

INTRODUCTION TO
ORGANIC
GARDENING
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WHAT IS ORGANIC GARDENING

Organic gardening is a process that promotes and enhances biodiversity, natural biological cycles and soil biological activities that restore, maintain and enhance ecological harmony.

Organic gardening basic tenets are feeding the soil through decaying organic matter and utilizing natural cycles and predators for disease and pest control.

PLANNING

Successful organic gardens are not accidental. They are a result of planning, constant care and attention to how things grow. As you plan your garden you have to consider the size of your plot, your commitment and your planting goals. What are your primary interests? Fresh greens, tomatoes, flowering perennials etc. Don't underestimate the work involved in organic gardening.

Once you decide your goals, develop a planting and harvest guide to fit your commitment. For example, do not plant something that will be harvested during that long planned vacation. If you do so you will not see the fruits of your labor and let produce go to waste. Your garden plan will need to include planting distances and depths. It may be helpful to draw your plant out on paper to determine the location of each crop. You will need to work out a succession plan of crops you plan to plant over 3 to 5 years as well as from season to season. If you plan to garden year round you may want to combine spring and summer into one plan and winter into a second plan for each year. Soil building strategies need to be included in your plan, giving the soil time to prepare for the next crop. Remember the organic gardeners slogan: "Feed the soil not the plant."

Plan your garden thoughtfully and far enough in advance to achieve your goals.

SOIL WHAT IS IT?

Soil health is synonymous with a healthy and productive organic gardens. If you continue to take from the soil and return nothing you will wear your soil out leaving you with nutritionally deprived, weak plants, increased diseases and pests. Commercial compost and manures are sterilized. Sterilization kills organisms that make up the soil food web. They will add organic material to your garden, but will not measurably increase its fertility or health. The use of Peat Moss is discouraged in that it has no nutritional value.

Soil Structure

Check your soils texture. Feel it. Rub some between your thumb and fingers. If the particles are very fine you have clay, if they are very coarse you have sand. How does it hold together: is it crumbly or powdery. Is it sticky or hard? Will it not crumble without a hammer? Does it refuse to hold together at all? Soil structure is how your soil holds air and water. Soil structure will determine how it warms up and how it cools down.

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The simplest way to improve your soils structure is to add organic matter. As it decomposes it will become humus. Humus will improve the way your soil binds together. Humus will keep clay from binding into “bricks” requiring a hammer to break up. Humus will help sandy soils begin to hold together. Working you soil when it is too wet or too dry can adversely affect its structure.

In addition to improving the structure of your soil, organic materials will add important nutrients to your soil and feed the soil food web, which makes nutrients available to your plants. Organic material will help maintain healthy levels of oxygen and water in your soil and make it easier to work.

The Soil Food Web¹

Introductory concepts

The soil food web is a cycle of soil organisms that feed on decaying organic matter and in turn feed living organic matter. Plants through photosynthesis use solar energy to fix CO₂ the building block of plant matter. The plants in turn add organic matter to the soil (biomass and plant litter).

The living components of the soil and food web have different compositions for different ecosystems. The biological complexity of the soil food web is involved in nutrient cycling, formation of soil structure, pest cycles and decomposition rates.

When organisms consume food they create more of their own biomass and release wastes. The most important waste is ammonium (NH₄). Other organisms including plant roots quickly take up ammonium and other readily utilized nutrients. This process is called mineralization.

In addition to mineralization the soil food web can immobilize or retain nitrogen when the demand goes down. Immobilized nitrogen is less mobile and less likely to be lost from the rooting zone. Commercial fertilizers are not immobilized and are easily flushed through the root zone and into the waste stream.

Many soil organisms' work to improve the structure of the soil. Earthworms and arthropods consume small aggregates of mineral particles and organic matter. They generate larger fecal pellets coated with compounds from the gut. These fecal pellets become a part of the soil structure. Fungal hyphae and root hairs bind together and help stabilize larger aggregates. Improved aggregate stability along with the burrows of earthworms and arthropods increase porosity, water infiltration and water holding capacity.

Complex soil food webs contain numerous organisms that compete with disease causing organisms. These competitors can prevent soil pathogens from establishing colonies and generating food. Some competitors feed on pathogens or generate material that is toxic or inhibit pathogens.

¹ Taken from *Soil Biology Primer*, published by USDA natural Resources Conservation Service, August 1999. The full primer is available on line at www.statlab.iastate.edu/survey/SQI/primer/index.htm

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An important role of soil is to purify water. Complex food webs include organisms that consume a wide range of pollutants.

There are six major groups of soil organisms: bacteria, fungi, protozoa, nematodes, arthropods and earthworms.

Bacteria

Bacteria are tiny, one celled organisms. What they lack in size they make up in numbers. A teaspoon of productive soil contains between 100 million and 1 billion bacteria. Bacteria feed other members of the food web, decompose organic matter, help keep nutrients in the rooting zone, enhance soil structure, compete with disease causing organisms and filter and degrade pollutants.

Soil Fungi

Fungi are microscopic cells that grow as long threads or strands called hyphae. Hyphae push their way between soil particles, roots and rocks. A single hyphae can span in length from a few cells to many yards. Fungi decompose complex carbon compounds, improve the accumulation of organic matter, retain nutrients and physically bind soil particles into aggregates. Fungi are import food sources for other organisms in the food web, they can improve plant growth with some plants, compete with plant pathogens and decompose certain types of pollutants.

Soil Protozoa

Protozoa are single celled animals that fee primarily on bacteria, but also eat other protozoa, soluble organic matter and sometimes fungi. There are several times larger than bacteria. As they eat bacteria, protozoa release excess nitrogen that can then be used by plants and other members of the food web. Protozoa release nutrients stored in microbial biomass for plant use, increase decomposition rates and soil aggregation by stimulating bacterial activity, prevent some pathogens from establishing on plants and provide prey for larger soil organisms such as nematodes.

Soil Nematodes

Nematodes are non-segmented worms about 1/20th of an inch long. A few species are responsible for plant disease, but the majority plays a beneficial role in the soil. Nematodes help regulate the populations of other soil organisms, mineralize nutrients into plant available forms, prove a food source for other soil organisms that influence soil structure and consume disease-causing organisms.

Soil Arthropods

Many bugs, known as arthropods, make their home in the soil. They get their name form their jointed (arthros) legs (Podos). Arthropods are invertebrates (have no backbone) and rely on an external covering called exoskeleton. Arthropods range in size from microscopic to several inches in length. They include insects such as springtails, beetles, and ants; crustaceans such as sowbugs; arachnids such as spiders and mites; myriapods, such as centipedes and millipedes and scorpions.

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Arthropods improve soil structure through burrowing and the creation of fecal pellets, control disease-causing organisms, stimulate microbial activity, enhance decomposition through shredding large plant litter and mixing the soil and regulate healthy soil food web populations.

Earthworms

Most people become familiar with these soft, slimy, invertebrates at an early age. Earthworms are hermaphrodites, meaning they exhibit both male and female characteristics. They are major decomposers of dead and decomposing organic matter. They derive their nutrition from the bacteria and fungi that grow in these materials. They fragment organic material and recycle the nutrients it contains. In terms of biomass and overall activity, earthworms dominate the world of soil invertebrates including arthropods.

Earthworms shred and increase the surface area of organic matter, thus, stimulating microbial decomposition and nutrient release, improve soil stability, porosity and moisture holding capacity by burrowing and aggregating soil, turn soil over, prevent disease and enhance decomposition by bringing deeper soil to the surface and burying organic matter. Earthworms improve water infiltration by forming deep channels and improving soil aggregation and improve root growth by creating channels lined with nutrients.

