HOW TO COMPOST

What follows is a lot of information that will help you to make the best compost possible in an efficient manner. You can customize your compost and increase your output by taking note of the information presented. However, if you never read the following; or don't adhere to every detail ... so what? If you only use a composter to contain your leaves and grass clippings, and otherwise forget about it ... in time you will have compost. It's that easy. Reading and applying the principles of How To Compost will allow you to make a higher quality compost in a shorter amount of time.

COMPOSTING IN GENERAL

Before we get into the nitty-gritty of making compost, let's expand our discussion of composting in general, and get some important background information (painlessly introducing small amounts of science along the way). As a society, we tend to notice and appreciate the production process, and ignore or find distasteful the decomposition process ... yet the decomposition processes must occur in order to recycle the basic building blocks required by the productive processes. Commonly, most paths taken by household wastes carry potential plant fertilizer away from the house. Ideally, household waste that is suitable for reclamation should be processed at the homesite to extract the valuable nutrients; saving you money, providing a superior fertilizer-conditioner, and easing the burden on municipal services.

Basically, composting is an imitation and acceleration of the natural process of decay. It is a process that returns the nutrients "borrowed" by the plant for its growth back to the soil in order for the cycle of life to continue. Compost, in its broad definition, has existed ever since green plants invaded the land. Any vegetation that falls to the ground and decomposes aerobically (meaning it uses oxygen as part of the decomposition process), turns into compost. Anything that was once living will be broken down by other living organisms into its simplest elements.

SOIL / MICROORGANISMS

Soil is much more than simply pulverized rock. It is teeming with many forms of life, each of which plays a vital role in the overall productivity and quality of the soil. A whole world of animals, plants and microorganisms derive their existence from the decomposition process. Most of the work is done by the decomposer bacteria, molds and fungi. These organisms are even able to release the inorganic forms of some minerals such as potassium and phosphorus by the action of the organic acids they produce. These smaller microorganisms are aided in their work by a group of larger

animals known as detritivores. These are the commonly seen, but generally despised bugs, beetles, mites, worms, etc. They eat just about anything, and in the process, break up the materials to expose many more surfaces to the microorganisms. By adding organic materials to the soil, gardeners improve the structure of the soil (better aeration and moisture retention) and feed the beneficial organisms in the soil (encouraging more to live at your place).

Why Compost?

You might ask, "If any organic matter is going to decay without my help, why not just throw any vegetative material on hand on the ground and let the worms drag it down?". Well you can, but you will be doing your garden a temporary disservice. The reason is that the organisms that eat the organic matter use a lot of nitrogen in the process, taking it from the soil, which leaves any plants trying to also use that nitrogen temporarily starved. Temporarily, because when the bacteria have done their job and decomposed the organic matter, they die; releasing the nitrogen again, *plus* any nitrogen the vegetative material had. So you get it back ... you just have to wait for it. A better and faster method is to put all your vegetative matter in a compost pile where you supply the necessary nitrogen.

C / N RATIO

This leads us into a discussion of perhaps the single best indicator of how rich / poor your compost mix is ... the *C / N RATIO*. C stands for Carbon, N stands for Nitrogen; and the Ratio is the comparison of the amounts of carbon to nitrogen any material might contain. Carbon supplies energy in carbohydrates and nitrogen provides growth in proteins. All living things need these elements to survive (including the microorganisms that make compost); and they use roughly 30 parts carbon to each 1 part of nitrogen ... this would make a C / N Ratio of 30:1, simply expressed as 30. If too little nitrogen is present in the pile, not enough heat will be generated, and decomposition will proceed slowly (taking perhaps many months). If there is an excess of nitrogen present, the microorganisms release it into the air as ammonia and carbon dioxide. This is not good, as it results in a loss of valuable nitrogen from the pile and is also likely to cause odor problems (ammonia has a "soiled diaper" smell; and if there is an excess of nitrogen, you will notice the odor, especially when turning the pile).

Therefore, the ratio of carbon to nitrogen in the pile should generally be in the right proportion to get it hot, and to keep it hot. The right proportion to keep those microorganisms happy, is a C/N of 25-30. A general guideline to follow is: ◆ materials that are still green and moist are high in Nitrogen (ex: fresh grass clippings, green weeds, most vegetative kitchen wastes) ◆ materials that are dry are generally high in Carbon (ex: sawdust, paper, dried grass, dried leaves).

