field – Buffer Zones

Organic farmers are typically required to maintain a buffer zone of 8 metres (or a permanent hedgerow) around their fields to protect against harmful adjacent land uses such as pesticides and genetically modified crops. Although urban gardeners would not be expected to maintain these buffers, you would be wise to consider surrounding land uses, their potential impacts and how you can mitigate any negative ones, using preventative and holistic strategies.



◀ Sample garden plan

Notes from the Field: Getting Started with a New Garden Site

If you are just getting started with a new garden site, the challenge before you is to decide how you will modify the area from the original use to veggies while still maintaining the soil life, since protecting and building the diversity of the soil is the foundation of organic gardening. Here are a few examples of techniques that worked for other organic gardeners. Get to know your site and its potential challenges or benefits, and see what might work for you. Remember your last resort is to remove the sod.

Backyard Organic Edible Garden

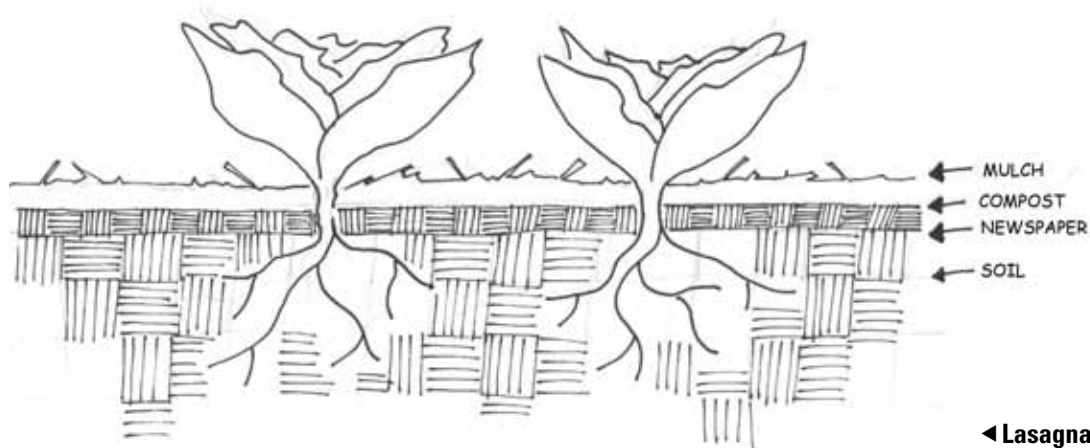
Initial site: sod, 20 x 5ft

Timeline: 2-4 weeks

Resources: newspaper, compost, mulch, 1 home gardener

I had a weed-free lawn with full sun and a gentle slope. I wanted to grow a forest garden with edible berries and fruit trees, as well as a vegetable garden patch. Knowing I wanted to replicate a nutrient dense forest floor in a short period of time, I chose to use a soil layering technique known as lasagna gardening, using newspapers, compost and mulch. I started in early spring

before the grass started growing, and layered the newspaper (ten layers thick), making sure they overlapped well so the grass could not creep through, lightly moistened the paper, then covered it with compost and mulch. I waited approximately one month, and then planted berry bushes, fruit trees, pollinator-attracting perennials and vegetables in each of the garden areas. The newspaper and grass were almost decomposed so it was easy to cut through. The area was rich with worms and soil organic matter at planting and remains this way with compost, mulch and rotations.



◀ Lasagna gardening

Organic Market Garden

Initial Site: Sod 100ft x 50ft

Timeline: 1 month (potatoes or winter squash)

Resources: mower, rototiller, broadfork, rake, manure fork, 1 farmer, compost

I chose this method because it would allow one person to quickly bring a larger garden space into production while still producing a good crop in the first year. After the initial tillage, there was minimal extra work over and above the work normally associated with growing potatoes. In mid- April when the soil could be worked, the grass was cut as short as possible before making one or two slow passes with a rototiller to disturb the roots of the sod and start the decomposition process. About a week later, I (with some help!) went over the site with a broadfork to provide deep uprooting of the sod. About a week after the forking and when the sod was dry enough, another normal pass with the rototiller had the site ready for the first potato planting.

Nutrient availability can be a concern with this approach due to the amount of organic matter that is decomposing. To address this concern, you could add compost to your rows at the time of planting. Winter squash with buckwheat or oil radish interplanted between

widely spaced rows is another option for this type of garden space addition. As the squash develop runners you can cut the cover crop and leave it as a mulch or incorporate it. Either strategy also provides one more element of weed control.

Community Garden Site

Initial site: Sod, 20ft x 40ft

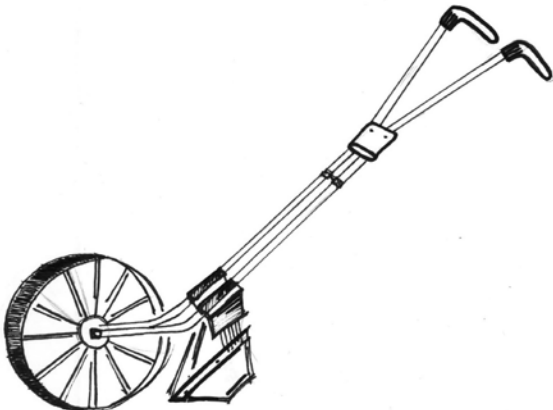

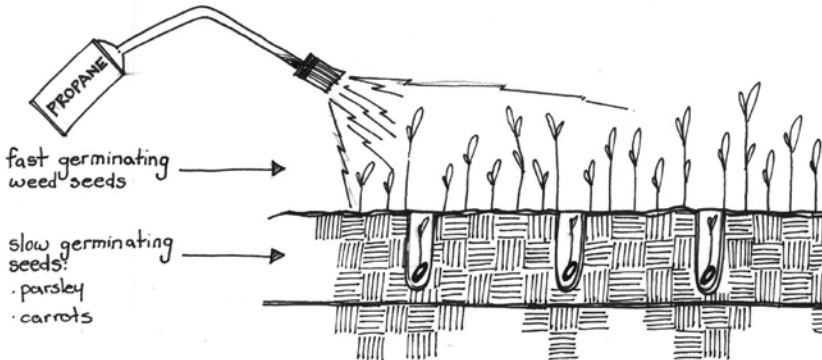
Timeline: 7-10 days

Resources: rented sod cutter, shovels, borrowed rototiller, ten yards of partially composted manure, 5 volunteers