Fertilization

N-P-K, nitrogen, phosphorus and potassium are the principle nutrients required by plants. Green growth is encouraged by nitrogen, Phosphorous encourages flower and seed production while potassium helps the plant to use proteins and carbohydrates and build strong stems. Certain crops need more of a particular nutrient for example tomatoes need calcium and garlic requires lots of nitrogen.

These nutrients all can be supplied through compost and decomposing organic material such coffee grounds from your local espresso stand, carrot pulp from the local juice bar, hops and grains from the local brewery, fresh mowed grass, fall leaves, straw and banana peelings; along with the addition of a wide variety of nutrients found in such things as ground oyster clam or mussel shells; crab or shrimp finings, egg shells, granite dusk, glacial till, fish meal, seed meal, ground poultry bones, water that was used to steam or boil vegetables and water used to hard boil eggs.

You may want to start out with a soil test. An inexpensive test is available from the University of Massachusetts that will provide the basic information you need along with the added bonus of a lead test. The soil tests will provide you with the pH (acidity level) of your soil. A balanced pH of 6.5 to 7.0 is desired. Soil tests will guide you in what nutrients you may need to add to your soil and other amendments that can improve the soil.

You can also find soil food web testing services at Soil Food Web. These are more expensive, but will give you accurate information on your soil's health.

Many gardeners use the organic fertilizer provided by the P-Patch program to provide nutrients. The fertilizer should not be considered an adequate substitute for adding organic materials to

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your soil. A good soil-building program can provide all the necessary nutrients required by your garden. Fertilizing requirements decline as a healthy food web efficiently stores and cycles nutrients.

FEED THE SOIL NOT THE PLANT

Decomposing organic matter into the soil is the underlying tenant of organic gardening. Microorganisms decompose organic matter and through the process of mineralization makes make nutriment available to plants.

Living soil is successful soil! The benefits of adding organic matter include:

- Support for the soil food web (microbiological activity or life of the soil)
- Contributes major and minor nutrients required for healthy plants
- Improved tilth and structure of the soil
- Improved water retention. More water soaks into the soil and can be used by crops.
- Improved ability to store nutrients
- Slow release of nutrients
- Assist the mineralization processes (converting insoluble minerals into plant usable forms)
- Increase pest and disease resistance
- Water quality is protected. Nitrates do not leach into the ground water when soil organism hold nitrogen in the rooting zone
- Removes organic materials from the urban waste stream
- Reduces pollutants
- Strong healthy plants
- Flavorful sweet vegetables and beautiful flowers.

Composting

Gardening raises our consciousness about where our food comes from, and allows us to observe basic life processes in the food chain. Animals, plants, insects, worms, bacteria and arthropods each occupy a unique rung in the ladder of life. Through gardening, and particularly through composting, we can observe their complex interactions in a microcosm, and we can learn how our own actions affect the process.

P-patch garden waste, grass clippings, browned leaves and other organic materials are returned to the earth to nurture and replenish the soil. As these ingredients decompose, we see how life perpetuates itself in the plant realm. The disintegrating plants, leaves and stems supply food for insects, worms and bacteria. As these creatures burrow into the earth, they digest and excrete other forms of life-supporting materials, and circulate these materials from the surface to lower areas. These underground transformations enable strong new plants to emerge, blossom, produce and, once again, return to the earth.

Compost is the end product of a natural decomposition of organic materials.

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Mulching

Top dressing, side dressing, and sheet composting are some of the terms used to describe mulching. Mulching is using finished compost, grass clippings, leaf mold, leaves, worm casings and other organic materials etc. on top of the soil along side growing plants. Mulches conserves water, inhibits weed growth and feeds the soil food web. Depending on season, mulching is done in many ways for many reasons. Organic mulches can cool the soil in the summer. A heavy side dressing of fresh mowed grass can be used to heat the soil in the spring. Mulches always feed the soil.

Gardeners have been known to avoid mulching in Seattle, because they feel it harbors slugs. The benefits far outweigh the efforts required to control slugs. In addition, a healthy food web produces arthropods that attack slugs and help keep them under control.

Mulching reduces and can even eliminate the need for weed control. Weeds compete for nutrients and can take a lot of time to eliminate over and over again through out the gardening season. Hoeing weeds will results in crusty soil and exposes more weed seeds to sunlight and air and hence more weeds.

You can not mulch with plastic. It is not a mulch. Plastic does not allow oxygen to reach the soil and will impede if not stop the development of the soil food web. Plastic does nothing for your soil. Some gardeners question if it is even useful to warm the soil.

The more complex the mixture of materials, the more your garden will benefit. Use a good mix of greens and browns. By using a wide variety of materials in your side mulch you will add a wide variety of nutrients to your garden. When you harvest add the tops of your root crops to your mulch. Garden debris is a great source for mulching. Fresh grass clippings will give your plants a nitrogen boost as will coffee grounds from your local espresso cart or coffee shop. Spent hops and grains, seaweed, apple and grape pressings, juice bar pulp etc will enrich your garden mulch and your produce.

It is not recommended that you mulch with manure that has not been composted. Un-composted manures may carry e-coli and other diseases. Avoid using sawdust and wood chips, they will take too long to break down and will steal nitrogen from your plants if worked into the soil too soon.

Weed free garden

Mulching reduces and can even eliminate the need for weed control. Weeds compete for nutrients and can take a lot of time to eliminate over and over again through out the gardening season. Hoeing weeds will results in crusty soil and exposes more weed seeds to sunlight and air and hence more weeds.

A good over wintering soil building program using an Interbay Mulch or Green Manure and a heavy top dressing/side dressing mulch can eliminate weeds in your garden. Fertile soil will help crops grow vigorously and healthy. A deep side mulch of 2-3 inches will keep the sun from reaching the seeds at the soil level and hence they can't germinate. In addition the mulch will break down and feed your crops.

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Some gardeners shy away from using fresh grass clippings for fear of seeds starting grass in their garden. If you get grass starting it means your mulch is not deep enough. Apply more mulch and add a greater variety of materials. If a weed comes up in your garden add it to the mulch.

Hot composting

Hot piles" make efficient use of compost bins and are the quickest way to garden-ready compost. Like baking a cake, the process is easier than it looks once you do it. The growth of high temperature micro-organisms is achieved by balancing food, water and air in the compost pile to favor their growth. A hot compost pile can heat rapidly to 120 to 160 degrees Fahrenheit, killing off weed seeds and disease organisms and neutralize pesticide residues. Once the hot phase is completed, lower temperature creatures such as worms, insects and other decomposition organisms complete the decomposition process.

Basic Principles

Air

The microbes make your compost need air to live and work to make compost. Compost piles should allow for plenty of air. This is usually accomplished by using some kind of "bulky" ingredients such as straw or old weeds. When the pile settles under its own weight and excludes air, it needs to be "turned" to get more air into the pile.

Moisture

Composting microbes need moisture to live (just like we would die without water). Ideally, the pile should be "as wet as a wrung-out sponge." At this ideal moisture level, the ingredients are full of water, but there is still air getting into the pile. And, the microscopic film of water on the surface of each particle in the pile is an ideal medium through which the microbes can spread as they do their work.

A pile that is too wet will collapse under its own weight, excluding air and becoming anaerobic and smelling like rotten eggs. A pile that is too dry cannot support a healthy population of microbes, and so the rate of decomposition will be drastically slowed.

Food (materials)

You will need a combination of brown and green materials. Green materials provide nitrogen, which is a critical element in amino acids and proteins, and can be thought of as a protein source for the billions of multiplying microbes. Browns provide carbon, which is mostly made of long chains of sugar molecules linked together. Browns are a source of energy for the compost microbes. A good mix of browns and greens is the best nutritional balance for the microbes

Brown materials are dry, porous materials that help aerate the compost pile. They can be such things as leaves, dried grass, hay, wheat straw and dried corn stalks. Browns do not decay quickly on their own. Green materials" provide the nitrogen and high-energy carbon compounds

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needed for fast microbial growth. They include grass clippings, fresh dairy, rabbit or chicken manure, fruit and vegetable waste and garden trimmings.