On the average, the plant material that goes into a compost pile has a C / N of 50; which as the material decomposes, reduces to a C / N of 15-20 (finished compost); the C / N of stable humus in fertile soils is generally in the range of 10-15.

Below is a list of the C / N Ratio of some common materials used in composting. Use it as a guide as you assemble the materials available to you.

Some Common C/N Ratios

- sawdust 150-200
- peatmoss 50
- straw 50-150
- raw garbage 25
- cow manure 30
- leaves from oak, maple 40-60
- sun-dried grass clippings 20
- hay from legumes 15
- fresh grass clippings 15
- fresh garden debris 20

The main thing to remember is that non-juicy, dry materials are high in *Carbon*, and if you use a lot in your compost you can throw your C / N Ratio off to the high side; and you will need to add Nitrogen in some form (lots of kitchen wastes, blood meal, etc.) to get that C / N Ratio into the 30 range. There are charts and formulas to enable one to get fairly scientific about figuring out the C / N Ratio of a compost pile. These are not included here because I'm not *that* scientific about the whole thing. You don't need to be absolutely precise in making your compost pile; just be aware, in a general sort of way, what a C / N Ratio is, and the approximate C / N of the materials you have assembled. C / N is figured on a dry weight basis, and some of your materials may be moist ... take this into account, and just try to put in about 30 times more carbonaceous material (estimate wt.) than nitrogenous material (guess at dry wt.). Experience will make this easier.

AEROBIC / ANAEROBIC COMPOSTING

Now that you have some background on the processes of composting, let's get into some specifics. There are as many ways to make compost as there are people making compost; but they all fall into two general categories. Anaerobic composting is decomposition that occurs using microorganisms that do not require oxygen. We will only mention anaerobic composting in passing, primarily because of two reasons: 1) the process is often referred to as fermentation, and is characterized by very strong odors; 2) only a small amount of heat is generated by the process, making the decomposition take a *much* longer time and not reaching sufficient temperatures to safely kill plant pathogens, weed seeds, etc. Aerobic composting, not surprisingly, is decomposition that occurs using microorganisms that require oxygen to perform their work on our compost pile.

Aerobic composting methods vary from simply raking the material into a pile in the open, to confining it in some manner; and whether to turn and mix the material or not. The basic requirements of an aerobic compost are; 1) **organic matter**, 2) the appropriate **microorganisms**, 3) **moisture**, and 4) **oxygen**. To better understand the mechanics of aerobic composting we will divide the topic into three major sections; *INGREDIENTS* of the compost pile, *MAKING* the compost pile, and *MANAGING* the compost pile.

INGREDIENTS OF THE COMPOST PILE

Organic Matter

What can be composted? The short answer is, just about any material that was previously alive at some time, that you can gather from your homesite or import in from the community, is fair game for a well-maintained compost pile (in addition, you might add certain inorganic materials if your soil requires them, for the advance processing a compost pile can provide). The real substance of compost is the organic refuse that comes from your garden and kitchen. The greater the variety of plant debris that you can introduce ... the better your compost will be, because it will contain not only the major plant elements (N/P/K), but also a wide variety of important trace elements (far more trace elements than any chemical fertilizer you can buy).

Let the following long list be just a guide to encourage you to use your imagination to put a wide variety of materials into your compost pile: 1) *KITCHEN WASTES*, (both those made while preparing the meal, and any table scraps the dogs don't eat) including; cereals, grains, banana peels, outside leaves and trimmings from all fruits and vegetables, rinds, eggshells, old bread, and don't forget any spoiled food; 2) *HOUSEHOLD WASTES*, including; faded flowers, old ragged house plants, bits of paper (no inks!), vacuum cleaner contents, ashes from the fireplace; 3) *YARD AND GARDEN WASTES*, including; leaves, grass clippings, prunings, thinnings, old plants, even weeds (leaves and weeds are especially rich in minerals, and the crumbly texture of decomposed leaves makes an excellent soil aerator), and if you have some old unrotted compost around, put it in. Remember our discussion of the C / N Ratio as you gather materials to put in your compost ... try to achieve a C / N of 30 in your materials to most efficiently use valuable nitrogen.