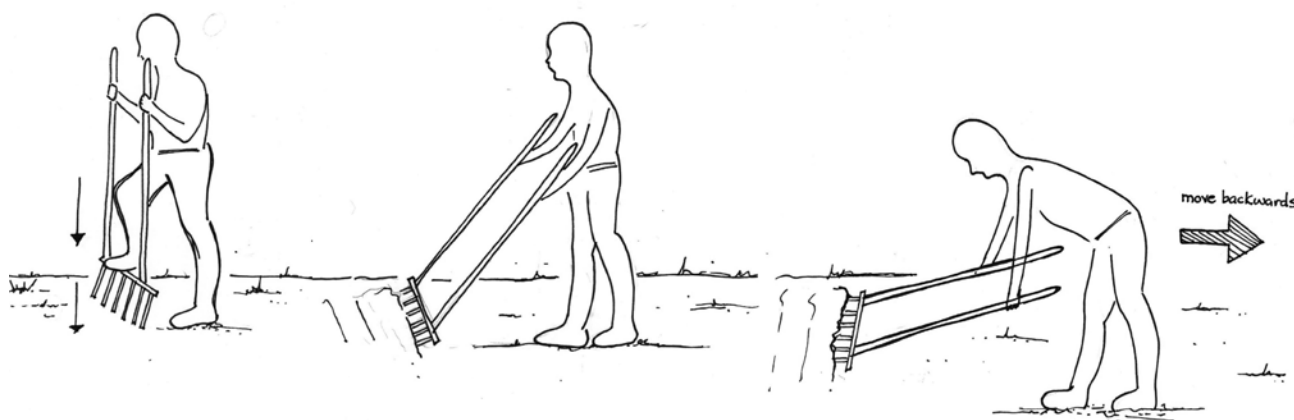
The garden site was chosen for its prominent sunny location and potential for expansion. In less than two hours the sod was cut and removed to the composting site. The garden was then double dug and the manure was broadcast over the site. The manure could have been part of the double dig if it had been available at the same time as the double dig workers were there. A neighbour lent a rototiller to incorporate the manure and the site was declared ready to plant. A month after work began the garden boasted seven healthy raised beds and visible earthworm activity, indicating that the compost application was effective in maintaining, and even improving, soil life.

The Organic Tool Shed

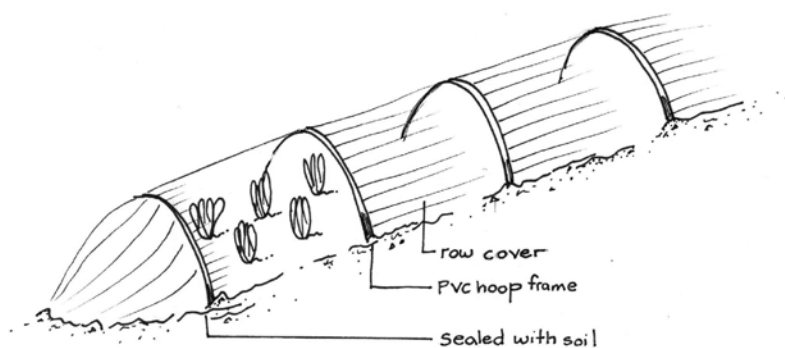
Organic farming is more labour intensive since it does not rely on chemical solutions for managing weeds, and focuses on maintaining soil health by tilling as little as possible. So, the organic community has sourced a list of tools, in addition to the basic gardening tools that you already have. See Resources section for availability of tools.

<p>Wheel hoe – A weeding tool with various attachments. It can also be used for digging furrows (such as with potato hills).</p>	
<p>Collineal hoe – A weeding tool designed for fast, easy removal of small, seedling-size weeds. The thin blade with sharp edges cuts small weeds just below the surface without throwing soil onto small seedlings. Its design allows for upright posture which makes hoeing a pleasant task.</p>	
<p>Flame weeder – The common flame weeder consists of a torch, hose and tank, which is sometimes mounted on a backpack or cart. Flame weeding involves heating weed seedlings just enough to rupture the cell walls, causing them to dry out. Works best between beds, or just after seeding to kill early weeds.</p>	

Broad fork – A tool used to manually break up soil in the spring and to improve aeration and drainage. It consists of a row of solid steel tines, approximately eight inches long, spaced a few inches apart on a horizontal bar, with two handles extending upwards to chest or shoulder level, forming a large U-shape. To use, step up on the crossbar, using full bodyweight to drive the tines into the ground, then step backward while pushing down on the handles, causing the tines to lever upwards through the soil. This action leaves the soil layers intact, rather than inverting or mixing them, preserving the topsoil structure. It relies on leverage to move the soil, saving your back from lifting heavy soil.

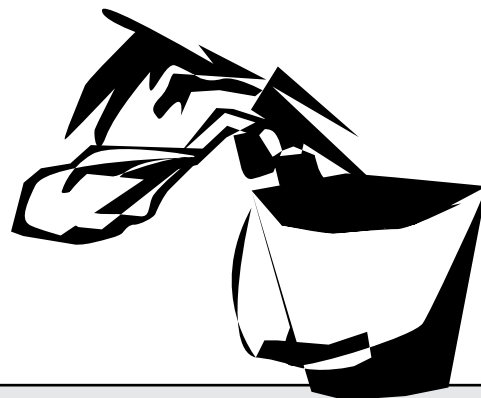


Row cover – A lightweight cover used to protect against pests, cold, frost, and winds. It is placed directly over rows of crops on a supporting framework—often, on wire hoops, to form a low tunnel—and usually left in place for several weeks until crops are well-established or the pests have disappeared. Floating row cover can be placed directly over plants, without a supporting framework, being anchored to the ground by soil, pegs or weights.



Seeds for the Organic Garden

Growing food starts with the seed. For your organic garden, seeds and seedlings must be organic, when available. Organic seeds are guaranteed not to be genetically modified or treated with fungicides. See www.cogwaterloo.ca for a list of seed companies and local organic farms that sell organic seeds and seedlings.



Seed Definitions

Here are a few definitions to help you source seeds for your organic garden.

Heritage or Heirloom seeds – Seed varieties that have been around for at least 75 years.

Open-pollinated seeds – Seeds that have been saved from a vegetable that has been pollinated with other vegetables of the same variety. Pollination occurs naturally and the seeds produce vegetables with the same traits as the parent vegetable.

Notes from the Field - Seed Catalogues

Seed catalogues are chockfull of information - use them for all they are worth! You won't find details on growing specific crops in this guide, so we suggest using a seed catalogue as a free resource for learning everything you need to know about the requirements of different vegetables for your garden.

Cross-pollinated seeds – Cross-pollination occurs when two different varieties of a plant are grown in close proximity to each other and pollination occurs by natural vectors (wind and insects). The following season the seed taken from that plant will produce a vegetable that has aspects of both varieties.

Hybrid seeds – Seeds of mixed parentage that have been purposely developed by breeders and for which breeders control the line. They are developed by mechanically pollinating one variety of a plant with pollen from another variety of that plant, creating a new variety. Get to know the hybrids that are bred for better productivity and disease resistance versus the ones that are bred for better shipability – an unnecessary trait when growing food in your own backyard!

Genetically modified (GM) seeds – Unlike conventional breeding, which relies on the existing reproductive systems of plants and animals, genetic modification takes genes from organisms such as bacteria and plants and inserts them directly into the cells of other often unrelated species (Canadian Biotechnology Action Network). The seed company that you choose should have a policy on GMOs clearly stated in their catalogue or website. Remember, certified organic always means GMO-free.

Growing Organic Seedlings

In the organic garden, seedlings need organic potting soil. Potting soils and seed starting mixes, readily available at garden centres and stores, often contain emulsifiers and wetting agents, which are chemical substances like detergents that are sprayed on the potting soil to help it to absorb moisture more readily. These soils are also typically sterile, which is far from beneficial in an organic garden that relies on living organisms in the soil!

