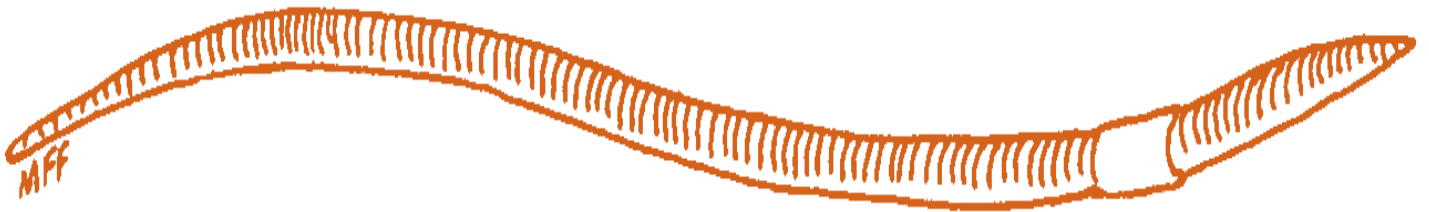


Worm Composting / Vermicomposting

with

Red Worm

“Eisenia foetida”



Information Packet

Red Worm

"*Eisenia foetida*"



Description:

There are many different kinds of worms and each of them do different jobs.

Composting worms often called Red Worms or "*Eisenia foetida*" (pronounced "i SEE nee a FET ida") love to eat organic waste. They can tolerate a wide range of temperatures, acidity and moisture conditions. They also reproduce very fast. They are tough worms.

Newly hatched worms appear as small white or pale red wiggly 1/8" - 1" long looking threads. It will take them around 2 months to reach maturity and be able to breed. They will grow in that time to be a dark red color and between 2 - 4" long. They only live approximately only one year.

Habitat

Red Worms in the wild will be found living in animal manure, decaying leaves, decaying grass clippings, and compost piles. The biggest requirement is that the materials they are living in need to be moist, have oxygen, food and favorable temperatures.

Temperature:

Red worms eat and reproduce the best between 55 and 77 degrees F.

Interesting Facts:

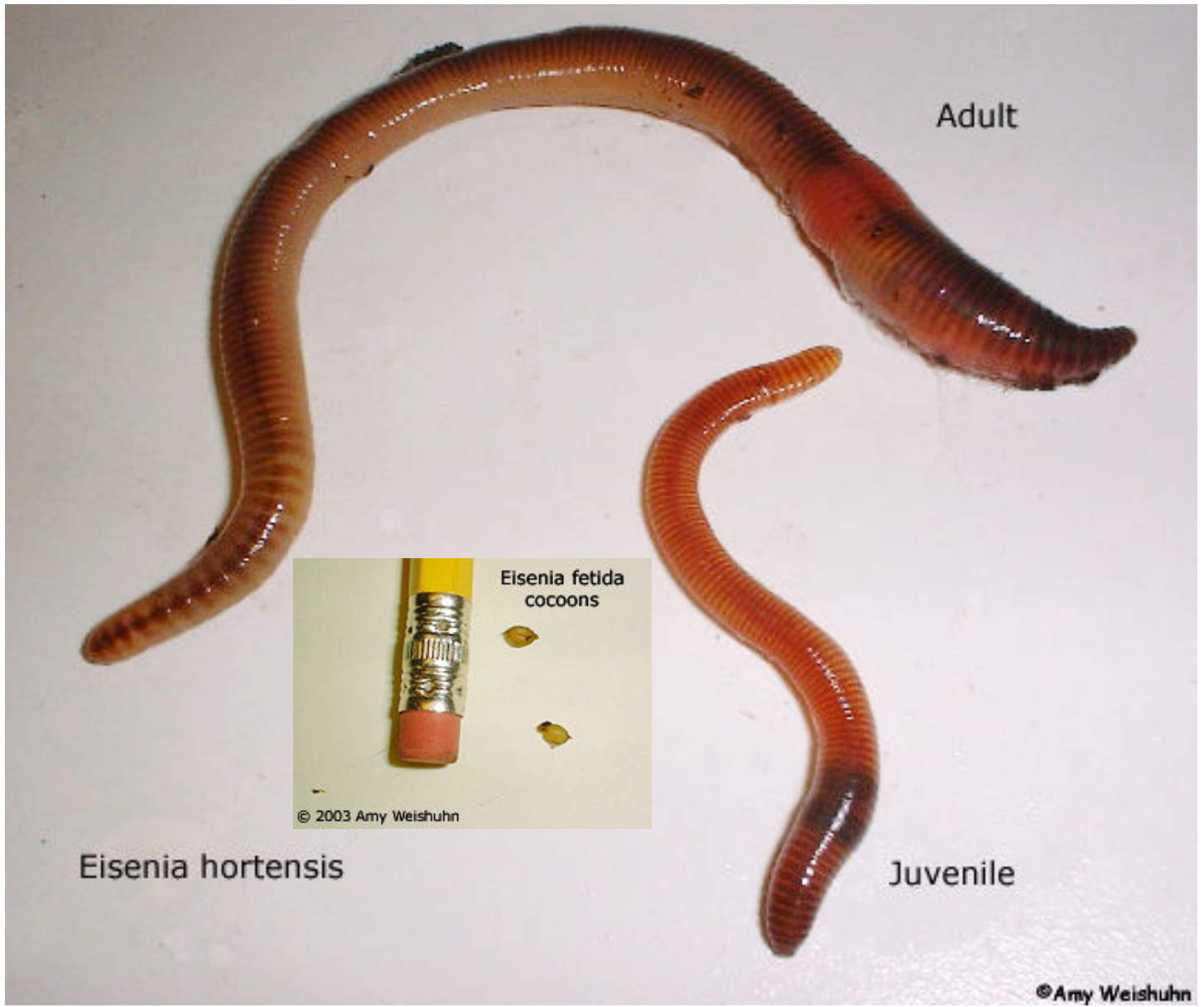
Worms have been around for about 120 million years.

Worms can survive in below freezing weather. They may freeze but as the temperatures rise they will begin to emerge again.

Worms can grow a new tail but not a new head.

Worms help increase the amount of air and water that gets into the soil. They break down organic matter and leave behind casting that are a very valuable type of fertilizer.

Worms have 5 hearts.



More Worm Fun Facts:

Feelings:

Worms do not feel happy and sad but they sense differences in light and touch. They can tell if their home is to wet or dry, to acid or to neutral. They also like to eat certain foods over other.

Eating Worms:

Many things eat worms. Birds, toads, frogs, moles, skunks, foxes, beetles, slugs, snakes, fish, flatworms and more.

Breathing:

Worms need oxygen just like all people and many other living things do to survive. Worms take oxygen into their body through its wet surface. The oxygen goes into its body is used by the worms organs. The organs then give off carbon dioxide, which goes out of the worm through its wet skin surface.

Brains:

Worms do not have a brain like people brains; rather they have a large nerve that runs all along their entire body with a clump of nerves at the head end. This nerve clump though not a brain does control the worm's actions.

Stinky?:

The Latin name for Red Wiggler (*Eisenia foetida*) means "stinker." It has the name because it loves to live in stinky manure piles in the wild. The truth is that if Red Wigglers are properly taken care of they and their home will have almost no odor.

Age:

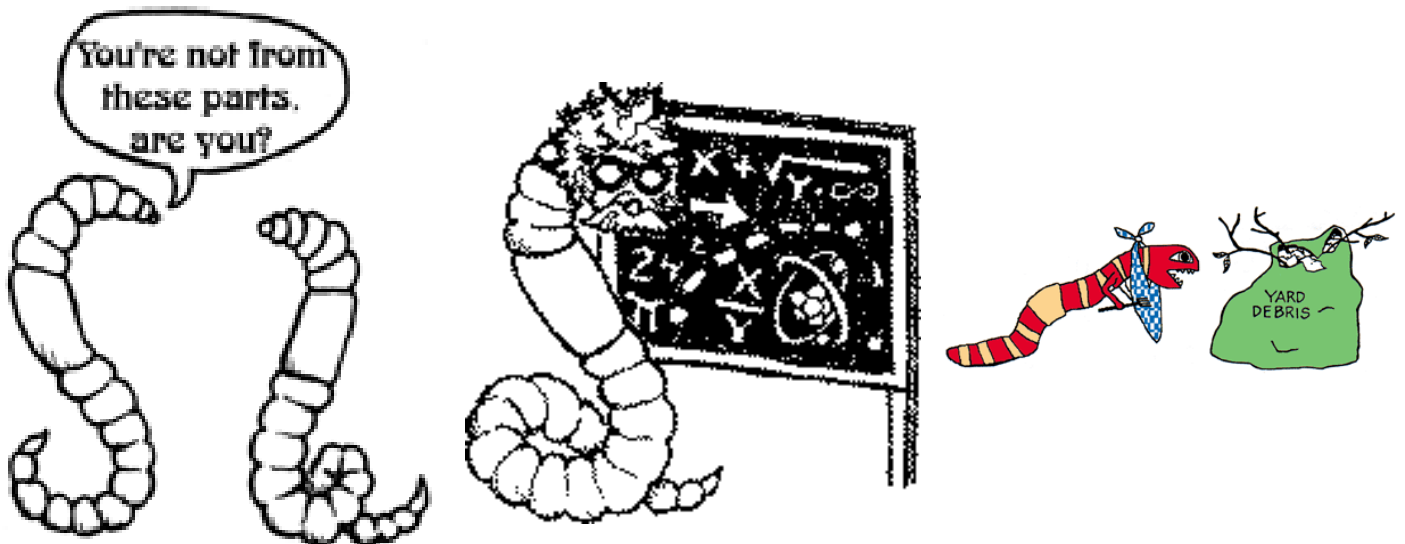
In the wild, most worms do not live more than a year at the longest. Worms in a worm bin that are properly taken care of can live up to four years old.

