WRANGELL COMMUNITY GARDEN COMPOSTING PLAN

In the Spring 2010, the Wrangell Community Garden group took the first important steps toward building a functional garden for the community. The City had agreed to allow the group to use the former Lion's Field for this purpose. The field was cleared of moss and crowned, and wood chips were brought in to cover the area. A series of raised beds were built and soil was brought in to fill the beds. A number of wire mesh towers had previously been built outside the fence at the east end of the property to act as composting bins. Later, these towers were replaced by a more substantial composting structure located just inside the fence.

A lot of effort has gone into the composting portion of garden activities, however, a lack of clear direction and disruption in continuity of these efforts has led to less than optimum results. Therefore, the Community Garden Composting Committee has decided to lay out a clear plan for the composting operations at the garden. One goal of this plan is to provide quality compost in the necessary quantities to users of the garden at the beginning of each gardening season. Another important goal is to help reduce compostable waste from leaving the community as garbage. In order to ensure continuity of composting operations at the garden if individuals currently involved in the Composting Committee are replaced by others in the future, the plan will bring newcomers up to date with a discussion of the importance of compost, a summary description of composting, documentation of past composting activities at the garden, and a detailed plan for composting at the Wrangell Community Garden.

Importance of Compost

Elliot Coleman, one of the leading organic farmers in the nation, published a book a few decades ago entitled The New Organic Grower: A Master's Manual of Tools and Techniques for the Home and Market Gardener. In his book, Coleman lists the five amendments that a grower should add to soil in order to make it fertile. These ingredients include organic matter in the form of compost or manure; rock phosphate; green-sand marl; limestone rock; and specific micro-nutrients, including Zn, Cu, Co, Bo, and Mo. In his discussion focusing on organic matter, Coleman explains that though "raw organic materials such as crop residues can be added directly to and can be digested by the soil. it is often better to compost them in a heap." He explains that this allows a crop to be planted immediately, rather than waiting for the organic materials in the soil to decompose sufficiently. Planting in soil where organic material decomposition is incomplete can lead to problems such as competition between plants and decomposers for oxygen and nitrogen. Coleman summarizes the benefits of compost as follows: "Well-made compost has been shown to have plant-growing benefits far in excess of its simple 'nutrient analysis' and to be an active factor in suppressing plant diseases and increasing plant resistance to pests." Perhaps J.I. Rodale best emphasized the value of compost when he wrote: "The compost heap is to the organic gardener what the typewriter is to the writer, what the shovel is to the laborer, and what the truck is to the truckdriver." Based on the importance of compost in producing optimum gardening results, the Wrangell Community Garden group should set composting success at the top of its priority list.

Composting Defined

Before describing past composting activities at the Wrangell Community Garden and settling on a composting plan for the future, it would be helpful to first define composting and describe the basic requirements for success.

Joseph Jenkins defines composting in The Humanure Handbook as follows: "In general,

composting is a process managed by humans involving the cultivation of microorganisms that degrade organic matter in the presence of oxygen." In other words, composting involves having an appropriate mix of organic material such as waste vegetables, straw, and manure, and gathering this material together and maintaining the pile in such a way that microorganisms are able to break the material down using oxygen. Specifically, the requirements for good compost are adequate moisture, oxygen, temperature, and a mix of materials with the correct carbon to nitrogen ratio.

The microorganisms in compost require some amount of moisture. The high temperatures that occur in a compost pile as a result of the activity of microorganisms cause water loss. The amount of water contained in a pile can be reduced by more than half in only a week. On the other hand, microorganisms cannot work in a waterlogged compost pile. Jenkins composts in an open bin in an area of Pennsylvania which receives 36 inches of rainfall per year. Moisture in his compost pile also comes from waste vegetables and, because he is also composting the family's sewage, urine adds to the moisture of the pile. He has found that he only needs to water the compost pile during an unusual drought. He notes that a compost pile may need about 200 to 300 gallons of water for each cubic yard of finished compost.

Plenty of oxygen should be available to a compost pile in order to cultivate aerobic bacteria (microorganisms that process organic materials using oxygen). The compost pile will break down more slowly and at lower temperatures if the work is done by anaerobic bacteria (microorganisms that process organic materials when there is no oxygen present). Anaerobic decomposition is also very smelly! Jenkins always covers a new compost deposit with a bulky material such as weeds, straw, or hay in order to trap oxygen into the upper layers of the pile where the heat-loving microorganisms are most active. Traditionally, people have turned compost piles with the purpose of entrapping more air into the composting material and thus speeding up the composting process. Jenkins does not recommend this practice and explains that a properly constructed pile, using enough of the bulky materials listed above, does not require any additional aeration. For more information concerning the turning of compost piles, read "To Turn Or Not To Turn: That Is The Question" (See Attachment 1).