So, here is a recipe for making your own organic potting mix! ►

ORGANIC POTTING MIX

5L fine textured organic compost

4L peat moss

4L organic garden soil

1.5L sand

2 TBSP lime

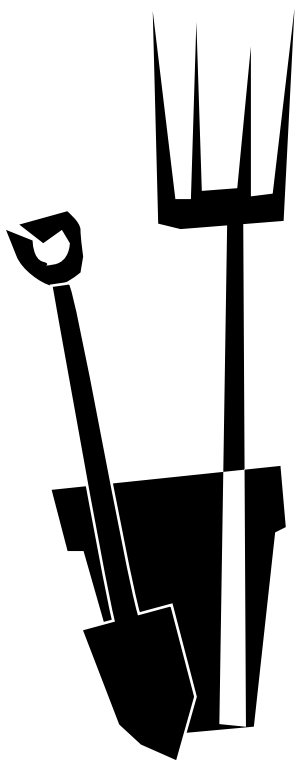
2 TBSP blood meal

1L perlite or vermiculite

Mix all the ingredients together in a large tub or wheel barrow. Add water until moist but not wet. Recipe will make enough to fill three standard size planting flats. See Resources section for availability of ingredients.

The Organic Garden Journal

Observation is the key to successful organic gardening. It can be a bit much to recall from memory all that you observed in your garden in the past year, month, or even week, so keeping a garden log or journal is a good idea. Organic farmers are required to keep accurate records of all on-farm activities, from soil inputs to seed sources and post-harvest handling. This record keeping requirement is all part of their traceability and certification to verify they are producing food for consumers in accordance with the Canada Organic Standards.



For the organic gardener, you will be mostly concerned with keeping notes to learn about your garden site and reach your organic gardening goals.

You will want to keep the following items in your garden journal:

- a copy of your map each year
- notes of your seed sources and varieties, plus comments on which ones grew well each year, and which ones you would like to try again
- your annual crop plan showing where you plant things each year, and how well they did there
- the findings from your soil assessment over time
- your compost plan
- your weed and pest management strategies each year

Soil, Soil, Soil – The Foundation of the Organic Garden

Soil is the foundation of organic growing. As such, the next crucial step in organic gardening is getting to know your soil so you can work to maintain it in a state of steady or increasing health, with future generations in mind.

Soil Life

The biological component of soil often goes unnoticed in the garden. It can be easy to forget about what we don't always see, but the importance of millions of active organisms functioning beneath our feet is something organic gardeners must strive to understand and promote.

The dominant agricultural system has focused on the chemical component of soil – nitrogen, phosphorus and potassium (NPK) – so gardeners usually go with the flow and think NPK needs to be added each season. However, for an organic farmer, the focus is much different. **The organic focus is on building and maintaining the biology of the soil – or the soil life.** It is the biological component of the soil that aids plant growth and minimizes the pressure from weeds, pests and disease.

Notes from the Field – The Life in Your Soil

Healthy organic soil is populated by millions of organisms including different types of bacteria, fungi, yeast and earthworms. In just one teaspoon of healthy soil live over one billion bacteria and over 1.2 million other micro-organisms. All this life aerates the soil and breaks down organic matter, improving the structure and overall fertility of your soil.

– Richard Stehouwer, Department of Crop and Soil Science, Penn State University's College of Agricultural Sciences, *The Life in Your Soil: An Introduction to Soil Microbiology*.

“In our experience, when people think about organic growing, they think about the challenges of not using synthetic fertilizers and pesticides, when it’s really about building and maintaining soil health.”
– organic vegetable farmer


The Soil Audit

Knowing your soil will allow you to build a healthy, productive garden. The following table summarizes a number of do-it-yourself assessments and questions to help you in getting to know your soil. The key here is observation. Keep track of your findings in your garden journal, and use this information to inform your crop planning.

The soil you have to work with is not something that you can change in the short term but the techniques given throughout this guide will help you to adapt and create the best growing conditions possible in your situation.

Table 1. Soil assessments

PROPERTY	ASPECT TO ASSESS	HOW TO ASSESS
Physical condition of soil	Composition	<p>There are a couple ways to determine soil composition.</p> <p>You can do the quick and dirty squeeze test:</p> <ul style="list-style-type: none"> • Moisten soil until it's the consistency of putty. • Compress a handful and try to squish it through your hand to form a ribbon. If it falls apart before you can form a ribbon, your soil is at least 50% sand, which is more than you want. Should it break apart before reaching two inches in length it is about 25% clay, a desirable composition. A large ribbon of two to three inches suggests at least 40% clay. <p>Or you can do the jar test:</p> <ul style="list-style-type: none"> • With a hand trowel or small spade dig down six to eight inches and remove a soil core with a good profile (visible separation of soil layers). • Put the soil sample in a one-litre jar and fill two-thirds with water. • Add one teaspoon of water softener to help the soil layers separate. • Shake the jar well and set it on a flat surface. • After five minutes, mark the top of the first visible layer (sand) on the jar. After two hours mark the new layer (silt). After 24 more hours mark the top of the next line (clay). The floating particles are organic matter. • Figure out the percentage of sand: silt: clay by comparing the width of the layers. More than 25% clay or 45% sand will need a lot of organic care. <p>Jar test for soil composition ▼</p>

PROPERTY	ASPECT TO ASSESS	HOW TO ASSESS
Physical condition of soil	Organic matter	What colour is the topsoil versus subsoil? Darker colour is ideal and indicative of higher organic matter.
	"Tilth" or compaction	A shovel should cut easily into soil with good tilth. The exposed soil should not be compacted but should crumble easily in your hands. How well are roots penetrating the soil? For instance, if your carrots are long and straight this indicates good tilth; if they are short and twisted this indicates poor tilth. Double digging or broad forking may be of immediate benefit here.
	Erosion	Erosion occurs most commonly on sloping fields. Look for evidence of gullies cut into the soil and exposed stones where topsoil has washed away. Cover crops and permanent plantings may be in order in this case.
	Smell	Should have a "sweet" and pleasant smell.
	Drainage	<p>Since drainage is not always uniform across a site, you should perform this test a couple of times to get a full picture.</p> <ul style="list-style-type: none"> • Choose your test site (maybe the highpoint and then the low point to compare). • With a shovel dig a hole about 30 cm (1ft) deep by 30 cm (1ft) wide. • Fill it with water and keep track of how long it takes to completely drain. Clay soils hold water, sandy soils drain quickly. <p>Results:</p> <ul style="list-style-type: none"> ▪ 10-30 minutes to drain – soil is draining well. ▪ Less than 10 minutes – soil likely has high sand content and will dry out and erode easily. ▪ Water still in hole after three hours – high concentration of clay. Poor drainage. <p>Drainage test ▼</p> 
Biology	Earthworm counts	Dig a 30cm (1ft) x 30 cm (1ft) hole and place the soil in a bucket. Sift or sort through the soil to count the worms. Ten or more earthworms indicate very biologically active soil.

Building Healthy Soils

You now have a map of your site, and have assessed your soil. The next step is to determine what techniques you may need to build organic matter and create a healthy productive garden.