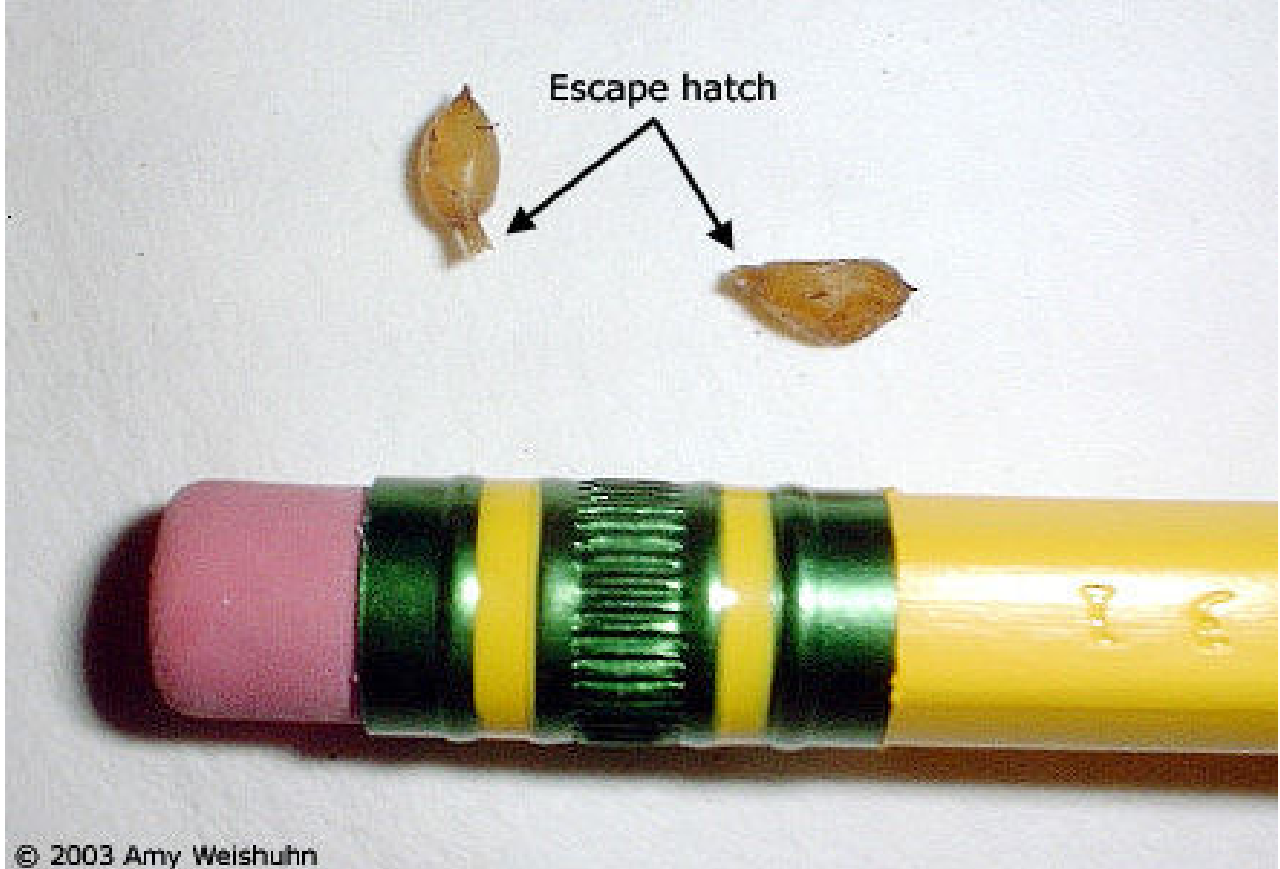
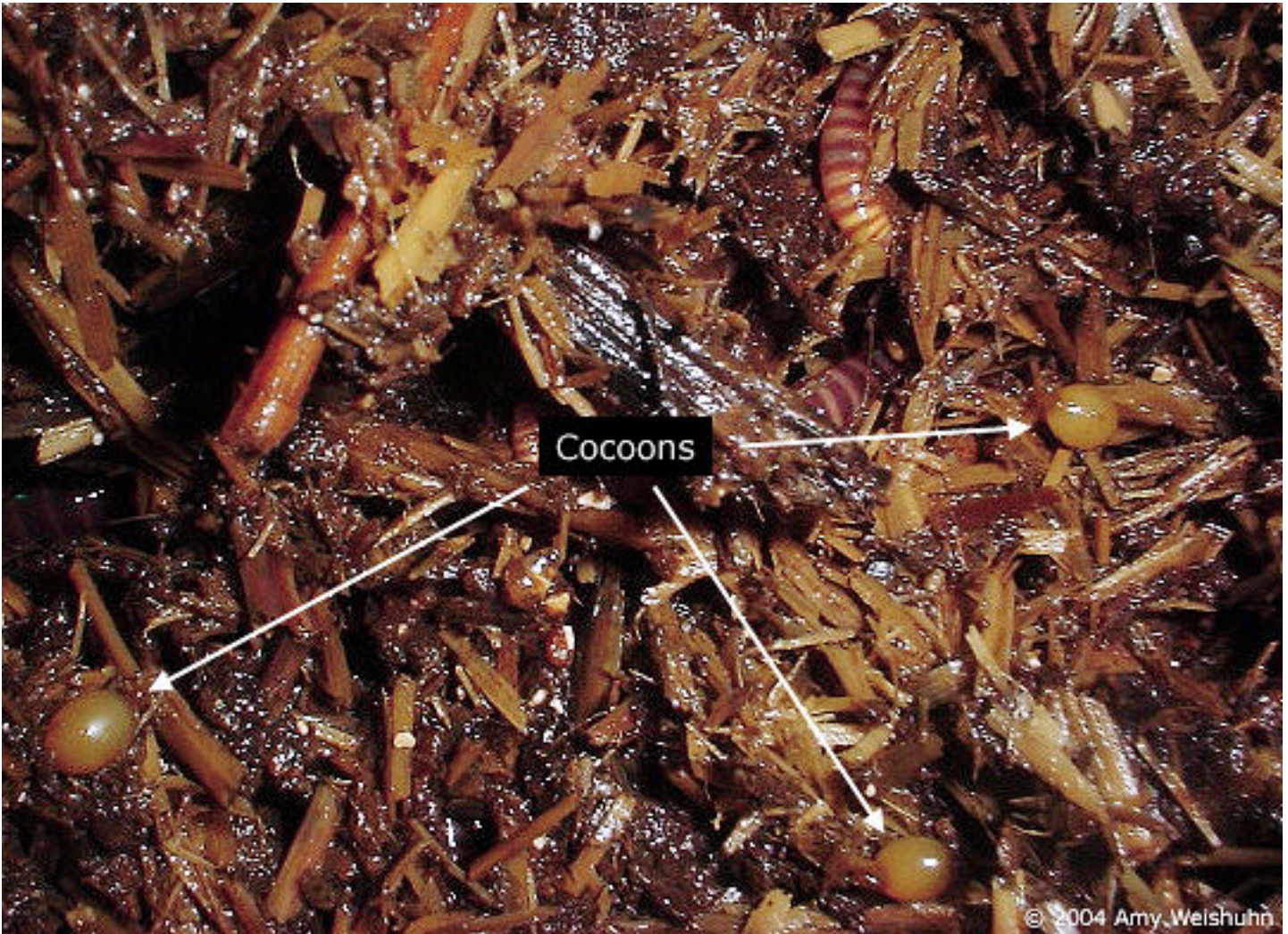
Casting:

Worm casting are dry and odorless, easily absorb moisture and reduce unpleasant smells. That is why many people use their worm casting or worm casting in general as cat litter.

Eyes:

Worms do not have eyes or a nose. However, they can sense light and vibrations from sound.

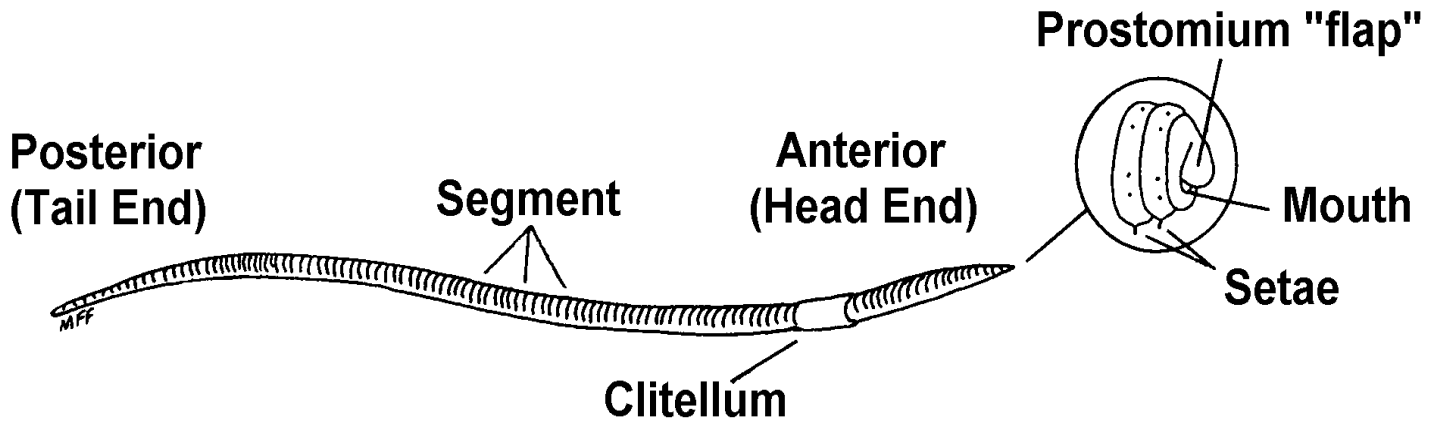




Red Worms

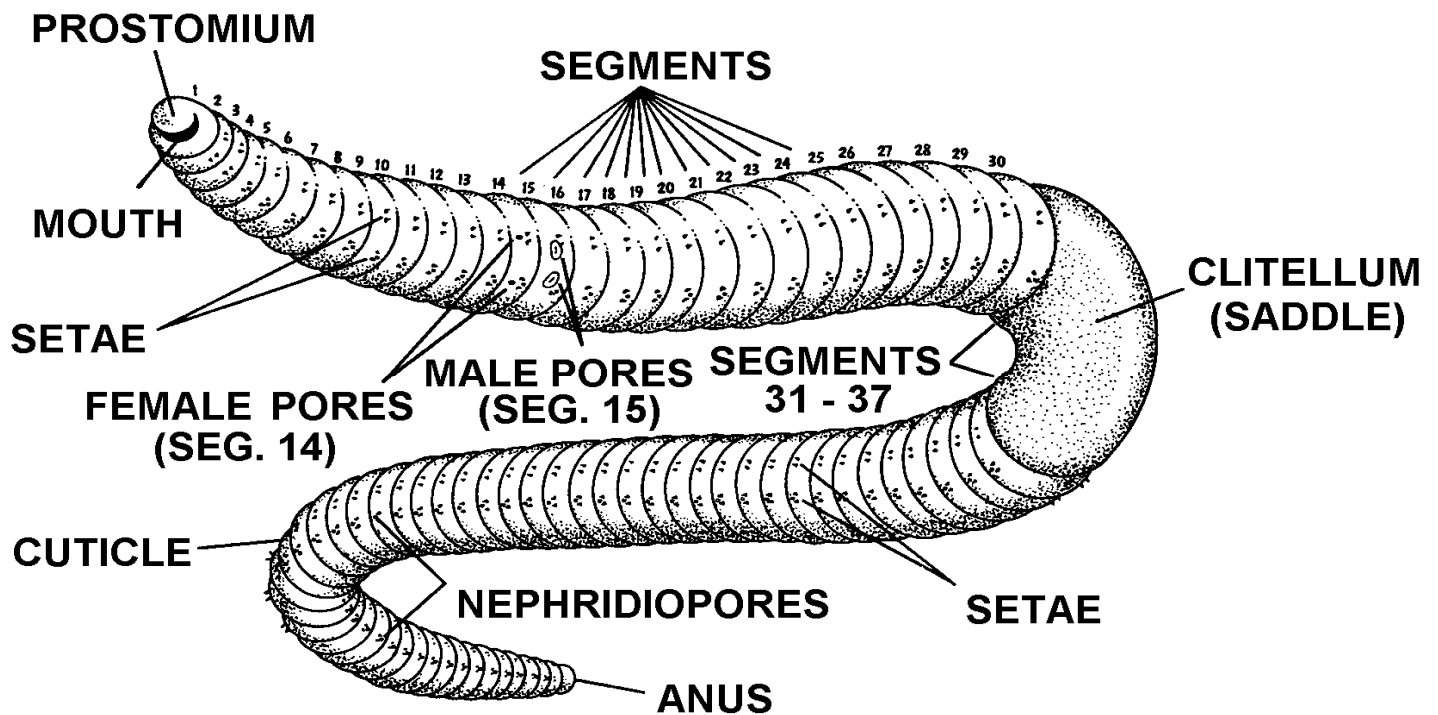
Eisenia Fetida

Body diagram:

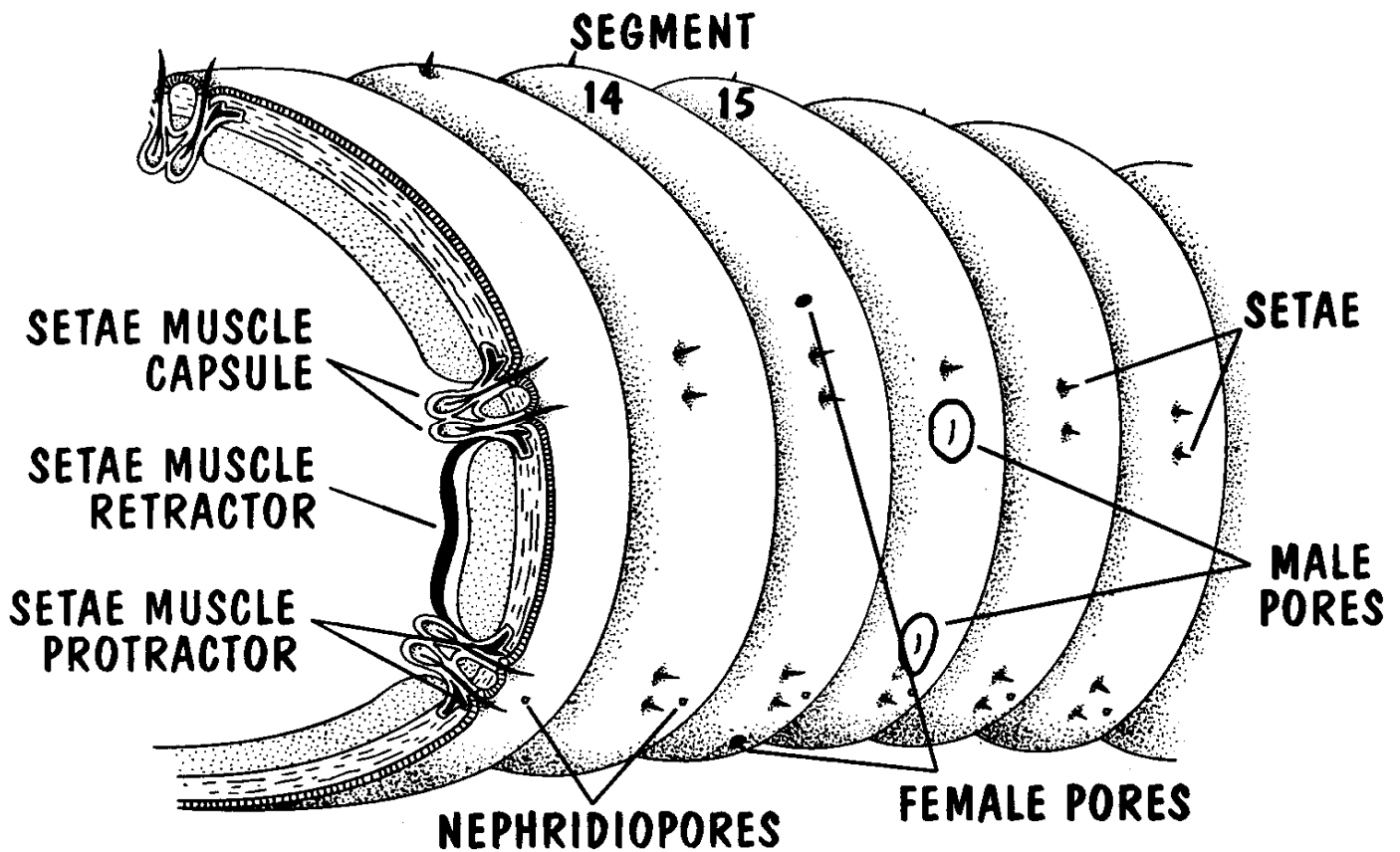


External Features:

External View of Worm Anatomy.

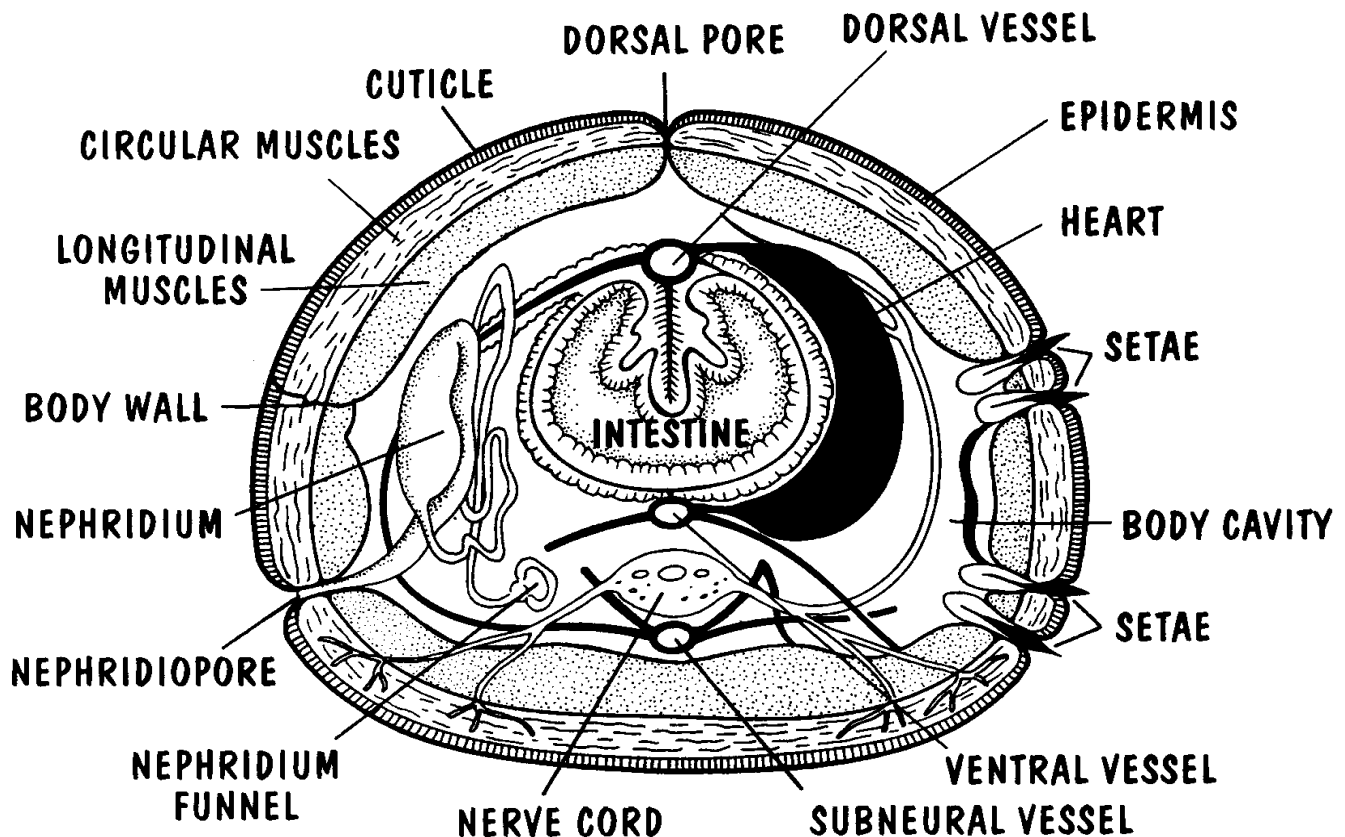


Ventral Surface of worm (counter clock wise rollover):

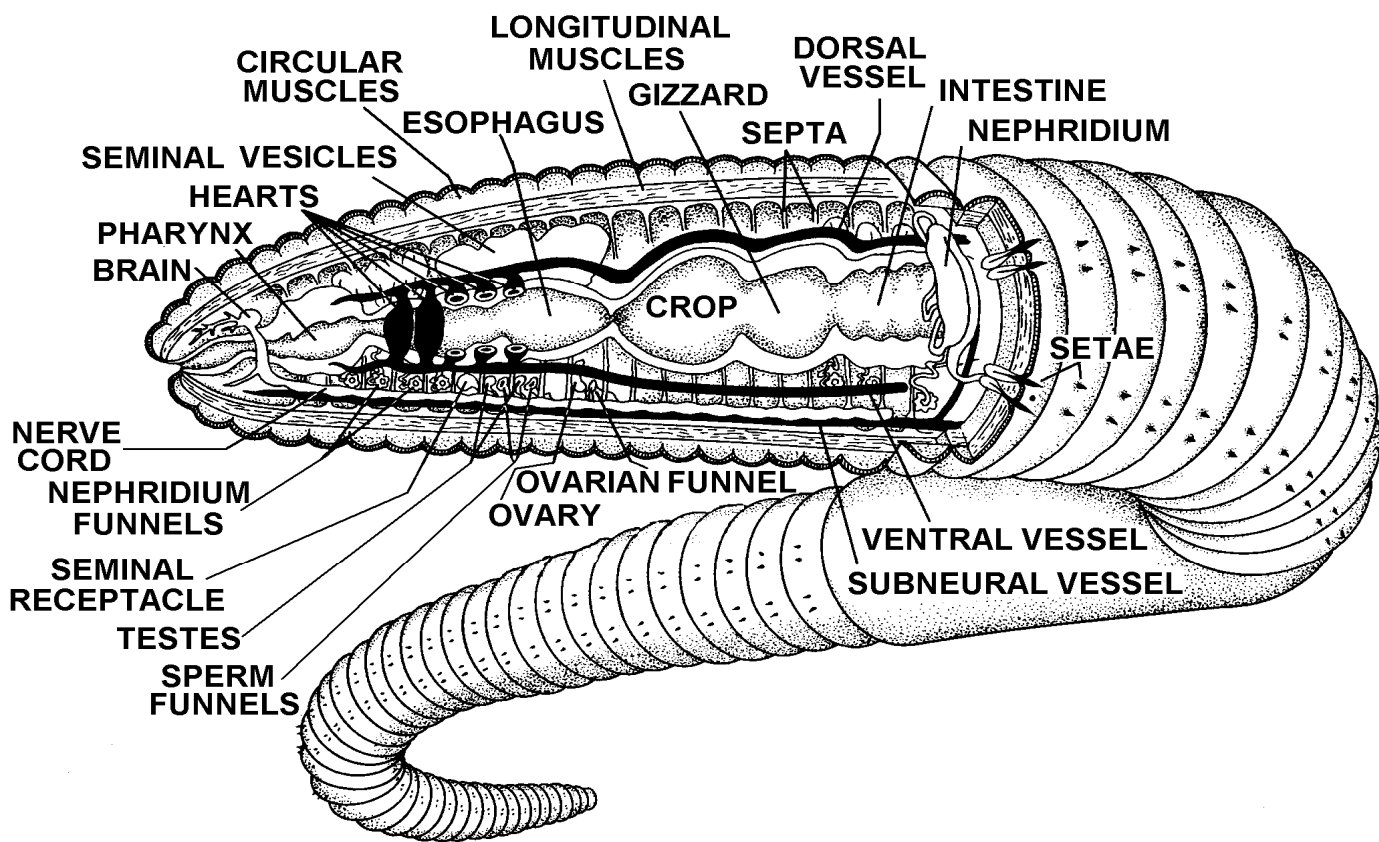


Internal Systems:

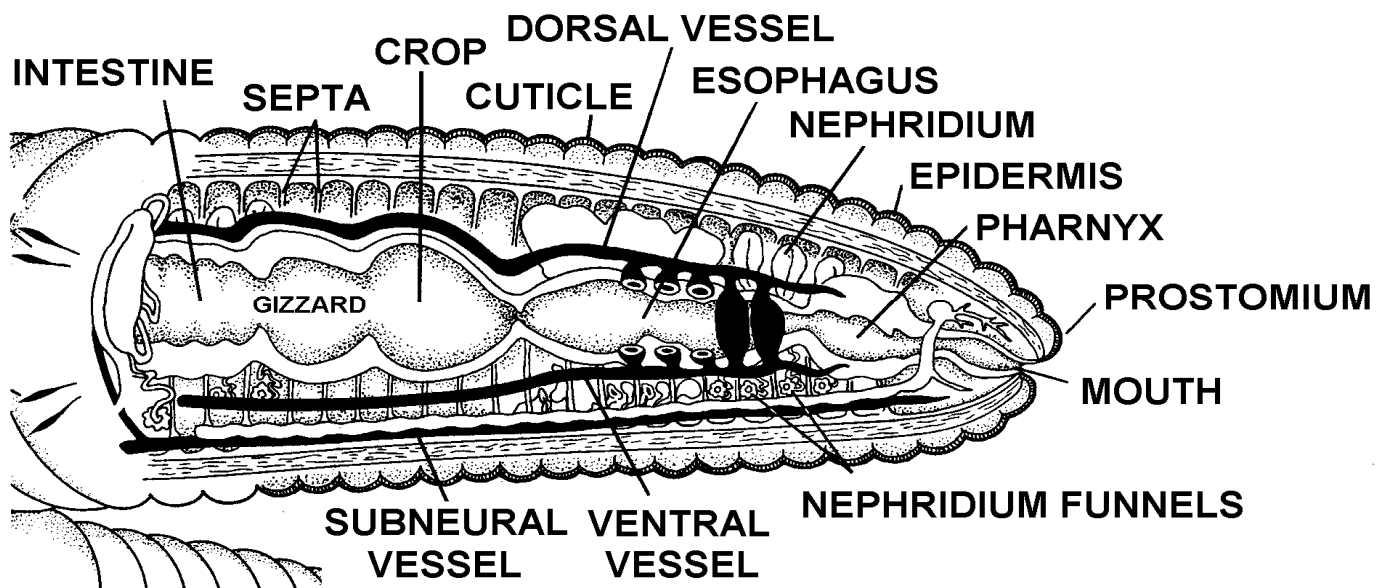
Musculature of a worm.



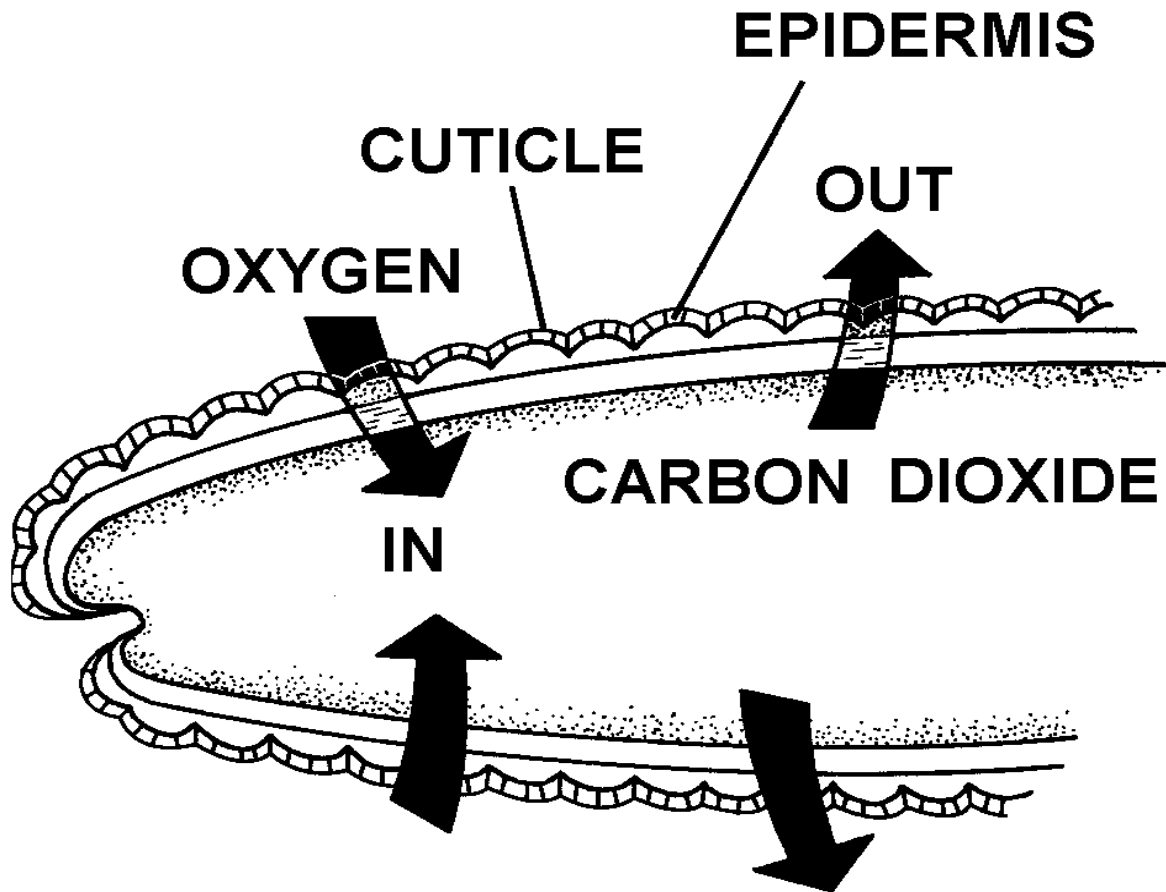
Internal Organs of worm:



Gizzard Location:

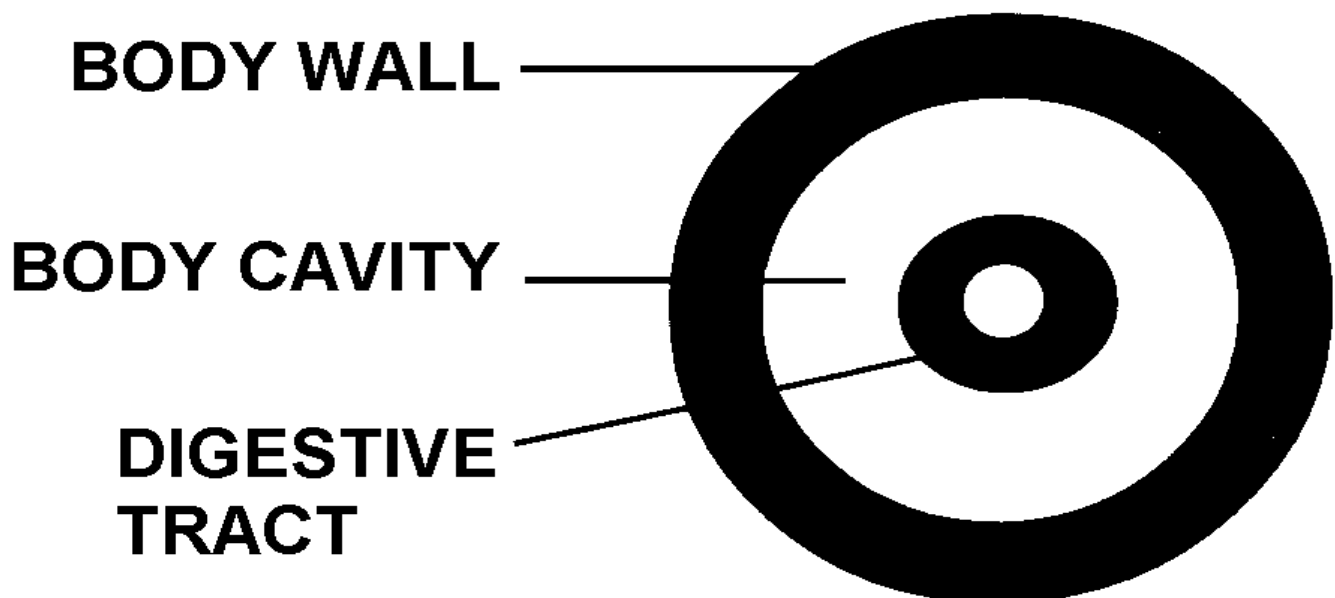


Respiratory System of worm:



Cross-section of worm body:

The cross-section looks like an archery target of three concentric circles.



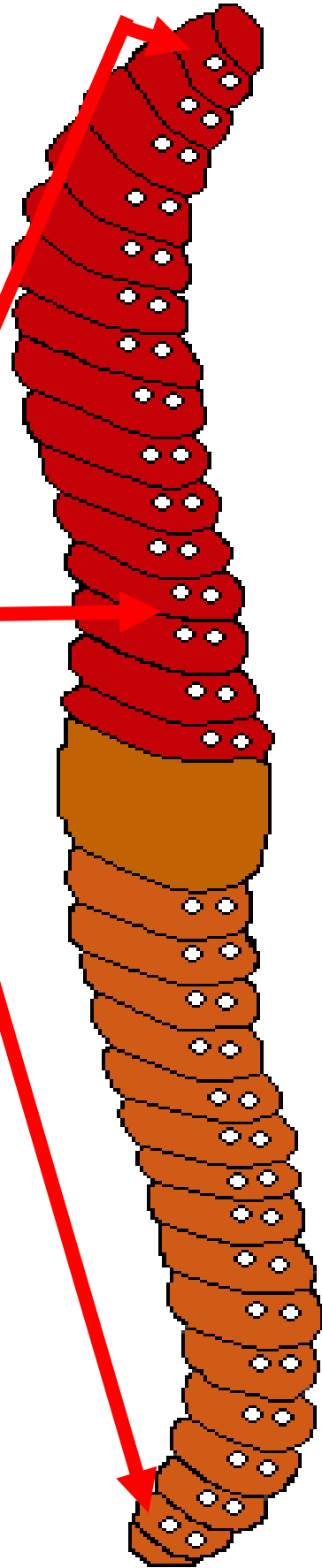
Setae:

If you were too gently, touch a worm. Its pink or brown body is covered with thin, moist skin. If you were to carefully rub your finger over the bottom of the worm, you might feel bristles. On an earthworm, you would even be able to see them with a magnifying lens. Nerves are attached to these tiny bristles, causing them to respond quickly to light, touch and vibrations. This same system enables them to sense your footsteps or those of a hungry bird above them! The setae also help the worm move forward and backward.

ACTIVITY!

Gently touch the worm drawing. Carefully rub your finger up and down between the arrows pointing from the words TOUCH the Setae!!!!

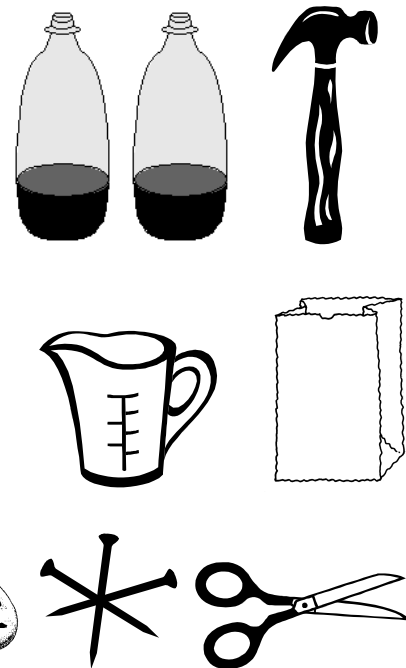
TOUCH the Setae!!!!