Is there anything you should *not* add to the pile? In theory, if it will decompose, it can go in the pile ... however, in real life you have to draw the line somewhere. You should not put any meat, fat, or bones in the pile as they will produce odors that will draw flies, rats, and other vermin. Walnut and bamboo leaves contain substances that inhibit plant growth. Some say you should not use any diseased plants or plants infested with insects. A properly built and maintained compost pile will achieve high enough temperatures to kill plant pathogens and insects; and the heat and microbial action may eliminate the effects of walnut and bamboo leaves.

Beware of using grass clippings, or any other material that has been treated with any of the various *'cides*; Pesti-, Fungi-, Insecti-, and Herba-. Composting may help to break these dangerous chemicals down, or at least buffer them; but it is safer not to introduce any of these chemicals to your compost. You will have to find your own way here, although if you keep any questionable material down to 25% of the pile, you will probably be safe.

Microorganisms

For the best results, the pile should contain plenty of microorganisms (bacteria, molds, fungi, etc.) and a healthy number of larger organisms (mites, beetles, worms, and such). Research has shown that it is not necessary to use any commercial compost starters, as the spores of the decomposer microorganisms are everywhere; as soon as you provide the proper environment of organic matter (Carbon and Nitrogen), oxygen, and moisture, they will begin their work.

Manure is not necessary to make compost. Old-timers among us will claim that it is the basis of good compost. Manure *is* great stuff; it is a compost all by itself. If you can get some, by all means use it (now I'm talking about the real thing, not some ancient stuff in a plastic bag that has long since lost its bacterial life). The amount to use is the amount you can get. It is estimated that 1/3 of the mass of manure is bacterial life. However, manure is not necessary to supply nitrogen; in fact, if you use a high proportion of kitchen wastes in your compost, your problem may be one of supplying enough dry carbonaceous material.

Many an authority advises using soil in your compost. The reasoning is that using soil introduces soil bacteria and worms to the compost. But as we have seen, this is not really necessary nor desirable, as the decomposer organisms are everywhere; and if you supply plenty of organic matter ... just try keeping the worms away. Soil will make the composting materials heavier to turn. One other use of soil by some is to act as a deodorant covering for the top of the pile (but if you are going to turn the pile often, as I suggest you do, then the soil will be mixed in with the other materials soon anyway). If you do decide that you want to use soil in your compost, at least use fertile topsoil, and not some sterilized potting soil from a bag.

Water

Water is critical to the decay process. Sufficient moisture must be present for the microorganisms to flourish. On the other hand, too much moisture will cool the pile down; and can cause it to go anaerobic. The goal is to try to achieve about a 50% moisture content. If you have a large amount of wet kitchen wastes, you may need to balance that with a lot of dry material. If you have a lot of dry material, be sure to have a garden hose on hand in order to lightly wet the pile during construction. We will cover this more thoroughly in the sections on *Making* and *Managing* the compost pile.

Air

Good air circulation is the final basic requirement for a successful aerobic compost pile. The aerobic microorganisms that are decomposing the pile need oxygen to survive. When making the pile, include plenty of coarse materials and don't pack the pile. A well-built compost pile is constructed to allow plenty of air circulation. However, aerobic piles can have areas of anaerobic conditions; this is the case when the center of the pile has air excluded by using material that is too fine-particled, or becomes water- logged from rains. We'll cover this some more in the section on *Managing* the compost pile.

Additives/Conditioners

The use of any supplemental ingredients largely depends on the specific condition of *Your* soil. The best way to determine the needs of your soil is to test it. There are several good, inexpensive testing kits on the market (which will not only let you determine the exact condition of your soil, but also explain how to custom-tailor your fertilizer for your specific needs). You can also have your soil tested by your local County Extension Agent, and often garden nurseries offer testing free, or for a slight fee.