It can be challenging in small garden plots to maintain soil structure and build organic matter without overloading the soil with weed stimulating nutrients. Because vegetables return so little organic matter to the land, and their root systems do not contribute significantly to building soil structure, **vegetable gardeners tend to favour adding manure (highly soluble nutrients) to the soil, which can lead to over-fertilization of the garden plot.**

The Canada Organic Standards outline specific practices that work instead on supporting soil life and enhancing the health and structure of the soil. Compost and cover crops will be detailed below, but key elements include:

- Use crop rotations
- Work the soil in a way that improves the soil life
- Use organic matter (compost, mulch, cover crops) produced from the garden as your soil amendments (inputs)
- Avoid over-fertilizing
- Only add manure if you are sure you need it, and then, only if you know the source to be organic

Compost

Compost is an organic garden hero. It helps to build soil structure and enhance soil fertility. Simply put, compost is the decomposition of organic matter by organisms, in the presence of oxygen and water. When we intentionally pile together brown (carbon) and green (nitrogen) materials in the correct ratio and add water and oxygen (achieved by aeration and turning the pile) the result is a rich combination of organic matter and stable plant nutrients that contribute significantly to the long term health of soils and plants.

Carbon (browns) + Nitrogen (greens) + oxygen + water + microorganisms + time = compost

Like any good recipe, there are a few basic ingredients and a classic method. Here we will outline the framework and you can provide your own custom modifications. **Remember the only wrong way to make compost is not to make compost!**

COMPOST 101

Coming up with a list of browns and greens for your compost is easy if you look around your own site first. Using what you have before you look elsewhere for ingredients is the hallmark of a well-functioning organic system. Consider these questions to help you judge your potential compost materials. Remember it will eventually be part of your food.

- Is the material free of chemicals?
- Is the material free of disease?
- Will it breakdown in my compost system?

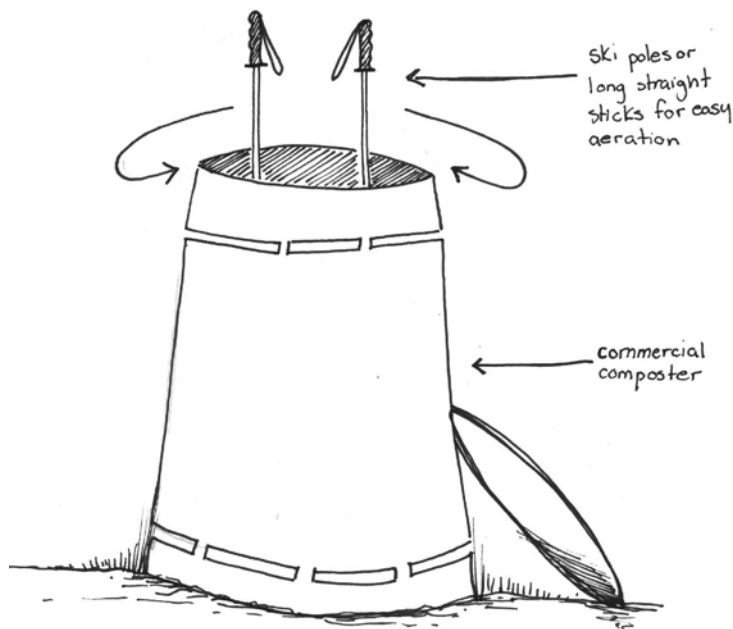
Carbon (Browns) - Look for dry yellow or brown plant matter like dry leaves, straw, newspaper (black and white only) or saw dust or shavings from untreated wood. You will need twice as much brown material as green material, but too many browns and your composting will be very slow because the bacteria will not get enough nitrogen to grow.

Nitrogen (Greens) - You'll want materials like fresh leaves, grass trimmings, manure, kitchen scraps including egg shells (no other animal products), weeds that have **not** gone to seed, pet litter (gerbils, bunnies, hamsters), and garden trimmings. Do **not** use weeds that may root like bindweed or Jerusalem artichoke tubers. Too many greens and your compost will smell of ammonia.



TIP: A Comfrey plant near the compost pile allows you to add the potassium-rich leaves (not roots) to your pile to benefit flowering and fruiting plants.

Oxygen - The micro-organisms that make up your compost pile ecosystem need air like nearly every living thing. Some coarse material like small sticks and twigs will help keep the pile from matting down and becoming oxygen-starved. Turning the pile is the best way to keep up the oxygen levels, but compost aerators that bore into the pile will achieve a similar, though not as uniform, result in the short term. If the pile gets hot you know you have good oxygen levels. A couple of ski poles or broken hockey sticks left in a commercial composter as the material is being added will let you push and pull on them to aerate the pile.



Ski poles as compost aerators ►

Water - The compost-making micro-organisms also need moisture. Green material will naturally add moisture to the pile. If too much moisture gets into the compost, it reduces the air flow resulting in a temperature drop and unpleasant smelling compost. Too little moisture and it decomposes less efficiently and never gets up to temperature. The composting process takes long enough as it is; you don't need to add another year on because you didn't moisten your compost. If the pile feels like a sponge that has been wrung out, that is good.

Microorganisms - They are the vital last ingredient in compost. This crew will decompose your "browns" and "greens" for their own benefit and leave you with a stable, mature compost. You can inoculate your pile

with a good supply of microbes by using sparing amounts of your own garden soil. They will also come in on the nitrogen-rich “greens” you add to the pile. The presence of these organisms makes homemade compost a superior product to the bagged purchased product.



TIP: In the community garden context a simple rule of two parts brown for every one part green helps keep the composting system and the community gardeners happy. Keep a ready supply of browns for the gardeners to use as they will likely have lots of greens to contribute.

BUILDING AND MAINTAINING YOUR COMPOST PILE

1. Begin with a base layer of coarse materials like corn stalks, wood prunings or raspberry canes to allow for drainage and air circulation.
2. Once the base is laid begin to layer in the greens and browns.
3. A ten inch layer of browns followed by a five inch layer of green, a sprinkle of soil, a sprinkle of water...
4. ... and repeat.
5. Within the first week your pile will begin to heap up and shrink down.
6. If you are looking to create compost in less than one year, turning will then be necessary and involves removing the less composted top and sides and mix with inner more decomposed material.

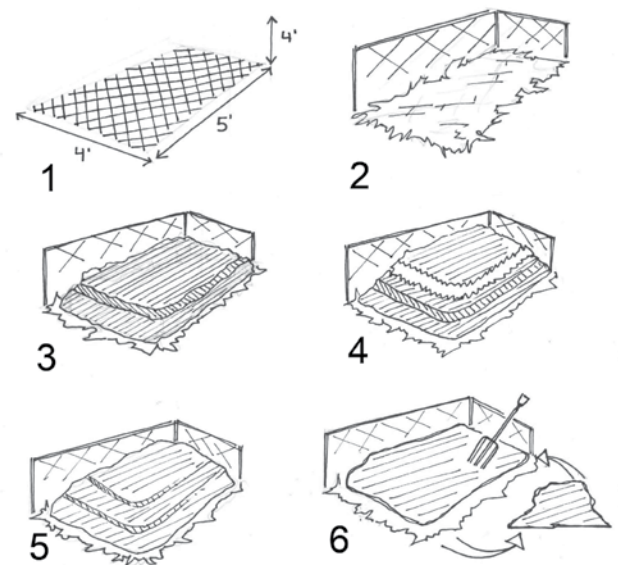
Covering the pile will help with controlling the moisture content but with experience you will be able to manage the moisture content even if the pile does not have a cover, by adding more browns to a wet pile and more greens to a dry pile. A cover may also serve to exclude critters but you can also deter these pests by burying newly added delicious material (like kitchen scraps) in the center of the pile.