The ideal carbon to nitrogen ratio (C:N) is 30:1. This is most often achieved through a 50-50 mix of materials by volume. High carbon browns take more time to break down and require more greens by volume. A list of materials has been provided.

Process

1. If you want to build a hot pile, you'll need to have a cubic yard (3' by 3' by 3') or more of chopped material to build the pile with all at once. Collect as many browns and greens as you can to start your compost pile. Larger piles tend to hold moisture better and decompose faster. You'll also need to make sure that you have a good ingredient mix, proper moisture and air. It is recommended that you always keep one bin free to turn compost into when doing hot compost
2. Chop materials into a mix of sizes and shapes to increase the surface area and provide for areas to store air. (Leaves and grass clippings provide an ideal mix of sizes)
3. Pay attention to the C:N Ratio. Usually a 50 – 50 mix of green and brown materials by volume will be satisfactory
4. Spray with water and mix the materials (rather than layering them) outside of the bin, will trap air and help to make the pile evenly wet. The mix should be as “wet as a wrung out sponge.” Too much moisture will make the particles heavy and as they sink from their own weight they will displace the trapped air.
5. Cover the compost with burlap (If available).
6. The pile should be covered to protect from rain. Rain will move into the compost pile and displace the air trapped between particles creating anaerobic conditions.
7. Compost should reach 120 to 160 degrees by day 2 or 3.
8. **Turn and "fluff"** compost with a pitchfork at least once a week (every three days is best) Fork the sides to the middle and the middle to the sides. Fluff the compost by tossing it into the air. Turning and fluffing will help keep the pile composting at an even rate. Turning redistributes materials and fluffing adds air, which is required to keep the thermophile ("heat-loving") bacteria working. Keeping a bin open to turn hot compost into will save time and energy. Otherwise you have to handle the compost twice, once taking it out of the bin and again putting it back in.
9. A full bin will often become a half bin after settling. You can Combine two half bins to free up a bin and start a second pile.
10. When compost fails to heat up after turning (3-6 weeks), it can be used immediately as unfinished mulch or stored in the green and black bins or other "**curing**" area where worms, arthropods and fungi continue the breakdown process. Protect from rain to prevent nutrient leaching. The longer compost "cures" the more available nutrients are to plants.
11. Screen compost before use if using in soil with seedlings or young plants if it has not fully broken down. Microbes breaking down un-decomposed organic matter use nitrogen needed by growing plants.

Troubleshooting

Odors? Turn and add brown materials.

Dry pile? Add water, greens and mix.

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Compost Recipes

Carbon/Nitrogen Ratio Key

N = Nitrogen

NN = More Nitrogen

NNN = Lots of Nitrogen

C = Carbon

CC = More Carbon

CCC = Lots of Carbon

Recipe # 1

3 parts	Dry leaves	CC	Brown
1 part	Fresh garden weeds	N	Green
1 part	Fresh grass clippings	NN	Green
1 part	Food Scraps	NN	Green

Recipe # 2

6 parts	Dry leaves	CC	Brown
3part	Fresh grass clippings	NN	Green
3part	Food Scraps	NN	Green

Recipe # 3

3 parts	Dry leaves	CC	Brown
3part	Fresh grass clippings	NN	Green

Recipe # 4

3 parts	Dry leaves	CC	Brown
3part	Fresh grass clippings	NN	Green

Power Boosts

The following materials will add nutrients to your pile. "Power Boosts" are not required but can benefit the process. Mix "power boost" material with the other ingredients so they are spread through out the pile. Quantities are maximum amounts recommended.

Garden soil	½ shovel full	High in micro-organisms
Compost	½ shovel full	Very high in micro-organisms
Granite Dust ²	shovel full	Rich in minerals
Ground Oyster Shell	shovel full	Rich in minerals
Wood Ashes ³	½ shovel full	High in potash and carbon

Cold Composting

There are many advantages of hot compost piles, but there are advantages of cold piles as well. Hot piles decompose more quickly, and kill most weed seeds and other diseases. Cold piles, on the other hand are convenient for individual gardeners to use in their plots. It is also a method for people who do not have the time to tend hot compost piles. Cold composting is an 'add

² Most monument makers will provide for free

³ Wood ashes are highly alkaline and if used in excess may upset the soil ph balance. Wood ash is often recommended to help cure club root.

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ingredients as you get them approach. Cold compost piles have to sit a year or so for microorganisms, worms and other decomposers to complete the decomposition process.

Basic Principles

The same basic principles of air, moisture and materials that apply to hot compost apply to cold composting. The difference is that the C/N mixture is built over time as the ingredients become available hence the pile does not heat up.

Slow composting does not produce the heat needed to kill many weed seeds. It is best to pull and compost weeds before they go to seed. If you put seeds in the compost pile, be prepared for more weeding. (Heavy mulching can prevent weeds. See weed free gardening section for instructions)

Process

Method One

1. Accumulate enough autumn leaves to fill $\frac{3}{4}$ of a bin
2. Moisten while mixing them to the consistency of a wrung-out sponge. Mixing will also help break up any leaf clumps .
3. Chop fresh green garden wastes into mixed sizes and stir in during the garden season.
4. Add kitchen wastes and vegetable scraps from the garden (greens) by opening the pile and placing wastes into the center and then covering them. This helps aerate the pile, and also buries the fresh wastes so they do not attract pests..⁴
5. Turn the pile. It will get turned some when you add materials, but will benefit from additional turnings and if necessary rewetting. (Keeping one bin free will facilitate turning)

Method Two

1. Accumulate garden waste enough garden waste to fill $\frac{3}{4}$ a bin when chopped and allow it to dry out
2. Chop dried garden waste (brown)
3. Moisten brown mix while mixing them to a consistency of a wrung out sponge.
4. Chop fresh green garden waste as it becomes available and stir into the bin
5. Turn the pile when the bin is full. (Keeping one bin free will facilitate turning)

Troubleshooting

If you add too many 'greens' you'll get a slimy, stinky, anaerobic mess. Add browns should this occur.

Compost tea

Compost tea is easily made by soaking or steeping compost in water. The resulting compost tea is used for either a foliar application (sprayed on the leaves) or applied to the soil. Garden plants can benefit even more by using compost tea. Compost tea:

- Increases plant growth
- Provides nutrients to plants and soil
- Provides beneficial organisms
- Helps to suppress diseases
- Replaces toxic garden chemicals

⁴ Fruit and vegetable wastes are particularly appealing to pests, such as flies, rats and raccoons. Burying wastes within the pile will help to avoid pests. If you bury the vegetable wastes in the pile, and pests are still a problem, you may need to screen the pile or keep vegetable wastes out.

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Green Compost materials

Green Compost materials have high nitrogen values and provide organisms nitrogen for protein synthesis.

	C:N (Carbon:Nitrogen) ratio
Grass Clippings	9-25:1
Garden Weeds	19:1
Coffee Grounds	20:1
Seaweed	5-27:1
Fruit waste	20-50:1
Vegetable waste	11-20:1
Potato Tops	25:1
Corn Stalks-green	?:1
Leguminous Plants	15:1
Yard Waste/Garden Debris	15-55:1
Alfalfa Hay	13:1
Spent Grain	? :1
Spent Hops	?:1
Alder Leaves	25:1
Mushrooms	?:1
Cottonseed Meal	7:1
Soybean Meal	4-6:1
Manure	
Chicken	3-12:1
Cow	11-30:1
Horse	22-50:1
Rabbit	6:1
Sheep	13-20:1
Pig	5-19:1
Night Soil	6-10:1
Urine	0.8:1
Blood/Blood Meal	3:1
Fish Waste	2.6-5:1
Crab Waste	4-5:1
Shrimp Waste	3.4:1
Oyster/Mussel Waste	2-4:1

Brown Composting Materials

Brown composting materials are high in carbon and provide energy for soil food web organisms.