A comprehensive discussion of fertilizers is beyond the scope of this composting manual; however, the basics as they apply to composting, and some suggestions, follow. By all means, if your testing determines that a fertilizer is needed; add it to the compost first. The fertilizer will aid the decomposition process, and the microbial action will convert the fertilizer to forms more readily used by the plants, and longer lasting in the soil. Commercial sources are available for all fertilizers, organic or chemical, but you should strive to find waste sources whenever possible to keep costs to a minimum.

pH FACTOR

The pH Factor is simply a way of expressing the amount of acidity / alkalinity of the soil. The scale runs from 0 to 14; with 7 representing a neutral soil (numbers below 7 indicate the degree of acidity; numbers above 7 indicate the degree of alkalinity). When conditions of pH become too extreme, chemical changes occur which prevent the nutrients from being used by the plants. Most garden plants do best in a slightly acid to neutral soil; pH 6.5-7. Finished compost generally tends to be slightly acidic (although this can be influenced by the materials used). When compost is added to the soil, it acts as a chemical buffer, increasing the plants tolerance to pH; plants will thrive in a broader pH range; ph 6-8. Adding compost to a slightly alkaline soil will bring it towards neutral.

To correct an overly acid soil requires the addition of lime; but here we encounter an area of controversy, as regards composting. Some authorities advise adding some

lime to the compost; the reasoning being that the microorganisms thrive best under slightly acidic conditions. However, it has been shown by repeated research that adding lime to a compost pile results in serious losses of nitrogen (through volatilization as ammonia). If you decide that your conditions warrant the addition of lime, and you think you might want to run the lime through your compost; 1) be sure to maintain enough nitrogen in the pile (expecting some losses), and 2) don't use quicklime (hydrated), as it tends to overdose with alkaline substances.

Nitrogen (N)

The most often used additive. We include it here as an additive, although it is also a basic requirement of compost, mainly because most of the time you will probably find that you are able to gather more materials high in carbon than materials high in nitrogen. Your experiences may differ, but if you find you need to add additional nitrogen to your pile, you definitely are not alone. As mentioned earlier, manure is an excellent (although not particularly high, 1-4%) source of nitrogen. If you can't get enough, the alternative is to use a fertilizer, and any garden fertilizer will do. Some suggested commercial sources of nitrogen are; (organic) blood meal, fish emulsion, cottonseed meal; (chemical) ammonium sulfate, ammonium nitrate. [See also *Additive Chart*]

Phosphorus (P)

If soil tests determine a need for additional phosphorus, several choices can be made. The rock fertilizers are naturally derived, are not highly soluble (will not leach away rapidly), and contain no harmful compounds that would disturb the microbial life in the soil. They are long-lasting and one application can suffice for several years. However, they do not decompose fast enough to be of immediate use the first season. If you decide to use rock phosphate, obtain the finest ground material possible, to hasten its decomposition. Compost itself aids in phosphorus levels; the organic material contributes some phosphorus, and the organic acids produced by the microorganisms help dissolve additional amounts from the soil (or any rock phosphate you add). Some suggested commercial sources of phosphorus include; bonemeal, or one of the super-phosphate chemicals. [See also *Additive Chart*]

Potassium (K)

If potassium is indicated as being low, wood ashes are a good, readily available source to add. Commercially available are; granite dust, greensand, fish meal and potassium sulfate. [See also *Additive Chart*]

Trace Elements

The trace nutrients that plants need are just as essential as the major nutrients; the plants only need to use small amounts. These trace elements include; Sulfur (S), Calcium (Ca) and Magnesium (Mg) ... both of which dolomite limestone will provide, Iron (Fe), Boron (B), Manganese (Mn), Copper (Cu), Zinc (Zn), Molybdenum (Mo), Sodium (Na), and Chlorine (Cl). As mentioned before, if you make an effort to include a wide variety of plant materials in your compost, it is very unlikely that you will find the need to add any of the trace elements specifically.

ADDITIVE CHART

Material	Nitrogen %	Phosphorus %	Potassium %
Bloodmeal	13-15	1	.5
Bonemeal	4	12-20	-
Coffee grounds	2	.3	.5
COMPOST	1.5-2	1.5-3	1.5-5
Cottonseed meal	6.5-8	2-2.5	1.5
Fish meal	4-10	4.5-8	0-4
Granite dust	-	-	5
Greensand	-	0-1.5	6-7
Rock phosphate (ground)	-	30	-
Hoof / horn meal	10-13	2	-
Seaweed / kelp (powdered)	1.5-4	1-2	5-6
Manures (dried)			
Cow	.6-1	2-.5	.5-1
Horse	.7-1.5	.3-1	.6-1
Sheep	.8-1.5	.3-1	1
Poultry	1.1-4	.8-2.5	.5-1
Wood ashes	-	1.5	8
Mono ammonium phosphate	11	?	?
Ammonium sulfate	21	?	?
Ammonium phosphate	?	16	?
Super phosphate	?	18	?
Sulphate of potash	?	?	53
Potassium sulphate	?	?	62