Compost Pile Development ►

Notes from the Field – The Poop on Manure

Manure differs from compost. It has a lower carbon to nitrogen ratio and having not been through the composting process, its nutrients are in a very soluble form and are at risk of leaching away with winter and spring precipitation.

Composted manure is always best, but remember manure is a green, so you will need to add twice as many browns if you add manure to your pile. As always, the source matters – an organic garden needs manure from organic sources – what goes in one end comes out the other! See Appendix A for carbon:nitrogen ratios of various compost ingredients.





TIP: A compost thermometer can be a very useful tool. A pile that heats to over 130°F or 55°C for at least four days is a requirement under the Canada Organic Standards. This temperature will kill off weed seeds and proves you have good microbial activity in the pile.

COMPOST TEA

Compost tea is a liquid extract taken from stable, mature compost. Typically, the brewing process includes oxygenating the tea to maximize the microbial communities and shorten the brewing time. Compost tea is a readily available form of compost that will affect the plant more quickly than compost mixed with soil. Compost teas can be applied either to the soil or to the plant foliage. When applied to the soil, the nutrients from the compost become more readily available for the plants' use, and more micro-organisms are added to the soil, building soil health.

When the tea is applied to the plant foliage as a spray, it delivers beneficial micro-organisms and nutrients to the plant surface to assist in disease suppression (like powdery mildew) and nutrient availability.

The quality of compost and water matters when brewing tea – good compost makes good tea, bad compost makes bad tea. If using treated water with chlorine present, the chlorine should be off-gassed for at least one hour first.

RECIPE FOR COMPOST TEA

- Put three litres of your best compost in a 20-litre bucket.
- Add enough water to bring it up almost to the top (leave enough space to stir vigorously without spilling over).
- Add ¼ cup of unsulphured molasses to the mixture.
- Put in an aquarium bubbler (air stone).
- Each morning take out the bubblers and stir vigorously.
- On the third morning, strain the whole mixture by dumping it into a burlap bag or pillow case.
- Mix about one part compost tea to ten parts water.

Teas can also be made from horsetail, nettles or comfrey. Comfrey is more nutrient-rich than other plants so it tends to be used more. Fill a five-gallon bucket half-way with chopped up leaves. Fill with rainwater or chlorine-free water. Let stand for several days. If you have a bubbler, all the better, but not absolutely necessary. Strain and use a one quart to five gallon (1:5) ratio to spray.



TIP: Manure has not been through a hot composting process, which reaches temperatures sufficient to kill potential human pathogens, so manure teas are a big no-no!

Cover Crops

Cover crops, also called green manure crops, are grown specifically for the services they can provide for the soil – and there are many! Incorporating green manure crops into your garden helps to increase organic matter and nutrient content, improve soil structure, and stimulate soil organisms to break down organic matter. Different cover crops have varying characteristics and benefits for the soil and your garden. Legumes are commonly used as green manures for the nitrogen fixing properties they possess. In organic agriculture these fixation characteristics are used as an alternative to synthetic fertilizers used to boost nitrogen availability in soil.

Table 2 lists the most common cover crops for your garden. The type of cover crop you use will be dictated by your garden site and your crop plan. Cover crops should be worked into a good garden rotation, but **at the very least, cover crops should be used to cover your garden over the winter**. In the spring you can mow or work in the cover crops to give your garden the boost it needs in the spring! But be sure to incorporate the cover crops into the soil 2-3 weeks prior to when you want to plant (particularly for small seeds). The process of breaking down a cover crop will temporarily tie up available nutrients slowing initial crop growth.

Notes from the Field – A Little Known Fact About Beneficial Rhizobia

The production of nitrogen fertilizer requires natural gas as an ingredient, and a temperature of 1000°C and a pressure of 1000 atmospheres – in other words, a lot of fossil fuel energy. Rhizobia bacteria on the roots of legume plants (e.g. peas, beans, and clovers) use enzymes in the form of carbohydrates from their host plants to produce nitrogen, with very little energy.

– paraphrased from Ralph Martin, Organic Agriculture Centre of Canada

Table 2. Cover crops and their characteristics

	Legume (Y/N)	When to plant	Seeding rate (lb/100sq. ft)	When to turn under	Winter killed (Y/N)	Soil building qualities
Barley	N	fall/spring	1/8 lb	spring/fall	Y	Adds organic matter and improves soil aggregation.
Buckwheat	N	spring/summer (May-July)	1/4 lb	before seeds form!	Y	Stabilizes soil, adds organic matter and phosphorous. Attracts pollinators. Fast growing.
Chickling vetch	Y	early spring/summer	1/4 lb	fall	Y	Can be grown as a green manure between crops for nitrogen-fixing properties.
Oats	N	spring to early fall	1/3 lb	as needed	Y	Use as a winter cover crop or green manure. Adds organic matter and improves soil structure.
Oil radish	N	spring/fall	1/5 lb	fall/spring	Y	Tap root breaks up compacted soil and draws nutrient from sub soil. Decomposing matter protects against soil-borne pests.
Clovers	Y	spring, summer or fall	1/5 lb	fall/spring	N	Can be grown as a green manure or in co-cropping situations. Also out-competes weeds and fixes nitrogen. Attracts pollinators.
Rye	N	summer/fall	1/4 lb	spring	N	Good winter cover; will continue growing well past frost and begin growing again in the spring. Incorporate at least three weeks prior to planting in the spring to breakdown alleopathic chemicals in rye.

How Does Your Organic Garden Grow?

With holistic and preventative measures of course! You have already begun by getting to know your site and soil, understanding and building soil health, selecting organic seeds and seedlings, and preparing your garden with care. Now comes the fun part of organic gardening – incorporating organic techniques to keep weeds, pests and disease at bay.

Managing Weeds

Weeds are an unavoidable reality in any garden! However, how you manage them is the key. Organic gardening focuses on **preventative weed management** and **reducing the weed pressure**.

The following practices can be used in the organic backyard to reduce the weed pressure:

Feed Your Veggies, Not the Weeds

Avoid broadcast spreading of compost before planting. Doing so makes nutrients available to fast growing weeds. Instead, apply compost near the rows where it is more likely to be captured by the crop.

Reduce the Weed Seed Bank Over Time

To prevent the addition of even more weeds in your garden next year, make sure that this year's weed crop does not go to seed. Solarizing your soil can help get rid of a large accumulation of weed seeds that have built up over time. Black plastic mulch laid down over the soil and left to draw the heat from the sun will cook weed seeds close to the surface. It can also negatively impact soil organisms in the top two inches of soil, but these rapidly bounce back once the plastic is removed. Uncomposted manure can be full of weed seeds, so try to always use composted manure! A temperature of 130°F or approximately 55°C is required to kill weed seeds.