Making a Worm Composting Column

Materials for Making One Column:

- 2 = 2-liter bottle, one bottle for the base and one bottle for the top
- One large brown paper bag or a 10" X 16" sheet construction paper
- 1/8 pound of Red Worms
- 4 - 5 Full Pages of Newspaper
- Organic leftovers from your kitchen, garden or yard, especially plant material
- Egg shells, crushed up very fine and/or Calcium carbonate
- One piece of scrap wood
- Hammer
- Scissors
- Awl or 5 - 10 2" galvanized nails
- Ice cream sized bucket
- Water
- 1/4-cup dry goods measuring cup
- 1 cup wet goods measuring cup
- Scotch or Masking Tape
- Permanent Marker
- 2' X 2' sheet of plastic



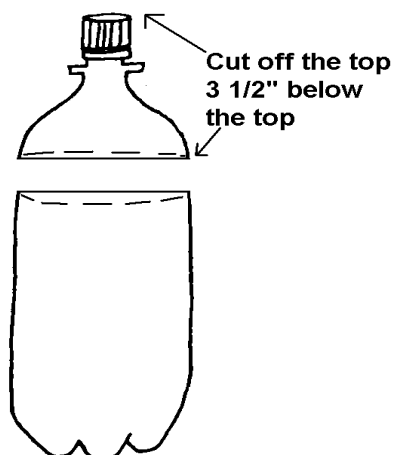
Constructing the Column:

1. Remove the labels; clean the inside and outside of both 2-liter bottles.

2. Take one of the 2-liter bottles and draw a line 3 1/2" below the top all the way around the bottle.

Then carefully cut the bottle along the line.

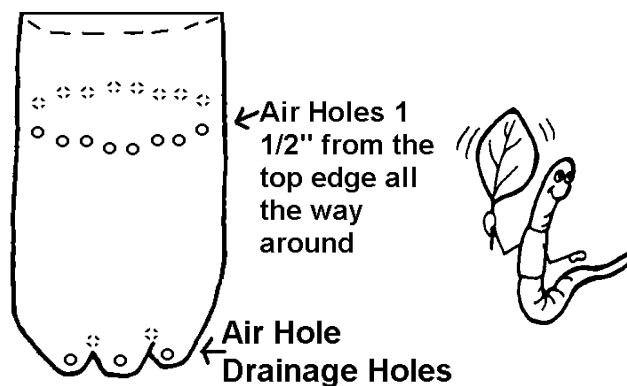
The lower part of the bottle becomes the bottom of the worm column and the top you can keep and use for a home made funnel or recycle.



3. Now carefully make nine air and drainage holes using the awl or nail, hammer and a piece of scrap wood in the bottom of the column.

Then draw a line 1" down from the top of the column. Then carefully make a line of air holes along this line...

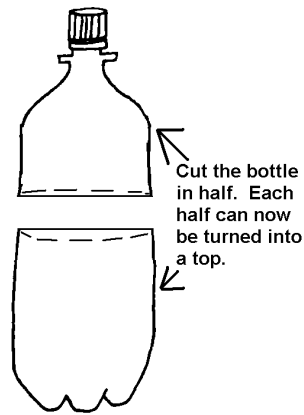
You can do this by laying the column on its side on top of the scrap wood. Then push the one side of the column down on top of the other side of the column. Then take an awl or nail and using the hammer, pound a whole through both sides of the column. Place the holes as evenly as you can all the way along the line on the column.



4. Now take the second 2-liter bottle and make a line halfway between the top and the bottom of the bottom.

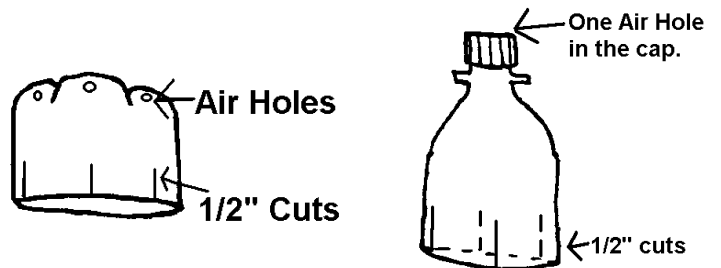
Then carefully cut the bottle in half along the line.

Now you can use both the bottom of the bottle and the top too make tops for two different worm column's.

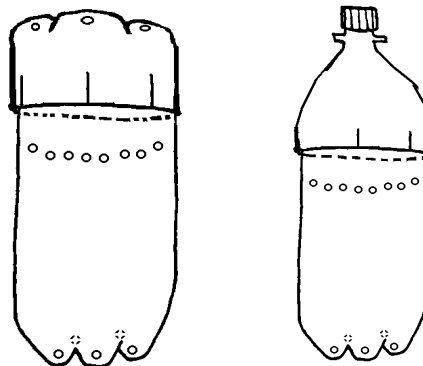


5. Now carefully make several air holes in the bottom of the old bottle bottom using the awl or nail, hammer and scrap wood. Then take the bottle top off of the old bottle top and put an air hole in it too. Then screw the top back on.

Then make four 1/2" cuts equally spaced around the cut edge of both new worm column tops.

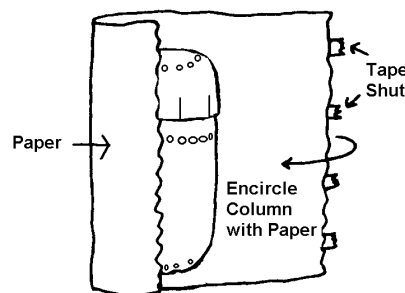


6. Now carefully put the top onto two different bottoms.

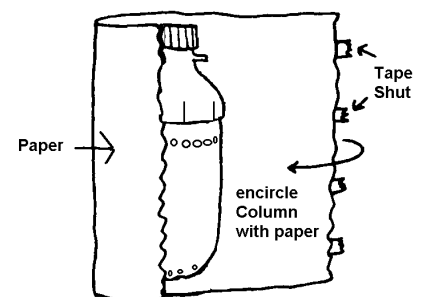


7. Then cut your bag or paper so it will encircle the column and extends about 1" higher than the top. Tape the paper around the column but leave it loose so you can easily pull it up.

Worms like to live in the dark that is why you want to encircle the column in paper. If you want to see the worms all you have to do is carefully pull up the paper and look quickly before they crawl away from the light.



8. Now you are ready for the next step of putting in the bedding (see "Bedding for Red Worms"), food, calcium (see "Feeding Red Worms" & "Red Worm Food List"), and the worms (see "Resources").



Bedding for Red Worms

Bedding is designed to hold moisture, provide a medium in which the worms can work and a place to bury the waste. Bedding must not be toxic to the worms. It should be light and fluffy, two conditions necessary for air exchange throughout the container to help keep offensive odors under controlled.

TYPES of BEDDING:

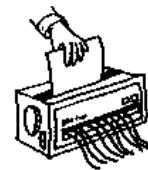
Black and White newspaper, White paper, Leaves, Animal Manure's mixed with Paper or other types of bedding listed, Coconut fiber, Wood chips, and Peat moss are all recommended types of bedding. Most people find it easiest to use Black and White newspaper or White paper. All types of paper needs to be shredded into thin strips and moistened. Leaves also must be moist, but not too moist for they will easily rot in the bin if they are too moist. Animal Manure needs lots of special preparation that only the books about worm composting can teach you. Coconut fiber can be expensive. Wood chips dry out fast. Peat moss is also expensive and a limited resource. Just remember any bedding you use must be moist like a damp sponge. This information packet recommends using Newspaper.



Peat
MOSS

Making Newspaper Bedding:

1. Cut, rip, or shred 4 - 5 Full Pages of newspaper into 6 - 12" long and 1/4" wide strips.



2. Put 2 - 3 cups of water into a bucket.

3. Add a small handful of newspaper into the bucket of water, getting the paper totally wet.

4. Remove the newspaper from the water and gently squeeze the water out.

5. Then take the sponge damp newspaper and carefully fluff it until all of the strips are separated as much as you can. Fluffing the paper helps to make sure there will be air exchange to help control odors and provide oxygen to the worms and bacteria.

6. Place the fluffed strips carefully into the worm column making sure you do not pack it in tight.

7. Add enough paper to make a layer that is 1 - 1 1/2" deep.

8. Add food and crushed up eggshells or other form of calcium. (See "Feeding Red Worms" and "Red Worm Food List")

9. Continue to add the sponge damp fluffed strips into the worm



column up to the top air holes of the column.

10. Now you can add the worms on top of the bedding. Leave the lid off and the paper cover off until the worms have all burrowed down into the bedding.

11. Once the worms have burrowed down make sure you put the paper cover over the column.



Feeding Red Worms

DO PUT INTO the WORM BIN:

Any vegetable, fruit, or vegetative waste that is generated in food preparations or is left on someone's plate after they have eaten can be put into a worm bin. Spoiled food from the refrigerator, like baked beans, moldy cottage cheese, or leftover casserole can go into the bin also.

Cow, Horse, Rabbit, Lamb and Goat manure that is at least three months or more old can be put into the worm bin.

[See the page labeled: Red Worm Food List]

Additions to Bedding and Food Waste that will need to be added to the Worm Bin bedding:

Soil: In nature Red worms live in decaying vegetation like fallen leaves or manure piles, or under rotted logs. You will only find red worms in soil when there are high amounts of organic materials in the soil. But they do need some soil for grit; the grit helps them break down their food within their gizzards.

Calcium carbonate: Powdered limestone can also provide grit. It also helps keep the bin from becoming to acidic, and provides calcium the worms need to reproduce and survive. You can use the calcium carbonate they mix with animal feed or the kind they use to line the athletic fields, or pulverized eggshells. DO NOT USE slake or hydrated lime as this will kill the worms.

DO NOT PUT INTO the WORM BIN:

Just remember not to put too much good food into you worm bin. For example if you were to put lots of orange peels into the bin it would build up a material that is found in the peels that can be toxic to the worms in high concentrations.

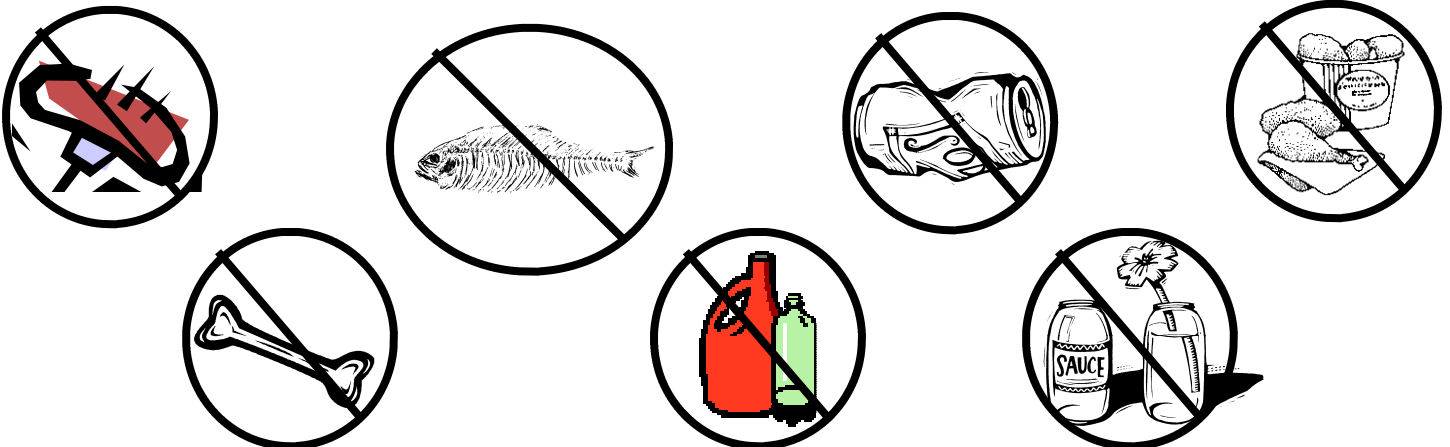
You should also not put more food into the bin than the worm can eat in a day because the extra food can start to mold and spoil causing a bad order.

