TITLE: Compost Happens

OBJECTIVES:

1. To understand that our activities on the land affect the quality of the soil.
2. To observe that soil is alive and must be fed to maintain fertility
3. To understand that it is possible to increase the quality and fertility of soil by adding organic material
4. To learn how to make compost

Take Aways:

- Soil is alive and can be improved by "feeding" it organic material
- Care must be taken to build and preserve soil structure
- Compost is an effective way to increase soil structure and fertility
- Compost happens naturally, and people can speed up the process.

TIME REQUIRED: 1-1.5 hours

MATERIALS:

- It's Alive!: several bottles of Hydrogen peroxide, sand, soil, clay, compost, small cups, clean water to rinse
- Soil structure:
    - Several lumps of soil (not sandy) from under uncultivated sod and from a heavily cultivated field.
    - (2) 1/4" Hardwire mesh baskets (9" square bottom w/ a 3" rim) for each crew.
    - (2) 5 gallon buckets for each crew
- Drainage revisited: 24 coffee filters; 4 mason jars; rubber bands; sand; clay; compost
- Compost piles in various states of decomposition (at different temperatures)
- Compost thermometers, shovels, forks for exploring and turning compost

DIRECTIONS:

Activity 1 - Soil-It's Alive! (10 minutes)

- Review brainstorm of living component of soil.
- The living component of the soil needs food to survive. Wherever there is food for bacteria to eat, they multiply. In the soil, the food for bacteria is dead plant and animal matter, or "organic matter." So if the soil has a lot of organic matter, there should be a lot of bacteria, because there is a lot of food for the bacteria to eat.
- One way we can test for the presence of bacteria without a microscope is with hydrogen peroxide. Discuss what happens when you pour Hydrogen Peroxide on a cut- it foams as bacteria

are killed. Hydrogen peroxide foams whenever it comes into contact with bacteria and kills them.

- Place a little sand in 1 cup, clay in a second, compost in a third, and soil in a fourth cup.
- Pour a little hydrogen peroxide in each cup and observe what happens. Which material foams the most? What does this mean? Why does soil and sand have the most bacteria?

Activity 2 - Soil Structure (15 minutes)

- Why do farmers care if their soil is alive? What does the living component do for soil? Because it is the living component that gives the soil structure.
- Think of soil like bread. Bread is a mixture of raw ingredients (flour, sugar/honey, salt, water) that then has living microorganisms (yeast) added to it. The microorganisms eat the sugars and make "air" bubbles (actually CO_2) that give the bread structure. (Show bread). Soil is similar- it is made up of raw ingredients (sand, silt, clay, decayed/ decaying living material, water) and is filled with living things that eat it and give it structure.
- Fill 2 buckets with water.
- Place "wild" and cultivated soil lumps in the hardwire mesh baskets.
- Gently lower the soil-filled baskets in the buckets of water.
- Observe what happens.
- Why does soil from the heavily cultivated field fall apart and drop to the bottom of the jar while the other one holds it's shape and clings together? The answer is largely the difference in the amount
- of organic matter and the effect it has on the soil.
- How does soil structure effect erosion and drainage?

Activity 3 - Building Soil Structure (30 minutes)

- From the previous experiment, it is obvious that cultivation practices disrupt soil structure. Therefore, farmers constantly need to work to rebuild the structure and fertility of farm soils. They can do this by allowing soils to rest and by adding organic matter to soils using the following methods: cover cropping with green manures, no-till agriculture, add compost, put land into pasture (with animals) or let the land lie fallow.

- <u>Cover Cropping</u> – This is the method we use most often on the farm to add organic matter to the soil. Although it doesn't have as great an impact as adding a large amount of compost, it is fairly easy to do over a large area. It has several other advantages: it can reduce soil erosion, add nitrogen to the soil, and smother weeds depending on the type of

cover crop that you chose. Cover crops to use include: sorghum, oats, peas, vetch, rye, buckwheat, and clover as cover crops. The choice of cover crop depends on the season and the needs of the soils that are being cover cropped (i.e. they are very weedy or the cover crop needs to prevent soil loss over the winter). What characteristics might we care about when choosing cover crops? (Strong root structure, quick growing, a legume to fix nitrogen, spreading to smother weeds).

- Compost – Composting is the natural decomposition of plant or animal waste materials into humus, the organic component of soil. Basically, this happens because soil microorganisms, earthworms and other invertebrates eat up the waste, digest it and poop it out as rich, dark humus. The use of compost is one primary way to build and maintain soil structure, especially on smaller gardens or farm sites. On larger scale farms this does not work as well.

    - The natural composting process adds the organic matter to the mineral component (silt, sand and clay) in soil. This happens slowly on the forest floor, in wetlands, in meadows and in gardens. Ask for examples of natural composting that they have seen. (E.g.: moldy bread or rotting fruit)

    - People can speed up the natural composting process. They do this because composting:
        - Reduces yard and kitchen waste
        - Produces compost that benefits farm and garden soils because it:
            - Contains macro and micro nutrients needed by plants
            - Releases nutrients at the rate at which they are most beneficial to plants (less in spring, more as weather warms)
            - Binds with soil particles to form aggregates that hold water, add spaces to soil for aeration and drainage
            - Adds beneficial microorganisms, earthworms and insects to soil
            - Neutralizes soil toxins and metals
            - Buffers low and high pH

        - In order to speed up the composting process, a few key elements must be KEPT IN BALANCE.

            - Carbon/Brown Stuff – Dried leaves, straw, sawdust, cornstalks. This is the food (energy source) for the soil fauna to eat.

- Nitrogen/Green Stuff – Grass clippings, food scraps, manure, blood meal, green vegetation. This provides the activators that get the microorganisms working. Must be balanced with the carbon; if there is too much nitrogen the pile will be smelly.
- Oxygen – Most decomposers can't live or decompose without this. Without it decomposition slows down.
- Moisture – Needs water to keep soil fauna alive, but too much water will force the air out of the pile.
- Temperature – Microbial action (bacteria digesting the food) causes the temperature in the pile to rise. Ideally the pile should reach 160 degrees for 3-5 days. A hot pile is desirable because it breaks down faster and deactivates weeds and toxins.

• Once you have given some background information on compost, ask participants to investigate the pile. What types of organic matter do they see? Is it carbon or nitrogen? Use a compost thermometer to test the temperature of various piles. Which ones are hottest? Why? What is happening? How could you increase the heat in other piles? Have them turn over a cool pile and watch what happens to the temperature over the next few days. Record the temperature daily.

Activity 4 - Drainage Revisited – How Compost Helps

- Review the results of the drainage experiment that participants did in Workshop #1. They are now going to repeat that experiment and add compost to the soils to see what happens.
- Set up four mason jars with filters in the mouth. In one put in sand, and in one put in clay. Then ask two volunteers to mix compost with sand and compost with clay. Put these two mixtures into the other two filters.
- Pour equal amounts of water into the four filters and observe what happens. How does the addition of compost affect the drainage/water retention properties of the two soils? Why? How can it have the opposite affect on both soils? (It should increase the drainage of the clay and increase the water retention of the sand).