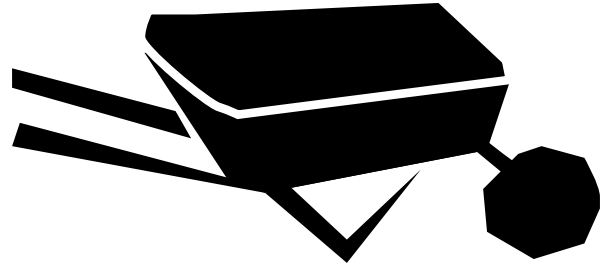
Notes from the Field – Some Tips for Better Understanding Weeds

- Weed populations tend to decline as soil health builds.
- Observing and learning about weed ecology and the influence of various crops on weed communities will help you refine your weed management practice over time.
- Keep good notes about the weeds and weed pressures in your garden from year to year.
- Dandelions are a sign of acidic or compacted soil. Red root pigweed indicates excess nitrogen and bindweed is an indication of low organic matter often in sandy soils.

Mulching Matters

Mulch is important in the organic garden to control weeds. It

- a) blocks sunlight that helps weeds germinate
- b) retains moisture
- c) moderates soil temperature
- d) adds organic matter



There are many different materials that can be used as mulch. Table 3 provides some ideas and guidance on what materials to use.

Table 3. Different mulches and their uses

Mulch type	Where to use	Comments
Compost	Around perennials and shrubs, and in the vegetable garden	One inch of well broken down compost will supply nutrients, add organic matter and hold moisture.
Mushroom compost	Best applied every two to three years to annual and perennial beds to maintain soil pH (mushroom compost is alkaline - works like lime to "sweeten" acidic soils)	Be cautious of the source and quantity when using mushroom compost. It is often manure-based and has a high salt concentration and could contain unwanted substances. Your best bet would be to obtain such compost from an organic mushroom operation. You need only a small amount (no more than one inch coverage) to achieve soil amendment properties.
Shredded bark	Around trees and shrubs, perennials (not ideal for vegetable gardens)	Bark mulch is not fully composted and robs your soil of nutrients as it continues to break down. Also adding too much wood material to your vegetable garden can result in poor structure and texture.
Straw or hay	Best used in the vegetable garden and on pathways	Used as a mulch straw helps keep your garden clean and neat, while suppressing soil-borne diseases by preventing soil splashing on leaves. Can also be used to cover root vegetables to delay the ground freezing to allow you to harvest in the winter months. Beware of weed seeds.
Grass clippings	Used in the vegetable garden between rows and on paths	Once broken down they are a good source of nutrients. Ontario's ban on the use of domestic pesticides means grass clippings are safe, though they are really best left on the lawn.
Newspaper (not glossy)	Used in the vegetable garden between rows and on paths	A thick layer will smother annual weeds and break down in one season. See Lasagna gardening, page 10.
Shredded leaves	Excellent around perennials, trees, shrubs and vegetables	Leaves could be chopped or partially broken down before being applied to prevent a mat from forming. Any type of leaves can be used but a mixture is usually best. Beware of Black Walnut however. These leaves contain traces of a plant toxin called juglone that negatively affects some plants, particularly the tomato family. Ensure these leaves are composted before use in the garden.

Cultivate with Care and Purpose

Organic growing utilizes tilling only when and where needed, most often for planting and weed management purposes. At a small scale, cultivating with a hoe or other hand tools is the best way to stay on top of weeds. The key here is shallow frequent cultivation so as to not turn up too many more weed seeds from deeper down in the soil.

- **Stale seed bed techniques** are ways of “surprising” tiny, newly germinated weeds. After preparing a bed and before planting, wait a few days and lightly hoe or rake to remove weeds that have come up. Alternatively, a black plastic cover (left on for a couple of sunny days) can be used to kill very small weeds without disturbing the soil. The heat will penetrate the top two inches of soil and can disrupt some soil organisms in the process but they quickly recover when the cover is removed. Flame weeding could also be used as a “stale bed” technique. Unlike mechanical weeding, flame weeding doesn’t bring new weed seeds to the surface. To save time and fuel, only the rows are flamed, leaving the space between the rows for mechanical weeding.
- **Blind cultivation** is especially useful for direct-seeded crops that are slow to germinate, such as carrots, parsnips, and green onions. A few days after planting, a very shallow cultivation is done (with care for the seeds below) using the back of a rake or other shallow tool as soon as the first tiny weeds emerge. Flame weeding is especially useful for blind cultivation. Weed seeds germinate first, so flaming is done after the weeds have emerged, but before the crop has sprouted, killing the weeds and sparing the crop. Cultivating early and often is the easiest way to control weeds. Wheel hoes are a pleasure to use – they can get very close to the crop when it is small without moving much soil into the row.

Notes from the Field - To Till or Not to Till

Soil cultivation, or tillage, is a common farming practice that is both praised for its seed-bed preparation and weed management capabilities, and frowned upon for its soil damaging potential. It is important to recognize that tillage has both positive and negative effects. All sides are considered in the table below.

Table 4. Positive and negative effects of tillage

Positive Effects of Careful Tillage	Negative Effects of Over-Tillage
Breaks up compacted soil and allows for better air and water exchange and better root penetration	Increases the rate of organic matter break down which leads to degradation of soil properties such as reduced soil life, poor water infiltration and drainage and reduced gas exchange
Maintains soil structure by mixing organic matter and soil minerals and encouraging the formation of new soil aggregates	Reduces soil biological activity, which in turn reduces the release of plant nutrients and therefore poor crop growth
Incorporates oxygen, stimulating biological activity, which in turn speeds up mineralization and the release of plant-based nutrients	Reduces water and nutrient holding capacity because of rapid organic matter breakdown
Increases soil temperature in the spring which creates an encouraging environment for soil micro-organisms	Weakens soil aggregates, leaving soil more susceptible to surface crusting and erosion from wind and water
Incorporates organic matter into the soil and manages crop residue, which avoids losing carbon or volatile nitrogen compounds through surface decomposition	Destroys earthworm habitat and numbers
Creates a supportive seedbed, especially for fine seeded crops	

Adapted from: Singh, A. “Soil: fertility or fluffy.” *The Canadian Organic Grower*, Spring, 2009.

Keeping Bugs and Disease at Bay

Pest and disease control in organic gardening is based on understanding the relationships between the food crops you are growing and the natural pests and predators that harm them and decrease productivity. Like weed control, pest management in *The Organic Backyard* is based on preventative practices, rather than inputs. Only when the organic management practices alone cannot prevent or control crop pests or disease may a plant-derived botanical or biological substance be applied.

A crop pest and disease management plan for organic production emphasizes maximizing plant vigor, monitoring and observation, reducing opportunities for pests and disease, removing pests before they spread, and preventing pests from accessing plants.

Notes from the Field – The Permitted Substances List

Part of the Canada Organic Standards contains a list of permitted substances that organic farmers can use only when all other practices cannot prevent or control a crop pest or disease. Organic gardeners will want to become familiar with this list as well. The list can be downloaded from www.cogwaterloo.ca.

Monitoring and Observation

The first step in dealing with pests organically is to get to know them and understand their place in the ecosystem. Not all insects are your enemy, which you will soon find if you take some time to walk about your garden monitoring insect activity. Which insects are on which plants? Which ones do you see eating other insects? Which insects aren't around that may be beneficial? You can learn a lot through observation with a good garden insect book on hand, but taking advantage of any pest management workshops in your area or any opportunity to share strategies with other gardeners is worthwhile.