	<u>C:N (Carbon:Nitrogen) ratio</u>
Brown leaves	30-80:1
Oak leaves	50:1
Pine Needles	60-100:1
Coffee Chaff	?:1
Corn Stalks-brown	60:1

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Straw	50-150:1
Burlap	?:1
Cotton Dryer Lint	?:1
Newsprint	400-850:1
Cardboard	200-550:1
Sawdust	400-750:1
Rotted Sawdust	150-250:1
Hardwood Bark	115-435:1
Softwood Bark	130-1285:1
Hardwood Chips/Shavings	450-820:1
Softwood Chips/Shavings	210-1,310:1

Composting Materials Used List ⁵

Aged wood chips	Manure - alpaca
Apples	Manure - chicken
Banana peelings	Manure - cow
Burlap bags	Manure - horse
Carrot pulp	Manure - rabbit
Coffee chaff	Mussel shells
Coffee cups, incidentally included in our espresso grounds	Mussels
Coffee grounds	Nettles
Corn stalks	Newspaper (lots of it came with a manure compost)
Crab	Oyster shells
Culinary school kitchen waste	Oysters
Diaper lint	Path chips
Egg cartons	Pine needles
Egg shells	Pumpkins
Fish scraps	Raspberry cuttings
Garden debris - a variety of, diseased & healthy	Salmon
Glacial till	Sawdust - rotted
Granite dust	Seaweed - a variety of
Grape stems and grape pressings	Semolina from the bakery
Grass - aerobic and anaerobic	Shrimp
Herring	Spent hops and grains
Human hair	Straw
Kitchen scraps - a variety of	Volcanic ash
Leaves	Weeds - a variety of noxious types

⁵ This is a list of materials that were composted at the Interbay P-Patch in 1999

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Over-Wintering

The P-Patch garden season ends and begins again in October. Seattle's mild winters allow for year round gardening. If you're not growing winter crops you should be building your soil. Soil must be protected and cared for through the winter. Soil left naked will be injured in the winter months. The rains will leach the nutrients and winter weeds will grow and try to heal the wound. Winter is a key time for soil building

Interbay Mulch⁶

Introduction

As an over-winter method for building humus-rich soil, it would be difficult to improve on the "Interbay Mulch" (named after the P-Patch where it was developed) for effectiveness. Interbay-Mulched soil, according to lab tests, is "uniquely active". Over a winter, an Interbay Mulch will give you a large volume of humus as well as a rich diversity of bacteria, fungi, protozoa, beneficial nematodes, arthropods, and worms.

Interbay Mulch is basically various organic matter culled from the urban waste stream piled on top of your soil and covered with damp burlap. Organic matter decomposes faster on top of the soil than it does when tilled into the soil as long as it is covered and kept moist.

Covering organic matter with burlap fools nocturnal, light-avoiding organisms into working for you 24 hours a day. Burlap will diffuse and soak up rain preventing it from driving into the mulch. It inhibits evaporation, keeping organic materials uniformly moist. Birds are unable to forage in the mulch so worms and other organisms flourish and multiply. Burlap covers the mulch but is also part of the habitat cultivating a rich variety of fungi and providing a home for beetles, spiders, worms and the like. Burlap is permeable allowing oxygen to reach all parts of the mulch.

Every October the P-Patch program makes Burlap coffee bags available to gardeners at various distribution points.

Building the Mulch

The first materials used in an Interbay Mulch should come from your garden debris. The crops you raised took nutrients from the soil and now it time for them to be returned. Chop up your corn, bean, squash vines, tomato plants, etc. (Many experienced mulchers don't even worry about seeds because of ongoing top dressing mulches during the growing season making a weed free garden) If you are concerned about seeds or diseases hot compost those plants. Interbay Mulch uses the same "brown" and "green" mix used for hot composting, approximately 50-50. The more variety in materials added to the mulch the better.

Leaves are a brown that are easily obtained in the fall. Dried cornstalks and straw are good browns. Straw is even better if it is rotted. You can also add rotted burlap, cotton dryer lint, shredded paper, and season with a few pine needles. Woody material should be limited to rotted material that you can smooch between your fingers.

⁶ Taken from Jon Rowley's *Building an Interbay Mulch* workshop handout October 2000

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Practically anything that doesn't burn when you put a match to it can be used as greens. Garden debris, green corn stalks, fresh grass clippings, coffee grounds (leave a bucket at your favorite espresso cart), juice bar pulp, spent grain and hops, seaweed, grape pressings, apple pressings, and so on. Any kind of organic manure is good.

Using compost as part of the mix will jumpstart the system. One wheelbarrow full of rough compost per hundred square feet is sufficient to get things going. Burlap from previous Interbay Mulch can also be used to inoculate your new mulch. The used sacks are full of dormant organisms just waiting to go to work.

Mix your greens, browns and compost starter to a depth of 6 to 18 inches deep. Make sure all materials are damp. Cover with burlap.

Maintaining the Mulch

Check the mulch for moisture during the winter. The burlap absorbs water and then quickly releases it to the cold and winds during the winter. Little moisture will find its way into your mulch. This feature also keeps the rains from compacting and leaching the soil. If materials dry out decomposition comes to a halt. You can also feed your mulch during the winter like a worm bin. Adding materials once the mulch is active makes it work even better. Checking your mulch out in the winter will give you a chance to check out the fascinating soil food web biology at work. The biology is fascinating. You will have given birth to billions of trillions of organisms. Some you can even see! (See, See What Is In Your Soil)

Spring Planting

If you start your mulch in October you should have rich humus to plant into by March. If you started with 12" of mulch you will end up with 2-3 inches of soil-energizing humus. You can till the mulch in or just plant right into it.

Green Manure Cover Crops⁷

What is Green Manure

Green manures are any crop high in nutrients that can be tilled back into the soil. Like all plants Green Manures capture CO₂ and transform it into sugars. Many have nitrogen fixing bacteria living around their roots which convert Nitrogen from the air to a form that plants can absorb. The soil food web quickly decomposes Green Manure so the nutrients in the leaves and roots can be taken up by the next crop. Cover crops can also be inter-planted with other crops.

Benefits

Cover crops add organic material to your soil. They make the soil easier to work. Cover crops help the soil hold water and nutrients for easy absorption by plants. Many cover crops have deep root structure that improves soil aeration and when the deep roots decay improve the soil structure. The deep roots loosen the soil and mine minerals which are made available to the garden. Cover crops are cheaper than buying commercial grades of compost and soil

⁷ Taken from Ray Schutte's *Winter Cover Crops* workshop handout October 2000

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amendments.. They protect soil from compaction and erosion by softening the impact of rain. Cover crops reduce weed crops. They prevent the leaching of soil nutrients by absorbing them

Planting

Determine your soil building goals. Is it nitrogen fixing, creating heavy biomass or breaking down compacted soil. Choose green manure crop for time of year and your soil building goals from the planting guide that follows. Mixing more than one crop together is a good idea. Consider a strategy to under sow green manures under maturing crops.