The temperature of a compost pile must be high enough for microorganisms to do their work. Freezing temperatures can cause this work to come to a standstill. During the winter, Jenkins continues to add to his frozen compost pile and, when warm weather arrives, the microorganisms start right back up with their work. Temperatures in the range of 110 and 125 degrees Fahrenheit indicate that thermophilic, or heat-tolerant, microorganisms are present in an active pile and thus favorable aerobic conditions exist.

Microorganisms require a certain amount of carbon and nitrogen in their diet. They will gag on a diet of either too much of one or the other ingredient. The optimum carbon to nitrogen ratio is between 20 to 1 and 35 to 1. Organic materials that are high in carbon include cardboard, newsprint, sawdust, and straw. Organic materials that are high in nitrogen include animal manure and animal carcasses such as fish. Most waste fruits and vegetables have the correct carbon/nitrogen ratio. However, some produce such as cabbage, onions, and tomatoes contain a lower carbon to nitrogen ratio in the range of 12 to 1. Grass clippings also fall within this range. Things that don't compost well or don't compost at all include eggshells, bones, woody stems, wood chips, metal, and plastic.

Composting Experience 2010

Preparations for composting at the Wrangell Community Garden began in early Winter before the 2010 new year. A number of cylindrical wire mesh towers were arranged outside the fence at the east end of the property (See Attachment 2). Branches were placed at the bottom of each unit to provide aeration. The composting plan involved having individuals bring their waste fruits and vegetables to the garden to deposit in one of the three metal garbage bins also located just outside the fence. Shredded paper from the hospital would go into a second garbage bin. Someone from the

garden group would then layer the produce and paper materials into the wire composting units.

In practice, the composting operation did not always function as it had been envisioned. First, individuals would sometimes bring waste produce and place the material into the metal garbage bin, but more often they would dump the material directly into one of the wire composting units. Shredded paper was also added to the composting units. Any time the wind picked up, the light-weight material would blow out and scatter like confetti across the surrounding area. At some point, shredded paper stopped arriving at the site, and the wire composting units began to fill up with fruit and vegetable waste only. This created a dense, gooey mass at the top of each pile and the smell from the composting units indicated that the material was composting anaerobically.

In the Spring of 2010 when the Community Garden work group built the first raised garden beds, they also built a composting structure just inside the east fence to replace the wire composting units (See Attachment 3). The structure is built of wood enclosed in wire mesh and is separated into three bins. Each bin is approximately 6.5 feet wide, 4.5 feet deep, and 3 feet tall. The bins can be accessed from the front by removing several wooden bin boards. The base of the structure is built of wood and it is raised above the ground several inches. During that Summer, the material from several of the wire composting units was transferred into a bin in the new composting structure. The material in the bin was turned at least once into a neighboring bin.

At the beginning of Fall 2010, another work group tackled the task of moving the materials from the remaining wire composting units into the composting bin sets. It should be noted that the material in the wire composting units did not have the consistency and smell of rich soil characteristic of finished compost. Rather, the material contained coarser particles and smelled of vomit, indicating anaerobic composting. It was particularly difficult to separate the organic matter from the branches at the bottom of each composting unit. Once removed, the waste material was placed in the new composting structure at an equal level in each of the three bins.

During the cold months of 2010-2011, a few observations can be made concerning the new composting system. In October, seasonal heavy rains fell on on the uncovered compost at a volume likely in excess of required moisture for the pile. Individuals continued to bring waste produce to the site, leaving the material in garbage bags in the metal garbage bin, or adding directly to the composting bins. For entertainment, ravens in the nearby trees would rip open these garbage bags and scatter the contents about the site. They also pulled waste produce from the composting bins.

Composting Experience 2011

In the Spring of 2011, the composting bins were covered using the plastic lids from the metal garbage bins. Each set of lids was secured from the wind using a rope stretched across the lids that could be removed by loosening a metal turnbuckle at one end. The three bins were identified numerically from left to right with numbers painted onto the front bin boards (See Attachment 4). Because individuals continued to add waste materials to the bins, a sign that could be viewed from the entrance gate was attached to the side of the composting structure directing people to add to the bin on the right, Bin 3. Fresh materials were removed from the upper layer of the two left bins, Bins 1 and 2, and moved into Bin 3. The plan was to then consolidate the lower layer of old materials in Bins 1 and 2 into a single bin, but the compost was frozen solid at that point in mid-March.