Reducing Opportunities for Pests and Disease

REDUCE PEST AND DISEASE HABITAT

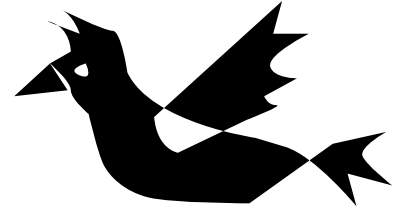
Pests and disease can overwinter in the garden, waiting for optimal spring garden conditions to appear. By composting or tilling in any remaining plant materials after harvest, you reduce sources for overwintering habitat. The exceptions include plant materials affected by early blight and squash bugs - these should be kept out of the compost pile. Winter cover crops will not harbour pests or diseases, but will contribute to soil health and should therefore be a part of your pest reduction strategy.

INCREASE HABITAT FOR BENEFICIAL ORGANISMS

Not all bugs are bad. Get to know who the good ones are and welcome them to your garden by:

- Planting insectory gardens (be sure to include a water source) with members of the carrot and sunflower families.

- Planting cover crops in your rotations that attract beneficial insects, such as buckwheat, sweet clover, fava beans, vetch, red clover, white clover, mustards, and cowpeas.
- Intercropping plants that attract beneficial organisms, such as species in the carrot (Apiaceae, Umbelliferae), sunflower (Asteraceae, Compositae), and mint (Lamiaceae) families. Even leaving some lambsquarters (*Chenopodium berlandieri*) in the rows as an alternate host for aphids can work.
- Mounting bird houses and bat boxes near your garden.



MODIFY PLANT SELECTIONS AND PLANTING PRACTICES

- Read the seed catalogues carefully and find cultivars that are resistant to common diseases.
- Try timing plantings to avoid peak pest pressure. For instance, plant potatoes after mid-June.
- Watch over-fertilization, as aphids love sappy, tender new growth.

EMPLOY COMPANION PLANTING APPROACHES

There are many theories about companion planting. Since the garden is a living ecosystem, our best advice is to try some out, see what works and take good notes! There are two ways to think about companion plants. The most common being interplanting a crop that repel pests from another crop, such as onions to repel carrot rust fly. The other is using plants that act as decoys or traps to lure pests away from your crops, such as using mustard greens to trap flea beetles and keep them away from kale or broccoli.

MAINTAIN PLANT HEALTH TO RESIST PESTS

Just as healthy soils mean fewer weeds, healthy plants mean greater resistance to pests and disease. Stressed plants accumulate free nitrogen in their tissues, a protein source that attracts insects and causes their populations to explode.

- Water as needed during dry periods to reduce plant stress.
- Reduce overhead watering to reduce disease risk.
- Don't harvest when leaves are wet to avoid spreading disease.
- Remove and destroy any diseased plants.
- Disinfect pruners before use (dipping in 40% rubbing alcohol works well) on susceptible plants like tomatoes to protect against bacterial and viral diseases.

Removing Pests Before They Spread

Sometimes the best way to combat pests in the garden is to beat them off with a broom – okay, maybe not that severe, but hand-picking (and even vacuuming) the first pests before they can reproduce can work well on potato beetles (and their egg clusters), cabbage worms, squash bugs and tomato hornworms. Spraying hard with water is one way to dislodge aphids. Knowing what pests' larva and eggs look like is a good strategy, allowing you to get a handle on the problem before it is too great.

Preventing Pests from Accessing Plants

Row cover is a light weight material used to keep caterpillars, moths, beetles and flies away from vulnerable plants, such as squash, pumpkins, cucumbers and gourds, as they grow to maturity. Row cover is generally applied as soon as transplants are in the ground and they can remain covered until the plant blossoms and requires fertilization. At this point the plant can sustain a bit more pest pressure, yet the pressure is greatly reduced. Crucifers (see Table 5, Crop families) also do well under cover. They are protected from flea beetles in the early stages and avoid infestation of cabbage worms by preventing the European Cabbage moth from laying eggs in their heads. They do not flower therefore the cover can stay on until harvest. See Resources section for row cover availability.



Notes from the Field – Making Your Own Pest Management Products

Bugs can happen even with the best preventative measures. Homemade sprays can be beneficial before resorting to allowable organic pest management products. After all, organic principles state to use what is on your site first!

All-Purpose Homemade Pest Spray

Garlic contains allilcin which confounds insects; hot peppers contain capsaicin which gives anything a chemical burn; onions contain sulfur, which helps to suppress fungal disease; and many pests avoid tomatoes. The result? A truly all-purpose spray!

Chop: 2 lbs ripe tomatoes, 1 lg onion, 1 lb chili peppers, 2 cloves garlic. Blend. Add 1 cup vinegar and ½ tsp pepper. Strain. Spray.

Rhubarb Spray

Rhubarb spray can be used to help control fungal disease and aphids.

Cut rhubarb leaves (6 leaves). Boil in 3 quarts of water. Steep for an hour. Strain. Spray.

Crop Rotation: The Secret Organic Ingredient!

Just as building soil health is the foundation of organic gardening, crop rotation is the practice that brings the whole organic garden plan together.

Crop rotation is used in organic farming to:

- a) Break the cycle of soil-borne diseases and pests from year to year
- b) Balance soil fertility
- c) Reduce the weed pressure

Breaking the Cycle of Soil-Borne Diseases and Pests

In a small space crop rotation can be as simple as not planting like crops (those in the same family) in the same place in consecutive years. Table 5 below groups common vegetable crops in their respective families.

Table 5. Crop families

Compositae	Amaryllidaceae	Cruciferae	Chenopodiaceae	Gramineae
Artichoke Dandelion Endive Lettuce Radicchio	Garlic Leek Onion	Arugula Broccoli Cabbage Kale Radish Rutabaga	Beet Spinach Swiss Chard	Corn
Leguminosae	Solanaceae	Cucurbitaceae	Umbelliferae	
Bean Peas	Eggplant Pepper Potato Tomato	Cucumber Melon Pumpkin Squash Zucchini	Carrot Celery Parsley Parsnip	

Balancing Soil Fertility

As your garden increases in size you may be able to employ a more complex crop rotation system, which involves identifying heavy and light feeders (plants that require more or less nutrients in the soil). The following chart explains a simple four-year rotation moving from heavy feeders that require a significant amount of nutrient inputs and organic matter to light feeders that do best with lower nutrient availability.

If you are having trouble with productivity (e.g., carrots with lush green tops but underdeveloped root), then re-adjusting your rotation to reflect this kind of a system could help. By following the examples in the chart you can ensure that heavy feeders like garlic, potatoes, tomatoes and squash use up a significant portion of the available nutrients so light feeders like carrots, parsley and radishes are not overfed in the following year.