Green Manure Crops

CROP	PLANTING DATE	SPACING	SEEDS/ 100 Sq. feet	COMMENTS
Buckwheat	June-August	Broadcast	4 oz.	Summer green manure. Grows rapidly from May through July. Excellent weed control in any area that will be without a crop for 1 month. Requires little water. Attracts beneficial insects. It is not winter hardy.
Cereal Rye ⁸	Late Sept. – early Oct.	Broadcast	5-10 oz	Produces lots of biomass. Breaks down in 2-3 weeks. Roots loosen soil. Often combined with Vetch. You may want to “mow” before turning. Can be used as part of Interbay mulch for late seeded beds.
Crimson Clover	Sept. -mid Oct. and early spring	Broadcast	4 oz.	Legume. Requires well-drained and low acidic soil. Good for under sowing with cucumbers, tomatoes, peppers or under winter crops like kale and brussels sprouts, it will take over beds by March and be ready to swallow the stumps. Winter hardy, easy to grow. Broadcast seed evenly. Rake or till in to 1” depth. It will flower in April and must be tilled ASAP. Early spring beds can be hoed in and will rot within days, just in time to plant mustards, spinach and other early spring greens.
Vetch	Late Aug – early Oct.	Broadcast	5-10 oz	Legume. Soak seeds overnight before sowing. (“Soaking in compost will enhance germination and expedite growth. Often combined with Rye.
Fava Beans	Late Oct.- Early Nov.	6” – 8”	12-14 oz	Legume. Soak seeds overnight (or use compost soak) before sowing. Large plants produce lots of organic material. Plant the right variety and you can harvest the beans.
Corn salad	September	Broadcast	1 oz	Good winter through spring salad green. Allow to grow in spring before chopping. Can be combined into Interbay Mulch for beds that will be planted late spring or early summer.

Harvesting

It is best to harvest green manures right after they have started to bloom. Harvesting earlier is fine but plants will not have reached their maximum nutritional storage and bio mass. After

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flowering green manures become woody and after they seed and take longer to break down. Bury them as you turn your soil or cut them off and chop them up. If you chop them up mix cover crop with the two inches of soil and treat as a mulch or use them in a side mulch. If you remove the chopped cover crop from your garden you will have missed out on its biggest benefit, feeding your soil. Allow buried crops to decompose before planting (one to three weeks depending on crop, soil and weather).

Leaf Mold⁹

Introduction

Leaf mold is the product of decomposed leaves. In nature we commonly find leaf mold in the duff just below the surface of a forest floor. Leaves have a relatively high carbon content and relatively low nitrogen content compared with green matter from the garden. The process of decomposing leaves alone differs from what goes on in a compost pile. Leaves by themselves break down primarily through the action of fungi and small critters called detritivores that eat fallen leaves. By comparison, a good, hot compost pile contains necessary amounts of high nitrogen-containing materials, which cause it to decompose primarily through the action of bacteria. Bacteria are very much involved in the leaf mold process but play a subdued role compared to compost where they dominate the process.

Leaf mold improves the soil tilth by holding large amounts of water and by binding soil particles together into aggregates. It also adds biodiversity in the form of all the life that caused the leaf decomposition. The fungi in leaf mold are especially beneficial for plants like berries, whose root systems require a fungal environment.

Build a Holding Cage

Build holding cages out of heavy 4 foot fencing wire. Each cage is a cylinder open at both ends. The cylinder measures about four feet in diameter and stands four feet high. Many P-Patches have existing leaf cages.

Build the Pile

Each kind of leaf has its own particular chemical makeup. Carbon:Nitrogen ratios vary from 25:1 in Alder (actually a very good ratio) to 80:1 for Oak. In addition, there are differences in trace elements like calcium. However, other than avoiding use of waxy leaves like holly and rhododendron, the differences among leaves should have little significance if you use a mix of different kinds of leaves rather than leaves all of one kind.

Make a pile of wet leaves. The wet leaves are dumped into the cage until it is full. If you have leaf mold, sprinkle some into the cage as you fill it. This will jump start the process by introducing the fungi and other critters who will do the work. They will come on their own, but it helps to seed them. If you have some sunflower stalks lying about the garden lay them in the pile horizontally, and allow the end to stick out through the wire a couple of inches. This helps

⁹ Taken from Jon Rowley's *Leaf Mold Workshop*, handout October 1999

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air to get into the pile at the beginning of the process. Later, when the critters are more numerous, the critters will make all the necessary air passages. If you don't have the stalks, don't worry, this process is very forgiving.

Every week or so add more leaves to keep the cage topped up. The leaves settle with time and break down. In fact, the volume of the finished product is only one tenth the volume of the leaves you put into the cage. Don't be shy about stockpiling leaves to feed your leaf cages. It is a good idea to keep the pile covered with a tarp or a layer of straw to keep the leaves moist. Remove the cover before topping off the pile and replace it after making the addition of new leaves.

Harvesting

In this climate you will have to wait 10--11 months before you can harvest the leaf mold. You can harvest your leaf mold just in time to refill the leaf cage with the new year's leaf fall.

Use a pitch fork to dig out the finished material from the top of the finished pile. When you get the pile down to a level where reaching in and digging the stuff out gets difficult, get two or three people to help you. Have the group surround the cage, grab the wire just above the level of the remaining material and gently rock, shake and lift the cage. In a short period of time you should be able to lift the cage off the remaining material leaving you with an empty cage to load with new leaves and a short pile of exposed leaf mold.

Using Leaf Mold

Leaf mold, with its fungal properties makes an excellent soil amendment or mulch for berries, perennials, roses and shrubs. Since it's a good idea to mulch these plants in the autumn, next year you should have the mulch material ready just in time.

You can screen the leaf mold and mix it with sand and other ingredients to make an excellent potting soil. Remember this is a high carbon material whose primary value comes from its physical and biological characteristics.

See What Is In Your Soil¹⁰

If you would like to see some of organisms are in your soil, you can easily make a pitfall trap to catch large arthropods and a burlse funnel to catch small arthropods. Make a pitfall trap by sinking a pint or quart sized container into the ground so the rim is level with the soil surface. A roof over the top to keep out the rain is a good idea. Add ½ cup of non-hazardous antifreeze or ethyl alcohol to cup to preserve the creatures and keep them from eating each other. Leave in place for a week and wait for soil organisms to fall into the trap.

To make a burlse funnel, set a piece of ¼ inch rigid wire screen in the bottom of a funnel to support the soil. You can make a funnel by cutting off the bottom of a plastic bottle. Half fill the funnel with soil and suspend over a cup with a bit of non-hazardous antifreeze or ethyl

¹⁰ Taken from Soil Biology Primer, USDA Natural Resources Conservation Service, August 1999. Available on line at www.statlab.iastate.edu/survey/SQI/primer/index.htm

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alcohol. Suspend a light bulb about 4 inches over the soil to drive the organisms out of the soil and into the cup. Leave the light bulb on for about 3 days to dry out the soil. Pour the alcohol into a shallow dish and use a magnifying glass to examine the organisms.

PEST AND DISEASE CONTROL

Every garden contains bugs. Some are beneficial, others co exist without causing damage and others harm plants. A temporary excess of one type of bug will often correct itself. However, a number of things can be done to keep pests under control. A healthy soil food web will help keep pests and diseases under control. The life web above the soil can also contribute to controlling pests and diseases.

Start with an evaluation of the situation. Are you talking about a few holes in the lettuce or are you losing the entire crop. Sharing some of your crop with a pest is better than eating pesticides. Row cover crops can provide barriers to many pests. Slug traps can help control slug populations. Two inches of complex compost can cure many plant disease and turn away a tide of aphids. One of the simplest ways to combat pests is to provide an environment for beneficial insects.

Beneficial Insects in the Garden¹¹

Beneficial insects are those which are helpful to us in some way. These include well-known flower pollinators such as bees and butterflies, and those which are natural enemies of insects we consider pests. The purposeful use of an insect to suppress other insects is one type of biological control and dates back at least to the fourth century A.D. when ants were manipulated to control citrus pests in China. Insect predators, in the immature and often adult stages, feed directly on their prey, killing them immediately. Examples of predator species are the praying mantis and the ladybug (lady beetles). Other insects parasitize their hosts by depositing eggs on or in them. Larvae emerging from the eggs typically develop within and emerge from the host. Parasitized insects usually continue to feed for a time before they die. Examples of insect natural enemies which parasitize pest species include many tiny wasps and flies.