In May, the compost had thawed and the contents of the left two bins, Bins 1 and 2, were combined into Bin 1 as finished compost. The compost in Bin 1 was soon completely emptied onto a few of the garden beds. Attempts were first made to sift the material through a screen, but the results were not deemed worth the effort to screen the entire contents of the bin. It should be noted that the amount of material consolidated into Bin 1 was only enough to cover four large garden beds. With both Bins 1 and 2 now empty, the contents of Bin 3 was turned over into the bins to the left; first, the material was turned into Bin 2, then a few weeks later it was turned into Bin 1. This was part of the

effort to turn the waste materials between Bins 1 and 2 at least every few weeks until the composting process was deemed complete. Meanwhile, Bin 3 was used to accumulate fresh material.

Based on composting experience during the previous growing season, it appeared that composting in the wire towers was occurring under low carbon/nitrogen and low-oxygen conditions. Low-carbon vegetables such as onions made up a bulk of the materials placed in the wire towers, which created a dense, unpalatable environment for aerobic microorganisms. In order to increase the amount of bulky carbon materials that would increase the carbon/nitrogen ratio and entrap air into the pile, the Composting Committee decided to encourage people to bring shredded newspaper and cardboard with their waste fruits and vegetables. Rather than gathering these materials into separate containers and designating an individual to carefully layer the materials into the new composting structure, people would be asked to deposit their carbon and nitrogen waste directly into the active composting bin. Four bales of straw were purchased and placed in the dugout to be used if carbon materials in the pile appeared to be lacking. The makeshift sign on the side of the composting structure was replaced by a covered bulletin board/chalk board. The bulletin board holds a laminated flyer, which list some basic rules for those using the composting bins (See Attachments 5 & 6). The chalkboard allows messages to be relayed between users of the composting bins. A movable sign which reads "Add To This Bin" was placed directly on the front of Bin 3. A blue trash can was placed beside the composting structure to hold waste containers such as plastic bags. A compost thermometer and log book were purchased and stored in the Community Garden shed in order to measure and record compost pile temperatures.

As noted above, the compost pile was turned twice early in the season, with the final effort occurring on May 15. Turning the pile was very physically demanding and required a couple of hours to complete. Because of the amount of effort necessary to turn the pile combined with a lack of volunteers, the materials turned into Bin 1 were not turned again for the remainder of the season, and Bin 2 remained empty. Bin 3 continued to receive fresh materials and the pile composted and shrank so that the bin never became too full. If the pile began to smell, a thick layer of straw was added to the top. In September, anticipating a large quantity of waste vegetation from the garden beds, the "Add To This Bin" sign was moved to the front of Bin 2 and a thick layer of straw was placed at the base of this empty bin. This static, hodgepodge method of composting appears to be effective. On May 28, the temperature of the newer material in Bin 3 was measured at 94 degrees Fahrenheit, then in July the temperature was measured at 122 degrees Fahrenheit, indicating aerobic decomposition. In May, the temperature of the older material in Bin 1 was measured at 96 degrees Fahrenheit, and later in July, the temperature was measured at 72 degrees Fahrenheit, indicating that the thermophilic composting stage was winding down. A bunch of happy worms were living in this pile.

A few difficulties were encountered during the growing season. A wind storm dislodged two of the lids from the top of the composting structure. The rods that hinge the two lids are not fixed at the end with a cotter pin, so they were easily shaken loose. During the same storm, the Plexiglas cover was broken from the face of the bulletin board/chalk board because it was not secured down. Even before the Plexiglas blew off, the board was not completely weatherproof and the surface would become wet in a downpour. The blue trash can beside the composting structure does not have a lid, thus the trash can collects water, making it more difficult to empty garbage. An ongoing problem with the composting process continues to occur. An individual regularly places a plastic bag full of waste materials directly into the composting bin. The list of rules on the bulletin board and notes written on the chalkboard do not deter the individual.

Composting Plan

The committee agrees that encouraging people to compost at home should be a primary piece of the composting plan. Composting at home would allow people to choose the materials that will go into their compost, and would make the compost easily available for home gardening. Ultimately, home

composting would reduce the amount of materials that the compost committee must manage at the Community Garden. Composting using worms has the advantage of working throughout the year considering that a bin of worms can be brought inside during the coldest months of the year. Composting at home using worms or other methods may be a topic for community education in the future.