Table 6. Sample four-year rotation

Heaviest Feeders	Heavy Feeders	Light Feeders	Lightest Feeders / Nitrogen Fixers
Brussel Sprouts Cabbage Corn Cucumbers Potatoes Tomatoes Squash Garlic	Beets Broccoli Cauliflower Celery Kale Leeks Lettuce Spinach Turnip	Carrots Onions Parsley Parsnips Radish	Peas Beans Other legumes

Reducing the Weed Pressure With Rotation

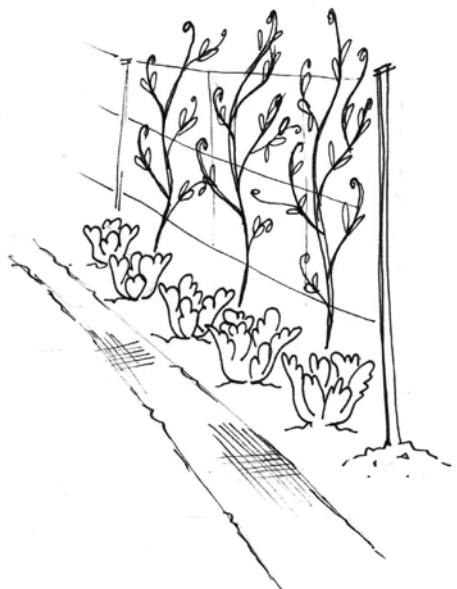
Giving consideration to the growth habits and tillage requirements of what you plant can create some good crop rotation strategies. Some seeds are naturally slow to germinate (e.g., carrots or parsley), which leaves that area vulnerable to faster germinating weeds while others have a leafy canopy (e.g., beans or zucchini) or cover the ground (e.g., squash or cucumbers) to create weed competition. Here are a couple examples of how to plan your rotation based on different tillage requirements:

- Plant a crop that is direct seeded and requires tilling in year one, such as lettuce or beets, and then in year two plant a transplanted crop with no-tilling. Just do a light hoeing to remove surface weeds and plant the transplants then mulch between the plants to exclude later potential weeds.
- If there is an area of perennial grasses in the garden like twitch grass consider growing potatoes. The hoeing, hilling and digging needed to grow potatoes will keep the top off the grass and starve the roots of the grasses. You may be able to eliminate some perennial grasses in one season.

Co-cropping is another strategy that can aid in weed suppression. It is a practice of planting different types of plants in close proximity to create diversity throughout your garden and increase the competition for weeds.



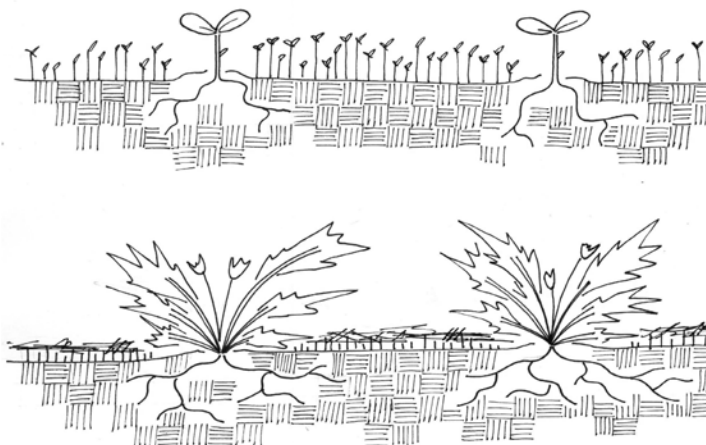
For example, head lettuce could be planted under trellised peas, beans or cucumbers to shade the soil and suppress weeds while making efficient use of available space. How about trying this with grapes!



You could consider using the traditional Three Sisters Garden. Squash leaves spread over the ground to suppress weeds around pole beans, and the beans are supported by the corn stalks. In addition the beans are fixing much needed nitrogen in the soil, replacing the nitrogen used by the heavy feeding corn and squash.



The co-cropping concept can also be employed using a cover crop between food plants to stabilize soil and suppress weeds. A cover crop is seeded when transplants are first put in the ground. This works in situations with a significant amount of space between the rows. You would broadcast seeds of a fast growing cover crop like buckwheat or oats (or a mixture of the two, known as “cocktail cropping”) between your transplants and rake it in. Both are recommended as cover crops as they germinate quickly. In addition, buckwheat leaves cover the ground to smother germinating weed seeds and the flowers attract beneficial insects and pollinators. Once the transplants become big enough and BEFORE buckwheat goes to seed, you mow or clip it and leave the clippings as mulch.



Growing the Organic Backyard Movement

Growing your own food is an educational, fun and empowering experience. Your homegrown harvest provides you with the purest form of local food possible, the knowledge that you are reducing your food miles, plus a chance to build community around fresh, wholesome food.

Using organic principles and techniques to grow your food means that you can have an even greater impact on your health and the health of your environment. *The Organic Backyard* demonstrates how the holistic and preventative principles and practices of organic agriculture can be adopted from the formalized standards and farm operations they originate from and applied on the home or community garden scale.

Organic growing's emphasis on soil health presents the opportunity to produce food more naturally, allowing you to move away from a food system that relies heavily on fossil fuels to produce fertilizers and pesticides towards one that integrates food production with environmental stewardship, and considers future generations.

Join us in growing organically in your home, school or community garden.

Together we can build a local organic food system!



Resources

Seeds

Canadian Organic Growers Perth-Waterloo-Wellington

*Lists Ontario organic seed sources
and has a downloadable version
of this guide*

[www.cogwaterloo.ca/
growOrganic.php](http://www.cogwaterloo.ca/growOrganic.php)

High Mowing Organic Seeds (Vermont)

Organic seeds

www.highmowingseeds.com
802-472-6174

Johnny's Selected Seeds (Maine)

*Organic seeds and garden
planning tool*

www.johnnyseeds.com
1-877-564-6697

Veseys Seeds (PEI)

Organic seeds and tools

www.veseys.com

William Dam Seeds (Dundas, Ontario)

*Organic seeds, seed starting
supplies, and row cover*

www.damseeds.com
905-628-6641

Equipment

Dubois Agrinovation (Waterford, Ontario)

*Row cover, irrigation and
composters*

www.duboisag.com
1-800-815-9929

Earthway

Garden seeders and wheel hoes

www.earthway.com

Lee Valley Tools

*An assortment of small garden
tools*

www.leevalley.com
905-319-9110 (Burlington location)

Orchard Hill Farm (St. Thomas, Ontario)

*Ken and Martha Laing
High-Kentucky-style wheel hoes
with stirrup hoe attachment made
on the farm*

www.orchardhillfarm.ca
519-775-2670

Compost

Cathy's Crawly Composters Vermicomposters and worms

www.cathyscomposters.com
1-888-775-9495 or 905-775-9495

Compost Council of Canada

*Some additional pointers on
composting, including some
troubleshooting*

www.compost.org

Garden Planning Tools

Johnny's Selected Seeds (Maine)

*Organic seeds and garden
planning tool*

www.johnnyseeds.com
1-877-564-6697

Mother Earth News

*Garden planning tool that
provides bed design and planting
guidance based on whatever
you're growing*

[www.motherearthnews.com/
garden-planner](http://www.motherearthnews.com/garden-planner)

Appendix A

Carbon:Nitrogen Ratios of Various Compost Ingredients

Material	C:N
hay, legume	16:1
hay, grass	32:1
straw, oat	60:1
straw, wheat	125:1
cattle manure	19:1
chicken manure	6:1
horse manure	30:1
softwood shavings	640:1
grass clippings	17:1
leaves	54:1
food waste	15:1 (highly variable)

Source: *ATTRA On-Farm Composting Handbook*, pg 54



Supporting farmers and consumers in building a local organic food system
www.cogwaterloo.ca

COG PWW
5420 Hwy 6 North, RR5
Guelph, ON N1H 6J2
Phone: 226-251-3012
Email: office@cogwaterloo.ca