MAKING THE COMPOST PILE

Location

Now we get into the actual mechanics of constructing and managing the compost pile. First, a few words about the location of the pile. Your compost pile should be placed directly on the ground to facilitate the entrance of worms and other beneficial organisms from the soil (but it will work just as well if you want to set it on any available concrete or such). Place your compost pile near the growing beds to save your legs as you maneuver wheelbarrows or buckets of compost around. If you keep livestock (chickens, rabbits, etc....an excellent way to handle kitchen wastes), locate the compost pile near the animal housing so you can empty the manure directly into the bins. Choose a site on level ground (if possible), that does not use any precious sunlight better used for growing plants. A shady spot will keep the bins from drying out so rapidly in the hot summer months. Locate near a water source, as water will be needed when building the pile, and also from time to time when turning the pile. Allow space for storage of materials that will go into the pile, if you can spare it. Well managed compost piles will have very little obnoxious odor ... however, when the pile is first assembled, and possibly during the first few turnings, some odors may be noticed (these will never be as objectionable as those from anaerobic processes).

Shredding

In general, the smaller the pieces of organic matter that compose the pile, the faster the decomposition process will be (the microorganisms have more surface area to work on). One way to inexpensively shred your material is to run your lawnmower over it. Work the material in small sections, directing the mower discharge to a convenient area. Leaves, especially, should get at least some shredding treatment, as they tend to mat into clumps in the pile. But don't carry this shredding business too far; material should not be much smaller than 1" (and pulping the material slows the process considerably, leading to anaerobic conditions). As long as there is some finer material along with the coarser material, you won't need to shred too much.

Building In Layers

Instructions on building a compost pile often advise putting the materials down in layers. This is a good idea for several reasons; 1) it makes keeping track of the materials and the approximate C / N ratio easier, 2) it is also easier to ensure that you put down a mix of coarse and finer textured materials, so as not to pack the pile, leading to anaerobic conditions. There is nothing sacred about the sequence, proportions, or contents of each layer, as they will all be thoroughly mixed in the turning process. However, the first layer should be composed of some fairly absorbent materials to catch any excess liquid (crushed leaves and / or sawdust is good for this). Make this first layer 5"-10" deep.

Apply water to the compost pile if the majority of the material used is dry. Try to achieve a moisture content of 50%, about the consistency of a squeezed sponge. It is difficult to judge this correctly without experience, (even with experience, I consistently under water for fear of getting the pile too wet) but no matter ... part of the reason for turning the pile is to judge the moisture content, and make adjustments as necessary.

After the dry materials, add a layer of green materials; wet and high in nitrogen (green grass clippings, kitchen wastes, etc.). Add lots of manure if you have it (say a 2" layer). Sprinkle on any supplemental additives you desire, or that your soil testing indicated a need for (blood meal, bone meal, minerals, etc). Continue in this manner, alternating layers of vegetation and nitrogenous substances, with additives and water as needed, until the bin is nearly full. The last layer should be composed of some highly carbonaceous material to help inhibit any odors, bringing the bin up to full, or slightly higher. You can make a smaller amount of compost, but the bin is designed to hold 1 cu.yd. of material; if the volume of the material is any less than about 3/4's cu.yd., there will not be enough mass to heat up properly.

To protect the pile from drying out too quickly; or, on the other hand, from drenching rains, cover the top with anything at hand (tarp, old plastic sheet, piece of carpet, whatever). Leave the sides open, to permit air circulation. Once the compost has been made, you can add more material for the first two turnings, or so; in order to make adjustments (discussed in *Managing* the compost pile). However, after the first week, store any additional materials for use in the next pile. This will keep odors to a minimum in the first pile, and help produce a more uniform product when completed.