Natural enemies are an important component of integrated pest management programs. For example, in home flower and vegetable gardens adult and immature lady beetles can quickly reduce a population of aphids thus eliminating the need to apply a chemical spray. Suppression of pests by beneficial insects alone, however, can be variable. When pest populations are large and there is enough food and the proper habitat to support the growth and reproduction of natural enemies, the impact of beneficials on pest populations can be greater. When pest populations are low, beneficials will search elsewhere for a food source. Beneficial insects tend not to recover as quickly from exposure to insecticides as pest species do.

¹¹ Taken from *The University of Georgia College of Agricultural & Environmental Sciences* web page prepared by Cooperative Extension Service, written by Julie Balsdon, Educational Program Specialist, Extension Plant Pathology & Entomology and Beverly Sparks, Extension Entomologist. Available on line at (NEED TO FIND)

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A number of beneficial insects occur naturally in your yard and garden. Learn to identify them and consider their needs in planning and maintaining your garden.

Attracting and Keeping Beneficial Insects

Alternative sources of food: Many predaceous insects feed on pollen, nectar or plant juices to supplement or replace their insect diet when host populations are low. Flower nectar also provides nutrition for egg-laying parasitoid species. Favored plants include daisies, Queen Anne's Lace (wild carrot), yarrow, alyssum, goldenrod, alfalfa, soybeans, clovers, and vetches.

Shelter: Provide areas of stable habitat in the yard and garden where beneficial insects can find protection from mowing, tilling and other disturbances. Perennial flower beds (especially those planted with pollen- and nectar-producing plants), hedgerows near flower or vegetable gardens, or plots of cover crops like alfalfa or soybean provide excellent shelter for beneficial insects. Predaceous ground beetles and rove beetles will take cover in permanent grass pathways in the yard and garden, in compost or mulch, and under rocks. Avoid excessive tilling by growing vegetables and flowers in raised beds.

Sources of water: Bird baths, small shallow containers, and temporary puddles provide water for insects. This is important especially during periods of dry weather. Change the water in containers every 2-3 days to discourage mosquitos from breeding in standing water. Sticks or rocks placed in the water serve as perches for insects so they won't drown. When pest populations are low, beneficials will search elsewhere for a food source. Beneficial insects tend not to recover as quickly from exposure to insecticides as pest species do.

A number of beneficial insects occur naturally in your yard and garden. Learn to identify them and consider their needs in planning and maintaining your garden.

Sources of Food for Attracting Beneficial Insects¹²

Simple flowering plants provide habitat and attract beneficial insects to the garden.

What's the bare minimum, maximum benefit plan??

I give a 4-6" border along my raised beds to marigolds, nasturtiums, allysums and dw.zinnias.
Throw in some herbs through out your plot-
mints grown in a coffee can with both ends cut out, some chives and thyme (these last 3 are good near cruciferae),
summer savory with your beans,
some basils and garlic (to flower) among solanums,
some dill intersown with a tall crop or at back of plot,
some overwintered parsley to bloom,
a radish (to bloom) in each hill of cucurbitae-

¹²Taken from Sean Phelan's *Attracting Beneficial Insects* workshop handout April 2000

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Your plot is a bennie truck stop!

Some "living mulches" among taller crops (cruciferae, solanum, corn...) such as allysums, nemophilias, tidy tips, california poppies and bluebells, even dutch white clover increases the effect exponentially. Let some crops bolt (deadhead before seed matures) to take it to the next level. Throw in some of the real nectar-super producers along the edge w/ the annuals (linums, phacelias, gilies, clarkias, godetias, dw. coreopsis, violas, dwarf bachelor buttons...) some fall/winter/spring bulbs

Prepare for the haze! You'll get more/more reliable pollination and consistent control of your pests. Beyond that, it's a personal art-you'll refine your plan for your crops and microclimate as you go. A minimum of "land wasted on flowers", a maximum of output with little labor. It's the only way to fly!!

NOTATIONS: (A = Annual, B = biennial; P = perennial, I = intermittent through the year, F = through to frost, ** = super nectar producer)

ULTRA EARLY (through winter)

Aconite (**; P)
Borage (I, **)
Calendula (I, **)
Crocus autumn (pulchellus, albus, zonatus... **; P)
Cyclamen (P; neopolitanum, hederifolium,
Colum... **; P)
Narcissus (earliest) (**, P)
Snowdrops (**; P)

EARLY

Bolting cruciferae (A, **)
Daffodils and Narcissus (Early) (P, **)
Eosmary (P, **)
Glory-of-the-snow (Chinioxidora) (P, **)
Iris reticulata (P, **)
Primrose (P; early)
Tulips (species tarda, hageri) (P, **)

MID SPRING

Daffodils Single (P)
Primrose species (P)
Scillas (P, **)
Violets (P, **)
Violas (P, I, **)
anemones (Spring-St. Brigid's mix, monarch de
caen... **; P)
allysum (annual-I; and perennial; **)

HIGH SPRING

Late Single Daffs (**; P)
Tulips-single (P)

Dutch iris
Aquilegia (columbine... P)
Armeria maritima (native-sea pinks.. **, P)
Candytufts (annual-F, P, **)
Dianthus (sweet williams, some F; and per.pinks)
creeping phloxes (P; **; incl. native P. subulata)
Campanulas (P)
Centaurea (A, P, I; **)
Digitalis (Foxglove) (B, **)
English daisy (B; **; bellis)
Godetia (F; **; summer's herald-native)
Clarkia (F; **; native-mountain garland)
Linaria (F; **)
Lupines (A, P)
Lunaria (B; money plant)
Pyrethrum (Painted Daisy) (P)
Saponarias (Soapwort) (P)
Stocks (F, **)
Bluebells California (Phacelia Campanularia)(A, **)
Nemophilias (A, **)
Tidy tips (A, **)
Myosotis (Forget-me-nots (B; **)
Poppies-single (all) (A, P, I, **)
Sweet peas (A, **)

EARLY SUMMER

Anagallis (P; blue pimpernel)
Bidens (P; golden goddess)
Achilleas (P; I; F; **; incl. native A. millefolium)
Nasturtiums (F, **)
Chives (**; P; both galic and regular)
Parsley (**; B)
Cilantro (A, **)

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Erigeron (A)
Dill (A, **)
Mints (A, **)
Dimorpethecas (F; african daisy)
Dahlberg Daisy (F)
Shasta Daisy-single (some F)
geranium (some F; true geranium-NOT
pelargonium)
Gilia (**; birds eyes)
Purple tansy (**; phacelia tanectifolia)
Silene (**; P; catchfly)
Hesperis matronalis (P; **; sweet rocket)
Linums (**; A & P)
Lobelias (A- F; &P)
Monarda (**; P)
Nepetas (**; P;F; catnip, catmint...)
Potentillas (P, F)
Spireas (P)
Viscaria (**; rose angel)
thymes (**; P)

HIGH SUMMER

Agastaches (**; P; licorice mint...)
Asclepias (**; b-fly weed)
Asters-single (A&P; F; **)
brachymone (F; swan river daisy)
Basils (**)
Catanache (P; cupid's dart)
Centranthus (P; F; jupiter's beard)
Cleome (F; spider flower)
Annual chrysanthemum (F)
Convulvulus (F)
coreopsis (F; **)
Cosmos (F; ; A&P)
Dianthus (F; A &P; carnations, ann. pinks...
singles)
Eupatorium (**; joe pye weed)
Gaillardia (F; **; A & P)
Gazania (transvaal daisy)
Hollyhocks-singles (**; P, B & A; singles)
Marigolds (**; F; singles-"gem" series T.
signata)
..