For those who do not have a place to compost and for the convenience of those who have a raised bed in the Community Garden, improvements will be made to the on-site composting system to ensure that quality compost in the necessary quantities is available to users of the garden at the beginning of each gardening season. As a practical matter, some compromises will have to be made in the materials that are allowed into the compost bins. The majority of fruits and vegetables purchased in Wrangell are not certified organic, so it would not be practical to prohibit non-certified organic food waste from going into the bins. Also, Wrangell has limited options for dry sources of carbon, so materials such as newspaper, cardboard, and purchased straw will be accepted in the composting bins even though these items may be less than pristine. In the future, the Composting Committee would like to put together a work-group to gather materials such as fallen leaves in the Fall, dead beach grass in the Spring, or some other local carbon source to provide material without cost. In the meantime, straw will be purchased and stored in the dugout to be added to the composting bins as necessary. Members of the committee will monitor the pile to ensure that enough carbon material is present and will add more if necessary.

Based on calculations of the amount of compost that would be required to satisfy the needs of the existing garden beds (See Attachment 7), and based on observations of the amount of compost that was needed to cover a few garden beds during the 2012 gardening season, it would be prudent to provide more composting capacity at the site. Therefore, a new composting structure will be build beside the existing set of bins. Much of the construction materials for a new composting structure have already been accumulated. Remaining construction materials need to be gathered and members of the Composting Committee have the expertise to build the structure.

While construction of the additional composting structure remains in the planning stage, the existing composting structure will continue to be used. Once a pile has been built, both Joseph Jenkins and Elliot Coleman recommend at least a year-long curing process for the compost. The compost in Bin 1 will have been curing for a year by the 2012 growing season, so it will be used as finished compost for the garden beds in the Spring. A sign that reads "Take From This Bin" will be placed on Bin 1, and individuals can use the compost from the pile on a first come, first served basis. Materials at the edge of the pile that did not compost can be chucked into the active pile. As soon as Bin 1 has been emptied, this bin will be used to accumulate fresh materials. Bin 2 will continue to accept fresh materials through the Winter, as capacity allows. The compost in Bin 3 will cure through the 2012 growing season and will be available as finished compost for the 2013 growing season. The Composting Committee has discarded plans to either regularly turn the compost pile or build the compost pile in a controlled fashion. This decision may be revisited in the future. However, it would be helpful to have a more frequent schedule for measurement of temperatures in the active compost pile in order to measure success.

Other aspects of the composting operation need to be addressed. The Composting Committee had discussed moving the metal garbage bins inside the fence to store manure, straw, etc. for used in the composting bins. A decision was made to remove the metal garbage bins from the community garden and store manure in a tarp-covered pile by the composting bins and keep straw in the dugout. The lids over the existing bins need to be secured, and the bulletin board/chalk board should be weatherproofed. The continued placement of plastic bags of waste in the active composting bin should be resolved, and a lid for the blue garbage can purchased.

The Community Garden Composting Committee will meet at least once at the end of each growing season to discuss lessons learned and identify maintenance needs and/or plans for any new projects. This written plan will then be revised as necessary. The Composting Committee will also

meet at least once at the beginning of the next growing season to organize planned work activities.

2012 Maintenance/Project List

1. Set a seasonal schedule for Compost Committee meetings.
2. The source of the plastic bag problem may have been identified, so there may no longer be a problem with plastic bags in the composting bins. The issue will be re-addressed in the future if necessary.
3. Identify an individual to record compost pile temperature on a regular schedule, and design a format for documentation in the logbook to include the timing of active, curing, and finished compost.
4. Discuss a timeline for the following tasks:
    a. Finalizing design of new composting bins including number of bins necessary and determination if a roof would keep out too much moisture. Discuss additional construction materials needed, and identify next steps for buiding the new composting bins.
    b. Securing the rod hinges on the lids covering the composting structure;
    c. Repairing the bulletin board/chalk board on the composting structure and replacing signage;
    d. Purchasing a lid for the blue trash can or replacing.
    e. Adding signs "Finished - Take From This Bin" & "Curing - Don't Add To Bin" on front of bins.
5. Consider possibility of obtaining a local carbon source such as waste newspaper and dried beach grass. If an outside carbon source such as straw is needed, its must be group-ordered in the Fall.
6. Discuss having a community workshop about worm composting or other home composting methods.