MANAGING THE COMPOST PILE

Temperature

After the pile has been made, let it sit for a day or two. Take a temperature reading from the center of the pile. If you don't have a thermometer, just stick your hand in the middle of the pile. If you've never made compost before, the amount of heat generated by what you have built, will come as a surprise to you, no matter that you've read about it. I'm still amazed by the whole process after many a compost pile. A temperature of 150-160 degrees F., indicates that the microbial life is flourishing. It is important to achieve as high a temperature as possible to be sure of killing all undesirable elements (pathogens, weed seeds, insects). If the temperature is lower, or not rising at all; the microorganisms are starving for Nitrogen. Immediately mix in sources high in nitrogen; blood meal, *LOTS* of manure, or a chemical nitrogen compound.

The smell of ammonia coming from the pile is a sign of too much nitrogen; and you need to add more carbonaceous material (sawdust, dried leaves, etc.). If the pile smells foul at any time, it has probably gone anaerobic. You will need to turn it much

more frequently to get oxygen into it (perhaps daily for awhile). If the pile hasn't heated up by 3-4 days, and it isn't too wet, you may have to add more nitrogen or water, or both. The experienced composter will strive to manage the pile so that few odors are produced; smells usually indicate a loss of valuable nutrients.

The population of microorganisms inhabiting the pile changes constantly as temperature varies; each group performing its own functions in the decomposition process. With all parts of the pile eventually passing through the high heat of the pile, the weed seeds, plant pathogens, and pesticides are broken down and destroyed. As the chart on the next page shows, even most human pathogens and parasites are killed. The temperature and speed of the decay are also a deterrent to the attraction of rats or other vermin after the kitchen garbage. After the pile reaches its highest temperatures (lasting for a week or two), it starts to cool slowly. This is not a cause for concern, as it allows some of the other organisms to get into the act; the fungi and some types of bacteria operate at the lower temperatures, in the less warm areas of the pile. The compost pile is a sort of microbe city, teeming with one population explosion after another of various decomposer organisms.

TEMPERATURE / TIME TO KILL COMMON PATHOGENS/PARASITES

Organism	Temperature (F.) / Time
Salmonella typhosa	140 / 30 min.
Trichinella spiralis (larvae)	131 / 1 min.
Brucella abortus or B.suis	142 / 3 min.
Streptococcus pyogenes	129 / 10 min.
Shigella sp.	131 / 60 min.
Micrococcus pyogenes	122 / 10 min.
Mycobacterium tuberculosis	151 / 20 min.
Corynebacterium diptheriae	131 / 45 min.
Entamoeba histolytica (cysts)	113 / 3 min.
Taenia saginata	131 / 3 min.
Necator americanus	113 / 50 min.
Ascaris lumbricoides (eggs)	122 / 60 min.

(It is important to note that this chart is only a guide to the effects of temperature on pathogens and parasites; actual kills seldom reach 100%, as it is difficult to be positive that all areas of the pile are exposed to the high heat.)

Turning

Turning is probably the most often heard complaint of the composter, or would-be-but-except-for composter. Well, you don't have to turn your compost. If you are willing to wait many times longer than you have to for a lower quality product, then just pile your materials in the bin ... and wait ... and wait. Unturned piles work best (as best as they can), when enough dry and coarse material is included to try to keep it aerobic. In such piles, decomposition proceeds largely through the action of various fungi (often producing a recognizable mushroom-like smell).

To ensure that aerobic decomposition takes place; that high internal temperatures are achieved to kill pathogens, weed seeds, insect larvae, etc.; and to produce the best quality product in the shortest amount of time ... you turn your compost. It's that simple. So if you want the best, adopt an appropriate attitude (stoic, exercising, zen, whatever works for you), and just do it ! This is where the double-bin and removable front slats design of THE COMPOSTER really comes in handy. After the pile has been sitting for a few days, turn it into the adjoining bin with a pitchfork (or spading fork; shovels just don't seem to work as well, but will do if you have no fork).

The manner in which you turn your compost is important. An effort should be made to turn the top and outside edges into the center of the adjoining bin (this leaves the center of the first bin to place on the top and edges of the second bin). This is done every time the pile is turned to make sure that all sections of the pile go through the center, where the temperature is the highest. As mentioned earlier, the Slats aid access to the bin. When turning the contents of one bin into another bin; remove the Slats one at a time from the first bin (as the level of the contents lowers), and add Slats one at a time to the second bin (as the level of the contents rises). Enough Slats are included with THE COMPOSTER to fully enclose both bins to give the user maximum flexibility in how the bins are used. For best and fastest results, the compost should be turned every few days (at least twice a week for the first two weeks, when the important high temperatures are present ... afterwards, if you like, you can get by with turning once a week). Alternate between bins, turning as explained above.