summer savory
Zinnias (**; F; singles; africans "profusion"series)
Salvias and sages (some F; **; A & P)
Oreganos (**; P)
Malvas (P)
Mimulus
Penstemons (P; some F; incl. natives)
Gauras (P; F; **)
Phlox (F; A & P)
Phystostegia (F; P; obedient plant)
Portulaca (F)
Sunflowers-singles (**; F; A & P)
Tahoka daisy (**; F)
Torenia (F; wishbone flower)
Trachymene (F; **;blue lace flower)
Verbenas (F; **; A&P)
Verbascums (**; P)
Veronias (P; **; F; speedwell)
lilies (**; P)
Daylilies-singles (**,P;some F)

LATE SUMMER

Asters-singles (F: A&P: late)
Amaranthus (F)
Echinaceas (**; P; F; coneflowers)
Calliopsis(**; F)
Rudbeckias-sigles (**; F; P; black-eyed susans)
Ratibida (**; F; P; prairie coneflower)
Ornamental grasses (P- important p[art of bennies
life-cycle)
Oenetheras (**; P; F; evening primroses)
Sedums (**; F; P; incl. natives)
Early, single mums (F; P)
Tithonia (**; F; mexican sunflower)
Solidagos (**;F; goldenrods)

FALL

colchicums (**; P)
late single mums (F; P)
late sedums (**;F; P)
fall anemones(**; F; P)
saffron crocus (**;P; all autumn crocus)

PLANTING

Selecting seeds and plants

You will need to secure seeds or plants. Select seeds or plants for the season you plan to plant them in the garden. Spring broccoli will not survive as a winter crop. Many organic seed/plant suppliers now have on line catalogs. Seed catalogues are usually available for the asking. Seed catalogues make great reading and include information that can be used in planning your garden.

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It is more challenging to find organic plants at your local nursery. Many organic plants can be mail ordered; however you will pay more. Many gardeners use a window with southern exposure to start plants for transplanting. You can use a florescent light if you do not have southern exposure. You will want to start early if plant to start plants indoors. You will need to “harden” off transplants by giving them increasing time outdoors before you plant them in your garden.

The seed and plant suppliers listed below have taken the *Safe Seed Pledge* that they do not buy or sell genetically engineered seeds or plants.

The Cooks Garden, PO Box 535, Londonderry, VT 05148 (800) 457-9703 www.cooksgarden.com.
Garden City Seeds, 778 Highway 93N, #3 Hamilton MT 59840 (406) 961-4837 www.gardencityseeds.com.
Johnny Selected Seeds, RR1 Box 2580, Foss Hill Rd, Albion, ME 04910 www.johnnyseeds.com
Seeds of Change, PO Box 15700, Santa Fe, NM 87507, (no phone calls) www.seedsofchange.com.
Territorial Seed Co. PO Box 158, Cottage Grove, OR 97424 (541) 942-9547 www.territorial-seed.com.

Not all of the seeds from these suppliers are organically grown. Their catalogues will identify organically grown seed. Some seed companies sell their best seed to farmers. They sell their left overs to seeds to gardeners. Check the seed catalogue to make sure the supplier grows their own seed and pay attention to germination rates. Keep seeds in a cool, dry and bug-free place. Most seeds will be usable for several years.

When buying plants from garden centers or grocery stores, be careful with your selection. Look for dark green plants. Make sure the stem is straight and strong. When a plant stem bends as it comes out of the soil, beware it can mean poor future growth. Avoid plants that are tall and leggy.

Planting

Take the time with the seed catalogues and gardening books to know the needs of the particular plants you have selected. Determine which ones can be planted next to each other. Consider their needs for sun and shade. Keep in mind your neighbors garden, so that your crops do not shade theirs.

Our average first frost date is around April 15th and our last frost date around October 15th. These dates can serve as guidelines for frost sensitive plants. Dates will vary and in gardens such as Picardo usually have earlier frost dates. Talking to long time gardeners at your site will give you good information on developing your own site tailored planting guide.

You will know your soil is ready for planting, when you can take a handful and squeeze it forming a clump. The clump should crumble when you stick your thumb in it. Never work extremely wet soil, especially clay, as it will damage the soil structure. If the soil is too wet and cold seeds won't germinate. Row covers can be used to warm the soil. Row covers will also help keep the seeds moist as they germinate.

Spacing

In your planning you will have decided whether you will plant in rows, mounds, raised beds or areas. You should have also considered how far apart your plants should be, as that will dictate

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the length and distance between rows. Consider the plants roots. Give the plant room to grow. The general guideline would be that the plants be far enough apart that the canopy will barely touch when ready for harvest. Well-spaced plants make it possible to mulch; develop better flavor and higher yields.

When you walk between rows in your garden you will be compacting the soil. Few roots will be able to penetrate heavily compacted soil. Consequently, plant growth can be stunted if you grow in narrow rows and walk too close to your plants.

Rows & Beds

Mounding rows of soil will help keeping the spacing wide between rows while providing a space to walk. Mounded soil helps with drainage and provides deeper topsoil. Many gardeners leave the soil mounded year round and there by reduced compaction from walking.

Many gardeners plant in raised beds. Raised beds should not be more than 4 feet wide. It should be comfortable to reach the middle of the bed. Since you don't walk on the raised beds the soil does not become compacted. Soil will warm earlier in raised beds and good drainage makes it possible to get an early start in the spring.

Soil Preparation

If you have properly prepared your garden for winter, you will not have any weeds to remove. Depending on your winter soil preparation will determine whether you till the soil.

Winter cover crops, green manures, should be harvest before or right after they have started to bloom. Harvesting earlier is fine but plants will not have reached their maximum nutritional storage and biomass. Bury them as you turn you soil or cut them off and chop them up. If you chop the cover crop mix it with two inches of soil and use it as side mulch. Allow buried crops to decompose before planting (one to three weeks depending on crop, soil and weather.)

If you inherit a garden that was not prepared for feeding the soil over the winter in preparation for spring, you will need to add some compost and maybe some other organic materials. It will be important to include heavy side mulching in your plans.

Sowing Seeds and Transplanting

Sow seeds about three times as deep as the width of the seed. Use the smallest width for flat seeds. Seeds can be sown a little deeper in dry weather than in wet weather. Seeds need warmth to germinate and grow. Seed catalogues should give the soil temperature for germination. Moistened newly sown seeds with a fine mist. A row cover is recommended. A healthy soil is a heaven for critters that birds feed on. Birds also like new seedlings. The row cover will also help keep newly sown seeds moist.

Soon after the seeds sprout you will need to thin them to provide for their growth. Some thinnings make good eating. Small lettuce plants can be eaten root and all, just wash the dirt off. Seedbeds can be used to start seedlings and then after the plants get some size they can be transplanted into rows. Plants do not have to grow in rows. Some plants such as lettuce does quite well in circles, rectangles, squares etc. What is important is thinning to the proper distance.

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Transplanted plants must be made to feel at home. If you are transplanting from a pot, break up the root ball. The general rule is to plant the plant slightly deeper than it was in the pot. Plants transplanted from a seedbed will not have a root ball. Seedbed seedlings should be carefully removed to preserve as much root as possible. Firmly press the soil with your fingers around the transplant and water it right way. The water will settle the soil and remove any free air trapped around the roots. It will help make the plant feel at home. The plant may wilt as it works to restore its natural water supply system (roots).