You also do not want to put very much meat into the bin because it puts off offensive orders when decomposing and can attract unwanted critters.

Bones should also not be put in because the sharp edges can cause injury to someone mixing up the bin and well attract unwanted critters.

Dog, Cat, Bird and human waste is also a BIG NO; too many unwanted germs that can be passed on to the handlers of the worm bin.

Do not put plastic, metal, glass, or any thing else that is non-biodegradable into the bin.

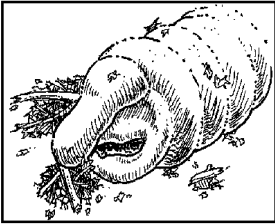


How to Feed Worm in a Worm Column:



With “worms as pets” you can go away and do not have to make boarding arrangements with a kennel, vet, friend, family member or a neighbor. You can leave for up to two weeks with out worrying about your worms. If you do plan to be gone for a month or more or want to turn your heat off while you are gone during the wintertime you should find someone to take care of your worms for you. Worms just need tender loving care and respect. The less you disturb them the better.

Your worms will need to be feed once every week or every other week depending on what you have feed them in the past. Sauced or very soft 1/4 - 1/2 “ pieces of fruit or vegetables are recommended to make it easier for the worms to eat because they have no teeth.



A worm eats by taking the pad that is above its mouth and stretching it out searching for food. When it finds food it pulls the food into its mouth, then starts to suck or pump the food into its pharynx, it will then closes the pad over its mouth when it is done eating.

← Worm Mouth with its pad stretched out searching for food.

Look at the list of foods your worms will eat included in this packet (“Red Worm Food List”). If it will be more than two days before you need to feed the worms then put the leftovers or scraps in a container in the refrigerator. If it will be longer than two to three days you might want to put the leftovers or scraps in the freezer. On the day you need to feed your worms take the food waste out of the refrigerator and put it onto the counter to warm up to room temperature. If you are taking it from the freezer you might want to take it out and put it in the refrigerator for a day or two and then put the waste onto the counter to warm up to room temperature.



You can feed your worms in the column one of two ways:

1. The first way you can feed your worms is to dump the whole column into an ice-cream bucket. Carefully mix the bedding and worms up, if you need to add moisture do so with a mister bottle carefully until everything is sponge damp again. Then carefully add one inch of the fluffed bedding and worms back into the column making sure not to pack the bedding.

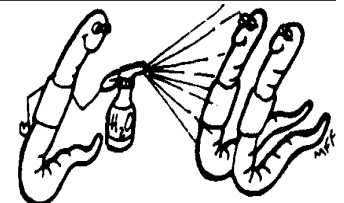
Then put 1/4 cup of 1/4 - 1/2” cut up pieces or 1/4 cup of sauced vegetables or fruits on top of the bedding in the column. You also need add crushed up eggshells or calcium carbonate at this time. Then put the remainder of the bedding and worms back into the column making sure the paper stays fluffed.

2. The second way to feed your worms is to take all of the bedding and worms out but the bedding at the bottom that is already full of vermicompost (worm poop), uneaten food and worms. Put the bedding and worms that you take out carefully into a bucket. Then carefully mix up the bedding and worms you have removed making sure that it is moist enough but not too moist.

Then put a 1/4” layer of bedding and worms on top of what you have left in the column. Then put 1/4 cup of 1/4 - 1/2” cut up pieces or 1/4 cup sauced or vegetables or fruit on top of the bedding in the column. You also need add crushed up eggshells or calcium carbonate at this time. Then put the remainder of the bedding and worms back into the column making sure it is fluffed.









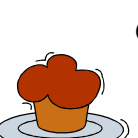
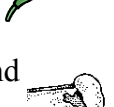






When you are done feeding the worms and have all of the bedding back into the column, if the height of the bedding is not up to the air holes on the side of the column, add moist bedding until the level reaches the air holes.

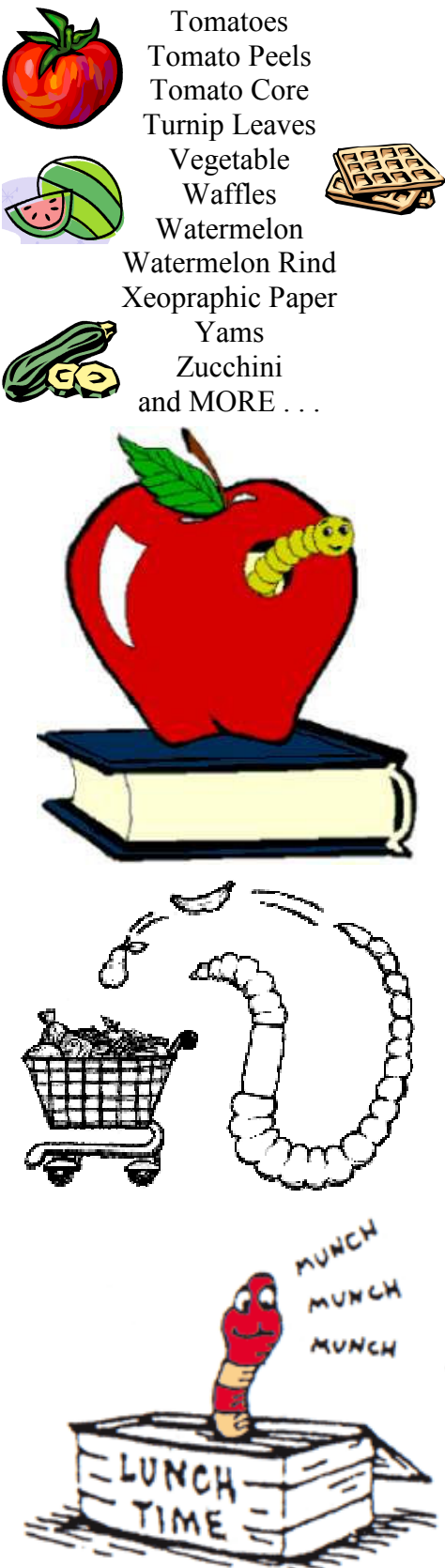
If the bedding is to moist you can pour it out into the ice cream bucket and let it sit for a day all fluffed to dry out until it is sponge damp.



Red Worm Food List

Here is a list of some of the things that many people throw away in their trash can or grind up in their garbage disposal that Redworms in a worm bin would love to eat.

	Apple		Grapes		Tomatoes
	Apple Core		Grapefruit Peels		Tomato Peels
	Apple Peels		Green Beans		Tomato Core
	Apple Sauce		Grits		Turnip Leaves
	Apple Pie		Jam		Vegetable
	Artichoke		Jelly		Waffles
	Asparagus		Ketchup		Watermelon
	Baked Beans		Lemon		Watermelon Rind
	Banana		Lemon Peels		Xeographic Paper
	Banana Peels		Lettuce		Yams
	Beets		Lime Peels		Zucchini
	Biscuits		Malt-o-Meal		and MORE . . .
	Blueberries		Molasses		
	Bread		Nectarine		
	Bread Crust		Oatmeal		
	Broccoli		Onion		
	Broccoli Stalks		Onion Peels		
	Cabbage		Onion Leaves		
	Cake		Orange Peels		
	Cauliflower		Pancakes		
	Cauliflower Stalks		Peach		
	Carrots		Pears		
	Carrot Tops		Pear Core		
	Casserole		Pear Peels		
	Celery		Peas		
	Celery Tops		Pea Pods		
	Cereal		Pepper		
	Cherries		Pineapple		
	Coffee Filters		Pineapple Rind		
	Coffee Grounds		Pizza Crust		
	Cookie		Potatoes		
	Corn		Potato Chips		
	Corn Bread		Potato Peels		
	Corn Cobs		Pumpkin		
	Cracker		Pumpkin insides		
	Cream of Wheat		Radish		
	Cucumber		Raspberries		
	Cucumber Peels		Rice		
	Cup Cakes		Spaghetti (in small amounts)		
	Doughnut		Squash		
	Egg Plant		Squash Rind		
	Egg Shells		Strawberry		
	Egg Plant Skin		Strawberry Stem		
	French Fries		Tea Leaves		
	French Toast		Tea Bags		



Harvesting:

After a while you will start to really see a build up of vermicompost either mixed up with the bedding if you are feeding the worms using the first method or at the bottom if you are using the second method of feeding.

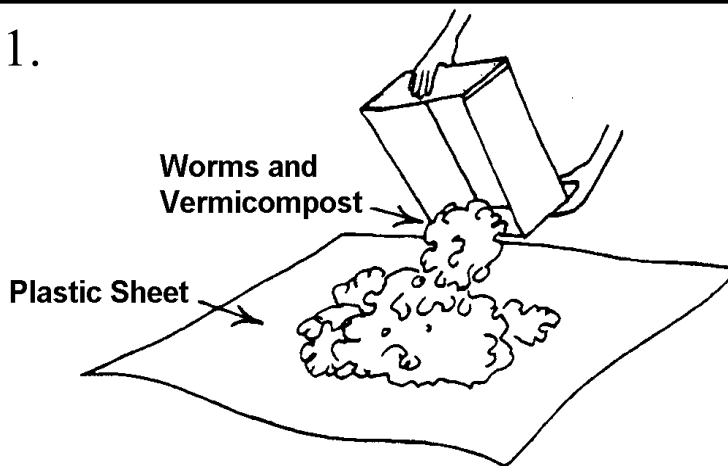
If you are feeding using the first method and there seems to be more vermicompost than paper it is time to harvest the vermicompost.

If you are feeding using the second method and the layer of vermicompost is up to 3 - 4" deep it is time to harvest the vermicompost.

Harvest the vermicompost before you feed the worms.

1. If you are doing the second method of feeding you will have cleaner bedding at the top of the column. Take this cleaner bedding out and put it and the worms in it into a new column or into a bucket. Once you have the top cleaner bedding removed you will need to dump the remaining vermicompost, bedding and worms onto a sheet of newspaper or plastic.

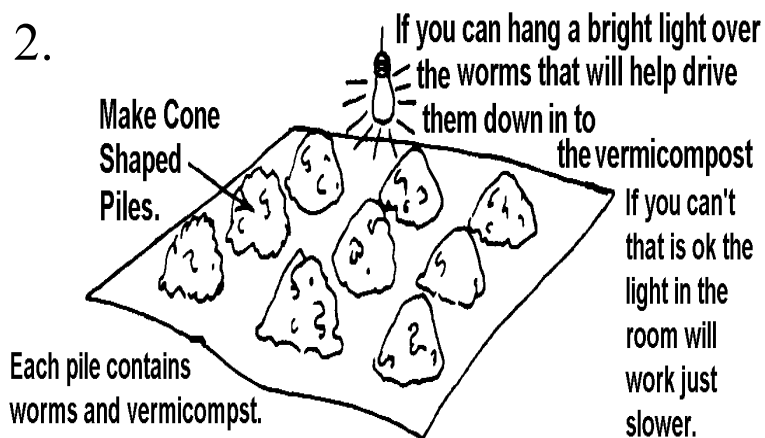
1.



If you are doing the first method of feeding you will have to carefully dump the whole column on to a sheet of newspaper or plastic.