Inspection

The turning process assures that oxygen is available to keep the pile aerobic; that all areas of the pile pass through the hot center; and provides the opportunity to examine the pile for moisture content and odor. If extreme odors are present, correct as explained above. The material should be wet enough to squeeze together and look damp, but dry enough to crumble apart easily when released from pressure. A well made compost pile will yield steam as it is turned (indicating the high internal temperatures). Turning will cool the pile down for a few hours, but temperatures will quickly rise again in a good compost mix.

When should you make compost? *ALL THE TIME.* Your household is always producing waste. When outside temperatures are cooler, the compost will take longer to make, but is still worth making. Protect the pile from winter rains. Earthworms are particularly active in the cooler months.

The Batch Method Of Waste Management

It is best to accumulate enough materials to construct a compost pile all at one time, rather than adding new materials as they become available. This keeps odors down to a minimum, and helps produce a finished product that is more uniformly decomposed. With this method, the materials are composted in batches. This means the materials must be stored until ready for use. The storage of the materials high in carbon is relatively easy. They are generally dry, and contain so little nitrogen that they don't easily start to rot by themselves. It helps if you keep these dry materials dry by covering with a tarp to exclude the rain, but it isn't strictly necessary. If you have another COMPOSTER unit, you can use one of the bins to store materials for future use, and use the other bin for temporary storage of finished compost ... or start another pile. If no other unit is available, just rake the dry materials into a pile at a convenient location (hopefully near THE COMPOSTER), and cover.

The storage of materials high in nitrogen present more of a problem. They often create smells, attracting flies and other pests. The best way to store these materials that I have encountered, is to store them in a container covered with sawdust or crushed leaves to absorb the excess moisture and odor (some sources of 5 gal. containers include; restaurants, paint and drywall contractors, etc.; or you can use a larger plastic trashcan w / lid). You put a 3" layer of absorbent material on the bottom, put your kitchen wastes over this as you accumulate them, covering with more absorbent material as often as necessary to control odor (pack it down tightly, and be sure to keep the lid on). When nearly full, cover with at least 3" more of sawdust or crushed leaves, and set near the pile to await accumulation of enough material.

If kitchen wastes are to be the primary source of nitrogen in your compost pile, you will need to accumulate maybe two 30 gal. trashcans of material to make 1 cu.yd. of compost. You will be surprised at how quickly a small family can generate this much kitchen wastes. If you can get some manure, you can be ready to start a pile even more quickly. The only drawback to this plan is that the materials are sure to go anaerobic ... this mainly means that when you use them to make your compost, they will be fairly strong in odor; so I always wait until a windy day to put my ingredients together. Don't worry about the pile itself going anaerobic. If you follow the instructions on *Making* and *Managing* the compost pile, when the oxygen becomes available, the anaerobic microorganisms will die and aerobic ones will take their place. This is how I do it, but you can come to your own decisions on how best to manage your wastes for your environment.

WHEN IT'S DONE AND HOW TO USE IT

The length of time required for decomposition is extremely variable from compost to compost. It depends on many factors, including; volume, C / N ratio, particle size, frequency of turning, moisture content, ambient air temperatures, and probably other factors I'm not aware of. After 15-20 days, or so, the temperature will come down; and in about four weeks (give or take a week), the compost will be cool. Gradually, the material in the pile will turn a dark brown, have a rich humus look and feel, and smell "earthy", like a forest floor. Assuming that it is still moist, and did not lose its temperature because it dried out, the compost will be ready to use.

Do not expect all the contents of the pile to be equally decomposed. There will always be a discernible leaf or stalk or whatever, but these will be mere shadows of their former selves. Some materials contain lignins and other hard to break down substances, but this will not matter, as they will continue to be decomposed out in the garden (slowly enough so as not to rob nitrogen). If the pile is left to completely decompose in the bins, many valuable nutrients will be lost as vaporized gases or by leaching down through the pile into the soil. The organisms in the soil need a certain amount of raw material to feed on.