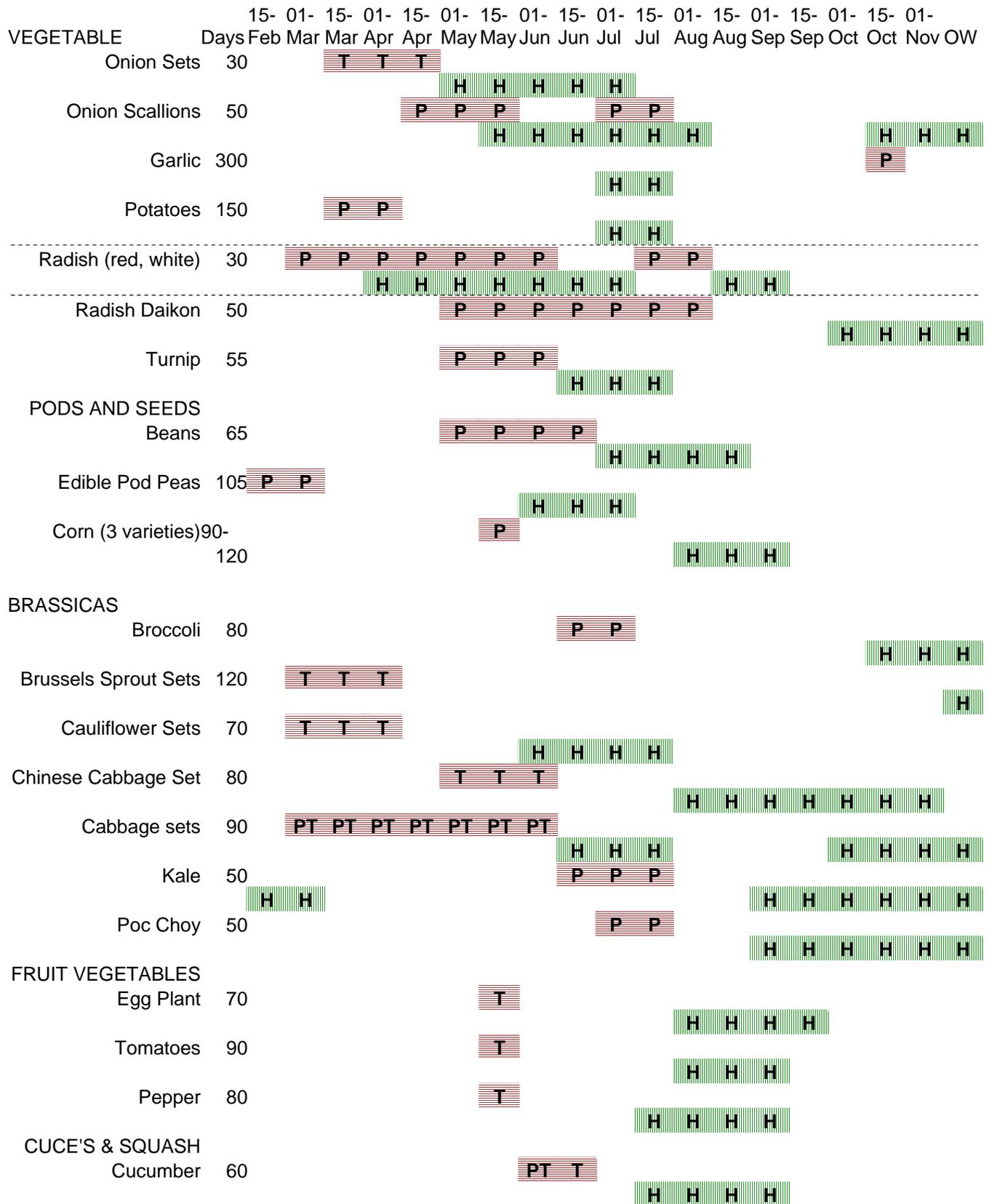
Vegetable Planting-Harvest Guide¹³

P= Plant seeds T= Transplant H= Harvest OW= Over winter

VEGETABLE	Days	15-Feb	01-Mar	15-Mar	01-Apr	15-Apr	01-May	15-May	01-Jun	15-Jun	01-Jul	15-Jul	01-Aug	15-Aug	01-Sep	15-Sep	01-Oct	15-Oct	01-Nov	OW	
LEAFY GREENS																					
Arugula	60	P	P		P		P		P		P		P		P						
					H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	
Buttercrunch	67		P	P	P	P	P	P	P												
							H	H	H	H	H	H									
Chicory	60										P	P									
													H	H	H	H	H	H	H	H	
Cress	10	P	P	P	P	P	P	P	P	P	P	P	P								
			H	H	H	H	H	H	H	H	H	H	H	H	H	H					
Dandelion	60	P																			
					H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	
Escaroles	80										P	P									
		H	H																H	H	
Leaf (oak, red sail)	60		P	P	P	P	P	P													
					H	H	H	H	H	H											
Leaf Simpson	45								P	P	P	P									
											H	H	H	H							
Radicchio	85		P	P									P	P							
		H							H	H	H	H	H					H	H	H	
Romaine	70		P	P			P	P					P	P							
					H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	
Spinach	45	P	P	P	P	P	P						P	P							
			H	H	H	H	H	H						H	H	H	H	H			
Watercress	80		P	P																	
											H	H	H	H	H	H	H	H	H	H	
ROOT TUBER BULB																					
Beets ⁶⁰⁺					P	P							P	P							
		H							H	H	H	H						H	H	H	
Carrots	80				P	P							P	P							
		H											H	H	H	H	H	H	H	H	

¹³ This guide was synthesized from many sources by Ray Schutte for his use at Interbay. Planting and harvest dates may vary for up to two weeks at other locations.

INTRODUCTION TO ORGANIC GARDENING



INTRODUCTION TO ORGANIC GARDENING

VEGETABLE	Days	15-Feb	01-Mar	15-Mar	01-Apr	15-Apr	01-May	15-May	01-Jun	15-Jun	01-Jul	15-Jul	01-Aug	15-Aug	01-Sep	15-Sep	01-Oct	15-Oct	01-Nov	01-OW
Pumpkin	110						P		T											
Summer Squash									PT	T										H
Zucchini	50								PT	T										
HERBS																				
Basil	40																			

Crop Rotation Planning¹⁴

Crop rotation is an important factor when planning the vegetable garden. Many disease organisms are soil-borne and may persist in the soil for several years. Disease problems can increase when the same crop is planted in the same area in successive years. Annually rotating your vegetables in the garden can help reduce the severity of diseases. Annual rotations also help build diversity in your soil by leaving root structures from different crops in the soil feeding different microorganisms. Insect populations and plant damage may increase when the same crop is planted in the same area over several years. Vegetable crops in the same botanical family are often susceptible to the same diseases and insects. For crop rotation to be effective, gardeners should not plant vegetables belonging to the same plant family in the same location for three to five years. Obviously, crop rotation in a small garden may be difficult. To assist crop rotation efforts, the following list places common vegetables in groups. Members of the same group should not follow each other.

GROUP A Beans Basil Endive Lettuce Peas	GROUP B (Lime) Arugula Broccoli Brussels Sprouts Cabbage Cauliflower Collards Kale Kohlrabi Mustard Okra Radish Rutabaga Turnip
GROUP C (Lime) Beets Carrots Celery Chard Eggplant Parsley Parsnips Pepper Potatoes Spinach Sweet Potatoes Tomatoes	GROUP D Cucumbers Gourds Melon Pumpkin Squash
GROUP E Chives Garlic Leeks Onions Shallots	GROUP F Corn

¹⁴ Crop rotation table synthesis from many resources by Ray Schutte

INTRODUCTION TO ORGANIC GARDENING

Other good guidelines are Steve Solomon's *Growing Vegetables West of the Cascades* and Seattle Tilth's *Maritime Gardening In The Northwest* (*CHECK PUBLICATION TITLE*)