2. Divide the pile of vermicompost, bedding and worms into equal smaller piles, as many as you can make on top of your sheet of newspaper, plastic or plastic bag.

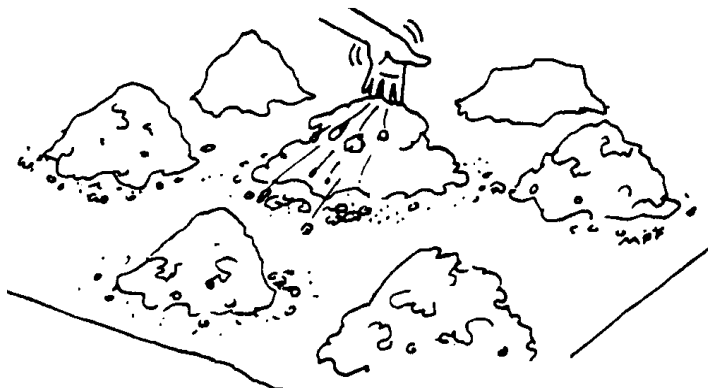
2.



3. While you wait for the worms to crawl down into the vermicomposting you can clean out your column carefully and put new bedding and food into it. (see "Bedding for Red Worms", "Feeding Red Worms", Red Worm Food List") If you want to you can also make a new column at this time. (See "Making a Worm Composting Column")

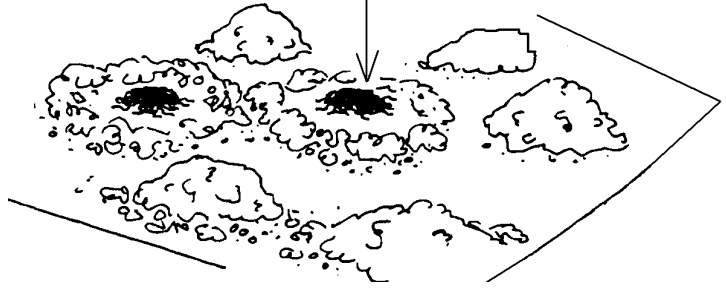
4. Come back to your smaller piles and carefully remove the outer layer of vermicompost, food waste and bedding. Try not to pick up any worms, if you do put them carefully into your column that has new bedding in it or put them back into one of the small piles of worm. If you see any cocoons you can put them into your clean worm column or columns.

4. **Worms go to the bottom of each pile to avoid light. Carefully remove the top and sides of the piles.**



5. After carefully removing the outer layers of vermicompost, leftover food waste and bedding over and over from each pile you will finally end up with several small piles of mostly worms and rings of vermicomposting.

5. After removing the vermicompost you will find masses of worms at the bottom of each pile.



6. Now carefully place all the "pure worms" into your worm column(s), another worm bin or empty container.

If you put the worms into an empty container you can weigh them to see how many you have.

If you have lots of cocoons and worms or just lots of cocoons you might want to put only about 1/4 of the worms you have back into the clean fresh bedding column. If you have a few cocoons you might want to put around 1/2 of the worms back. If you have no cocoons but seem to have more worms to you than you had before than you can decided how many worms you want to put back into the worm column.

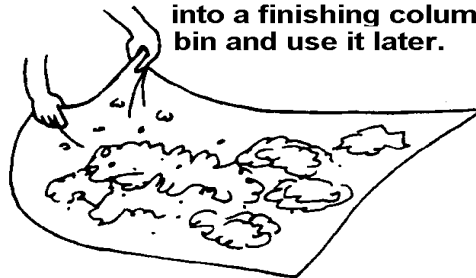
(See What to do with the extra worms!)

6. Place "pure worms" in a container. If you want you could now weigh them to see how many there are.

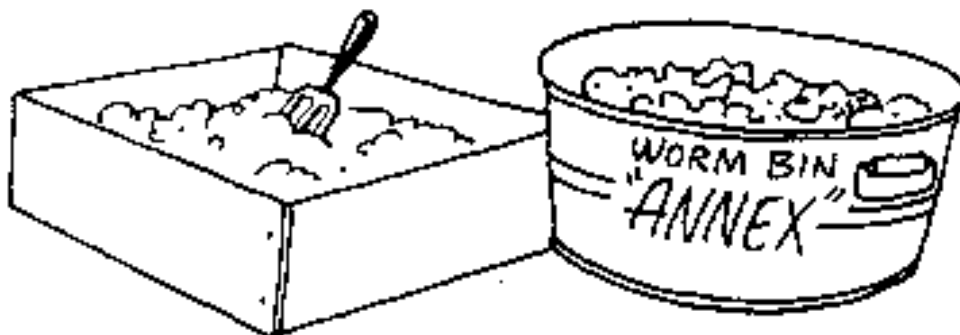


7. Once all of the worms are off of the plastic you can now pour your vermicompost into either an empty worm column or an annex bin so it can finish composting or you can use it right away. **(See What to do with the Vermicompost!)**

7. Save the vermicompost either to use in your garden and plants or you can put it into a finishing column or bin and use it later.

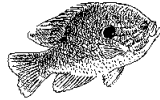


7.



What to do with the extra worms!

You can feed them to an animal who eats them, pick out the biggest ones and go fishing, give some to a friend to start their own worm column or bin or you could start a new one yourself.



What to do with the Vermicompost!

You can chose to use this vermicompost right away or you can let it sit a while. Letting it sit will allow any left over food or paper to break down more, cocoons that have not hatched to hatch, and baby worms missed to grow bigger so you can see them. If you use your vermicomposting in your inside, plant pots you might find worms living in the pots weeks later and that is ok.

If you choose to let your vermicompost sit, first make sure the vermicompost that you put into the finishing column is damp sponge wet. You can do this by dumping it into a bucket and misting it until it is moist. If it is to wet, you can dump it onto some newspaper to dry out.

Once the vermicompost is sponge damp, put it back into the finishing column or annex bin. (If you find some worms or cocoons, you can take them out and put them into one of your column or worm bins.)

Let the vermicompost sit for six weeks, to let any cocoons that have not hatched to hatch and to give any baby worms that you did not see time to grow so you can find them easier. Do check the column about once a week to make sure that it is sponge damp. You can also add some soft food in small amounts when you check the vermicomposting at two weeks and four weeks. To add food, dig a shallow hole or trench in the vermicomposting and place the food in the hole. Carefully cover it with vermicomposting. If you find any worms or cocoons at this time, put them into one of you columns or worm bins.

Then once six weeks is over, dump the column on paper or plastic into small piles just like you did when you cleaned out your column before. (See "Harvesting") If you seem to have a lot of little worms you can put them into a new column or an old column.

Now you can take your finished vermicompost and do lots of things with it.

- * Add it to your garden before planting to make the soil full of good natural fertilizer.
- * Add it to your potting soil before planting or replanting a houseplant.
- * Add it on top of the soil around your garden or house plants.
- * Sprinkle it all over your yard.
- * Give it to a friend who needs good natural fertilizer for their plants.
- * Make worm tea and water you plants with this great free fertilizer.



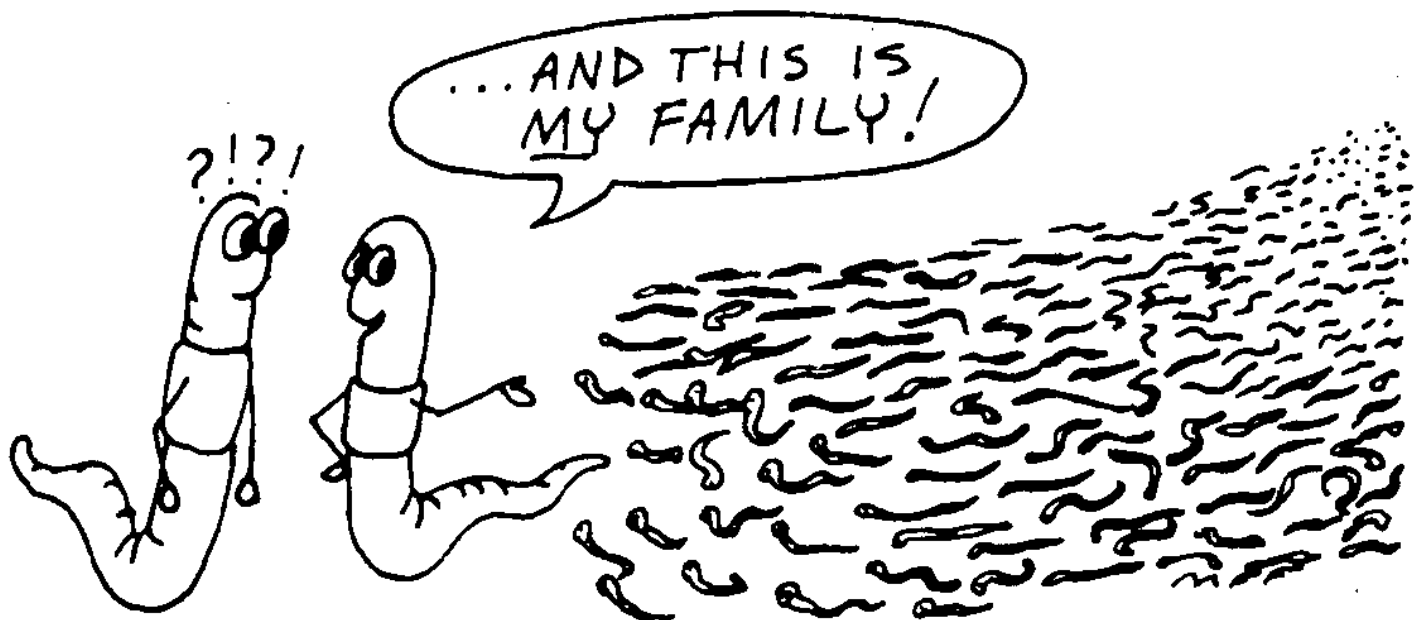
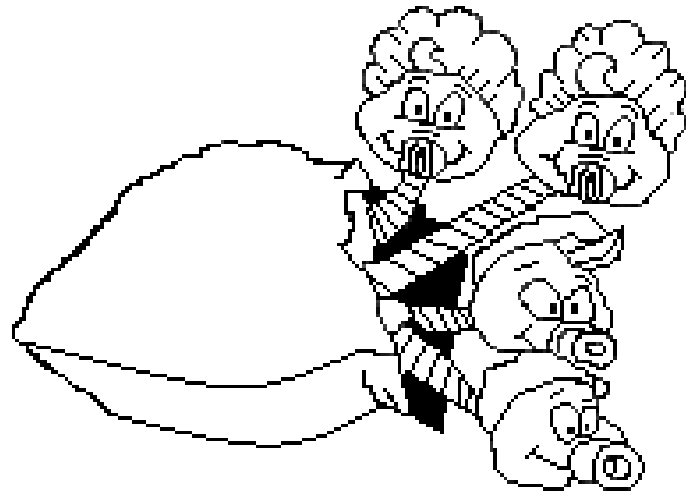
Population Explosion:

When the temperature, moisture, and food are all favorable, red worms will mature and mate producing two to three cocoons per week per worm. Two to five baby worms can hatch from each cocoon after the cocoon is around three weeks old. The average red worm is able to reproduce at around eight weeks of ages.

If everything were ideal and one adult worm had 5 offspring a week for 26 weeks, it would produce 130 babies in six months. In eight weeks, the offspring can produce cocoons. In another eight weeks, their offspring can produce offspring. And it continues.

