Worms and Compost

1. Activity – Looking at Worms
2. Compost Matters – Vermiculture and Garden Compost
3. Activity – Making Compost
4. Activity – Critters in Compost
5. The Sustainable Food and Feed cycle

This information has been prepared by Marin Master Gardeners in conjunction with Farm Day, 2010
Earthworms are invertebrates — they do not have backbones.

Like humans, earthworms have bilateral symmetry.

The prostomium, a flap that covers the mouth in some species, is a sensory device.

Earthworms do not have lungs — they can breathe through their skin as long as it stays moist.

Because earthworms do not have teeth, they use a gizzard to grind up large pieces of food.

Earthworms are hermaphrodites — their bodies contain both male and female reproductive organs.
2. Compost Matters

What is Compost?

Compost naturally occurs in woodlands and forests, or anywhere where organic materials fall on the soil to decompose. The decomposition process is aided by small organisms living in the soil. These organisms include worms, insects and bacteria, which break down the materials into rich, organic nutrients for growing plants. In addition the compost retains moisture and creates better structure for aeration and drainage in the soil.

By re-using organic matter as compost, it is possible to
✓ Improve soil quality for better plant growth
✓ Provide habitats for beneficial insects
✓ Create mulch to cover the soil and reduce water loss (so less water irrigation is used to grow crops)
✓ Reduce landfill

How to Make Compost?

Compost can be made in many ways, but essentially we do it by two main methods:

1. Vermiculture – where worms eat vegetable and fruit scraps, used tea bags, coffee grounds*. The worm casts produce fine, rich compost

2. Garden compost piles – Equal weights of browns, (carbon-rich dead leaves, twigs) and greens (nitrogen-rich grass clippings, vegetables and fruit) are left to decompose

*Note – do not use meat, dairy or high-fat foods such as salad dressing or nuts, as these will not only attract pests, but take a long time to decompose
COMPOSTING PROCESS

Greens

Water

Air & light

Browns

Soil organisms

COMPOST
3. **Activity – Making Compost**

This activity teaches children the concept of creating compost by recycling organic matter, in a clear, perforated, recyclable container.

Under ideal conditions the composting of organic materials requires five major factors:

- Food (browns and greens organic materials)
- Aeration (turning of materials speeds up decomposition)
- Water (moist, but not soggy, otherwise organisms die)
- Small pieces of material
- Bin or pile size that can retain heat during decomposition

At Farm Day the children can collect mixed greens and browns composting materials, and place in a recyclable clamshell container to take home.

Once the container is home, the materials should be moistened with water. The container should be left open and placed on bare soil in an area that receives morning sunlight. Further water can be added as the material dries. Occasional turning of the contents will help decomposition.
4. Activity – Critters in Compost

Children will be supplied with well-decomposed compost to examine using magnification devices called loupes, and asked to find and identify insects and organisms. Children will be asked to observe color, number of legs and other characteristics to identify the organisms.

Here are some of the some of the more common “critters” which will be present:

- **Sow bug** – 10 pairs of legs on a ½” grey, oval body with flattened plates. It is related to crayfish and lobsters. Breathes with gills so must live in damp, dark places.

- **Pill bug** – 10 pairs of legs on a ½” dark brown or black, shiny, oval body with flattened plates. It is very similar to a sow bug, but unlike a sow bug can roll into a ball if disturbed.

- **Centipede** – a pair of legs on each of the 15 - 137 segments belonging to a 1-2” reddish brown body. It moves very rapidly to eat prey, such as earthworms, which it kills with special poison.

- **Earthworm** – segmented, pale reddish body, with no legs. No eyes, but senses light and breathes through its skin. Creates tunnels to provide aeration and drainage in soil.

- **Ant** – 3 pairs of legs on a red, brown or black body. Like earthworm creates tunnels in soil, and moves soil into clumps. Helps decomposition process by breaking materials into smaller particles.
<table>
<thead>
<tr>
<th>Animal</th>
<th>Description</th>
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<tbody>
<tr>
<td>Earwig</td>
<td>3 pairs of legs, with a special pair of pinchers on the back of their brown, black 1” flattened bodies. Will eat other insects (living or dead)!</td>
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<tr>
<td>Springtail</td>
<td>Has 3 pair of legs, plus a special spring (furcula) on its abdomen to allow it to spring 3-4” in the air. The insect is less than 1/16” long and has a pair of antennae.</td>
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<tr>
<td>Ground Beetle</td>
<td>Has 3 pairs of legs on ½” long, black, shiny body. Has a pair of antennae and tough wings to fly. Preys on slugs, snails and soft insect adults and larvae such as caterpillars.</td>
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<tr>
<td>Fly larva</td>
<td>Legless grey, brown fleshy cylinder. Has mouth parts to chew decaying matter.</td>
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<tr>
<td>Snail</td>
<td>A mollusk with a shell and muscular belly, on which it crawls about. Also has a broad, retractable foot and head with two pairs of feelers. The longer feelers have eyes, the smaller are used to smell and taste food.</td>
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5. Compost in the Sustainable Food and Feed Cycle

Bees pollinate bean flowers

Beans for food → Beans growing → Beans as feed

COMPOST

ANIMAL WASTE

Soil bugs and worms make nutrients for beans to grow
- Bees pollinate the beans to create food for people and feed for animals (in this case cows)
- Cows consume feed, made of food processing by-products, corn, soybean, and minerals.
- People consume beans and make compost from bean scraps and other materials (browns and greens)
- Compost and animal waste is broken down in soil by micro-organisms (bugs and worms)
- Compost and decomposed animal waste is used to fertilize the field growing beans
- The dairy farmer harvests the field and feeds the harvest by-products to cows.

This is an example of a sustainable food and feed cycle which children visiting Farm Day can recreate.
Information Sources

Anatomy of a Worm Poster (University of Georgia)

Compost Matters
Growing Gardens from Garbage
Marin County Stormwater Pollution Prevention Program (MCSTOPPP)

Compost Critters
Junior Master Gardener Photos courtesy of J. Jackman and B. Drees,
http://insects.tamu.edu