Using The Finished Compost

You can use compost to grow plants in many ways. If the compost structure is suitable, it can be used by itself, without soil, as a complete growing medium. At least 50% of the compost must pass through a 1/4" screen of hardware cloth, to use it in this manner (I regularly screen my compost with 1/2" hardware cloth, putting what doesn't go through into the next pile). Spread the finished compost around shrubs and trees. Use it as a soil conditioner; adding it to clay soils opens the soil up to better aeration; adding it to sandy soils binds the loose grains into larger structures that hold moisture much better. Incorporate it into the top few inches of the soil as a top dressing (where there is sufficient oxygen to continue decomposition). Use it as a mulch, one that won't take nitrogen from the soil. When used as a mulch, many highly desirable organisms will feed on it, carrying it down into the soil for you. Use it as a tonic for ailing plants; not much is known on the subject, but some believe that compost contains an antibiotic for plants ... it surely will help them.

Use it as a potting mixture. A general mix of; 1 part builders sand, 2 parts sifted compost, and 1-2 parts soil works well, (and makes a good seed covering also). If you plan to use compost on indoor plants, it is wise to take some extra precautions in order to not introduce any undesirable elements to your houseplants. This means that compost for indoor use should be pasteurized. This is a simple process, but a smelly one. The easiest way I know to achieve the heat necessary for pasteurization, is to cook the compost *OUTSIDE* on a bar-b-q grille. Use a meat thermometer, and cook the mix for 30 minutes at 180 degrees F.

One final use of compost is to use it as a foliar feeder. Foliar feeding is simply feeding plants through their leaves instead of their roots. Many plants can benefit from foliar feeding, especially transplants, which may lack feeder roots. To make a liquid foliar feeder from compost, simply make "*Compost Tea*". To make "*Compost Tea*"; put 4"-6" of a well-made finished compost into a bucket; fill with water and let stand for 2-3 hours, stirring occasionally; strain through some burlap and sprinkle on the plants (or strain again through muslin, and use a sprayer). Use immediately for best results.

EARTHWORMS AND COMPOST

The finest compost made is by earthworms. Their castings contain 5 times the nitrate, 7 times the available phosphorus, 11 times the potassium, 3 times the exchangeable magnesium, and 1 1/2 times the calcium that occurs in the top 6" of uneaten soil. Earthworms derive nutrition from the organic content of the soil by eating it. In its passage through the worm, the mineral subsoil undergoes changes that make it immediately available for plants. While earthworms inhabit the surface layers of soil, they commonly burrow deep into the earth (as deep as 8 feet), honeycombing the soil.

They come to the top to deposit castings in the loose surface layers of the soil, bringing the subsoil to the top and mixing it with the topsoil. The aerating tunnels greatly increase the air capacity of the soil (in some cases increasing 60-75%). Water penetration into the soil is much improved, being quickly absorbed instead of pooling or running off. Earthworms produce a topsoil that is nearly a neutral humus. Wormcasts in acid soil are much less acid (sometimes 75%); and alkaline soils are made less alkaline.

Any gardener welcomes earthworms, and you can't have too many of these tireless workers in your soil. Since earthworms survive on organic matter, they love compost. Enrich your soil with compost and you can't help but increase the worm population of your soil. Earthworms seem to be particularly attracted to coffee grounds, so if you use coffee, be sure to put the grounds into your compost. Earthworms can't survive temperatures over 125 degrees; but not to worry. They will stay in the cooler areas of your compost pile, and as it cools in its normal progression, the worms will invade further. Don't worry about any worms you encounter as you turn the pile; the temperatures are reduced long enough for most of them to escape to the cooler areas before it gets too hot for them again. Earthworms are bi-sexual, and increase manyfold under good conditions.

IN CONCLUSION

Reading about how to make a good compost is no substitute for getting out there and making some. I've included all the information necessary to make the very best compost possible for your conditions. The product you produce may be fantastic or not the first time you make it; but to my way of thinking, *ANY* compost you make can only be beneficial to your soil. You can apply every principle mentioned, none of them, or pick and choose the ones that seem to make sense to you and your lifestyle. It doesn't make any difference ... just remember that your household is continually pumping out waste that you can turn into the most valuable substance your garden can get ... a sort of organic alchemy.

If you've read this entire manual, congratulations...the hard part is over. Start collecting your household wastes *TODAY* and . . . **MAKE SOME COMPOST !**

DECAY'S THE WAY !