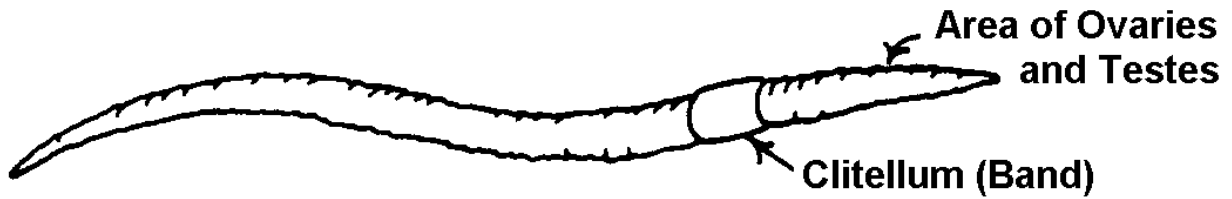
In six months assuming that each cocoon has five babies that two parent worms laying one cocoon per week over 26 weeks can yield 130 worms the first generation. At week 10 the first 5 offspring are now able to each have 5 offspring. Then over the next 16 weeks the other offspring produce their own offspring. All of these are the second generation. The around 19 weeks the first offspring from generation two start producing their own offspring for a total of around 125 offspring per week this is now the third generation being born. Once the third generation has all hatched there will be around 8,455 worms that were created from the original first two worms. All of this took place over a 26 week time period. [See: **Worms Mating and Cocoon Formation**]

Cocoon's are 1/8" long.

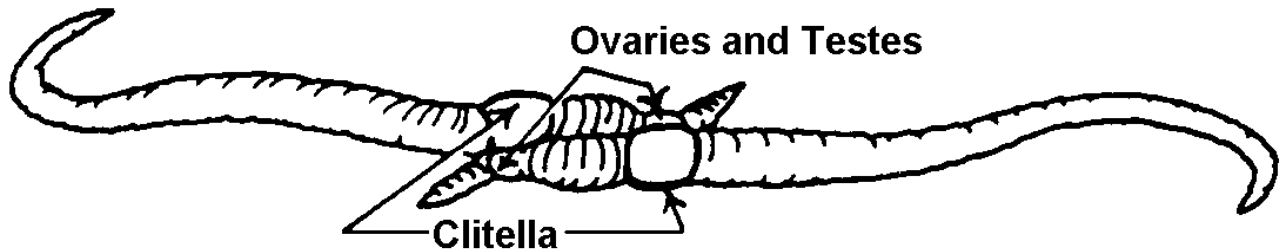


Worms Mating and Cocoon Formation

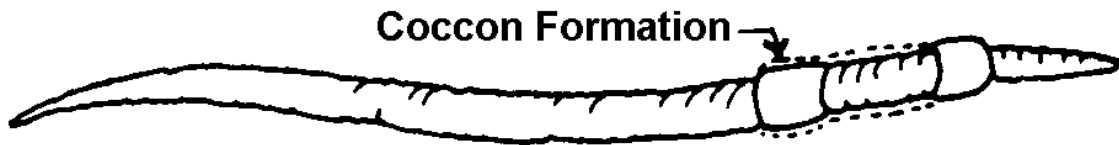
Each worm has both Ovaries and Testes.



Two worms join by mucus from their clitella. Sperm then pass from each worm to the sperm storage sacs in the other worm.



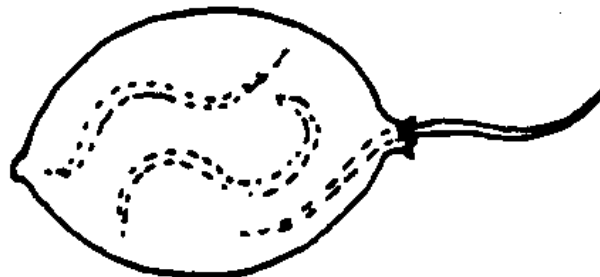
Later, a cocoon forms on the clitellum of each worm. The worm backs out of the hardening cocoon.



Eggs and sperm are deposited in the cocoon as it passes over openings from ovaries and sperm storage sacs.



After being released from the worm, the cocoon closes at both ends. Egg fertilization takes place in the cocoon.



Two or more baby worms hatch from one end of the cocoon.

Fun With Worms!

The Littlest Worm

(Echo Song)

The littlest worm
(The littlest worm)
You ever saw
(You ever saw)
Got stuck inside
(Got stuck inside)
My soda straw
(My soda straw)
The littlest worm you ever saw
Got stuck inside my soda straw

He said to me
(He said to me)
“Don’t take a sip
(“Don’t take a sip)
‘Cause if you do
(‘Cause if you do)
You’ll get real sick.”
(You’ll get real sick.”)
He said to me, “Don’t take a sip,
‘Cause if you do, you’ll get real
sick.”

I took a sip
(I took a sip)
And he went down
(And he went down)
Right through my pipe
(Right through my pipe)
He must have drowned
(He must have drowned)
I took a sip and he went down
Right through my pipe, he must
have drowned

He was my pal
(He was my pal)
He was my friend
(He was my friend)
There is no more
(There is no more)
This is the end
(This is the end)
He was my pal, he was my friend
There is no more, this is the end.

Now don’t you fret
(Now don’t you fret)
Now don’t you fear
(Now don’t you fear)
That little worm
(That little worm)
Had scuba gear
(Had scuba gear)
Now don’t you fret, now don’t you
fear,
That little worm had scuba gear.



Nobody Likes Me

Nobody likes me
Ev’rybody hates me
Guess I’ll go eat worms

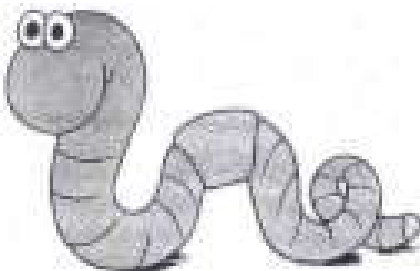
Long, thin, slimy ones
Short, fat, juicy ones
Itsy, bitsy, fuzzy, wuzzy worms.

Down goes the first one
Down goes the second one
Oh, how they wiggle ad squirm

Long, thin, slimy ones
Short, fat, juicy ones
Itsy, bitsy, fuzzy, wuzzy worms.

Up goes the first one
Up goes the second one
Oh, how they wiggle ad squirm

Long, thin, slimy ones
Short, fat, juicy ones
Itsy, bitsy, fuzzy, wuzzy worms.



Inch Worm

Inch worm, inch worm
Measuring the marigold
You and your arithmetic
You’ll probably go far
Inch worm, inch worm
Measuring the marigolds
Seems to me you’d stop to see
How beautiful they are
Two and two are four
Four and Four are eight
Eight and eight are sixteen
Sixteen and sixteen are thirty-
two

Number Wiggle Worm . . .

On 2 X 3 cards print the
numbers one to ten or higher and
then draw five worm cards too.

Place all of the pieces of
paper into a container that can be
passed around to the students in a
circle.

As the container goes around
the circle have each child draw
out a card.

If the child draws a number
then the child must state which
number it is. However if the
child would draw out a worm he
or she must yell out “Wiggle
Worm”. Then all of the children
must stand up and wiggle like a
worm.

Have each child put their card
back into the container Stirring it
up good before passing it to his
or her neighbor. The game is
over once everyone has drawing
a card.

Fun With Worms!

The Apple and the Worm

I bit an apple
That had a worm.
I swallowed the apple,
I swallowed the worm.
I felt it squiggle,
I felt it wiggle,
I felt it turn.
I felt so slippery, slimy, scummy,
I felt it land - PLOP - In my
tummy!
I guess that worm is there to stay
Unless . . .



Little Worms

(to the tune of Twinkle, Twinkle,
Little Star)

Little worms in the bin so neat.
How we wonder what you eat.
Apples, eggshells, veggies too,
All these things are good for you.
Little worms in the bin so neat.
Now we all know what you eat!

Little worms in the bin so neat.
How we wonder what you eat.
Don't give'em eggs, don't give'em
cheese.
No matter what, no meat please.
Little worms in the bin so neat.
Now we all know what you eat!

Squiggly Worms

(to the tune of Old McDonald had a
Farm)

Our class had some little worms, in
a compost bin.
All these worms made healthy soil,
in a compost bin.
With a squiggle squiggle here and a
squiggle, squiggle there.
Here a squiggle, there a squiggle,
everywhere a squiggle, squiggle.
Our class loves our little worms, in
their compost bin.



Christmas Worms

By Julie Gordon

'Twas the night before Christmas and all through the house not a
creature was stirring, not even my spouse.
I lay still beside him until I heard a snore, then I slipped from the bed
and out through the door.

I crept up the hallway and down the front stair; I tiptoed to the living
room to see what was there.

And lo and behold, under the tree, was a shiny black box labeled to
ME!

I pulled and I pried, and as I lifted the lid, I heard a cough from be-
hind, my husband up from bed.

I stood up and stammered "I-I just couldn't sleep"; "Mm-hm", an-
swered Don, "well that box'll keep".

And so I resigned to go back to bed, but visions of gifts still danced
through my head.

A new dress, a necklace, a crate full of socks; what could possibly be
contained in that box?

A tea set, some perfume, a puppy to keep; I ran through the options
as I drifted to sleep.

In the morning I woke from that sleep with a scream; creepies and
crawlies; I'd had a bad dream.

And then I remembered just what day it was: December 25th, Christ-
mas, or course!

I ran to the living room to see what I'd get, but I wasn't prepared for
the sight that I met.

There were worms in the carpet, worms on the chairs, worms in the
hallway, worms on the stairs.

Worms hung from the lampshades and climbed up the walls; they
infested the kitchen; they crawled through the halls.

I looked at my husband; on his face was pure shock' bewildered he
wondered "how'd they escape from that box?"

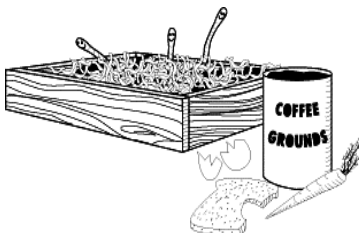
And then I remembered that I'd lifted the lid' could worms have
been what my Christmas box his?

"Yes", said my hubby, "it's a vermicomposter"; under my breath I
muttered "I'd as soon have a toaster".

But alas I was stuck with this so called 'worm bin'. So I set about
getting those worms back in.

And now it's one year later, Christmas eve once again; my house
plants are thriving, I've worm bins time ten.

Yes, it's true, that black gold sure works like a charm; I can't wait
'til my husband opens his brand new ant farm!



Fun With Worms!

The Worms in our Bin

(to the tune of the Wheels on the Buss)

The worms in our bin they eat our trash, eat our trash, eat our trash. The worms in our bin they eat our trash and help to save the earth.

They'll eat corn and apples too, apples too, apples, too. They'll eat corn and apples too and help save the earth.

Give them fruit and veggies too, veggies too, veggies too. Give them fruit and veggies too and help to save the earth.

Don't give them food like meat and cheese, meat or cheese, meat or cheese. Don't give them food like meat or cheese 'cusp it will stink real bad!

The worms in our bin they eat our trash, eat our trash, eat our trash. The worm in our bin they eat our trash and help to save the earth.



The pixie that put the worms to sleep

By: Christ Taylor

One day, a foolish young pixie named Soo sprinkled “doezey” dust over the soil of Troll Mountain. As a prank, thinking it would do not harm, the mischievous little pixie caused all the worms to fall into a deep sleep.

The old troll of the forest, who was Soo’s teacher, was very dismayed. He asked Soo why she would do such a thing! “I have no use for lowly earthworms,” replied Soo in her usual flippant manner.

The troll shook his head slowly and said, “You have not heeded my lessons well. It is time you learned that all things, even the lowly earthworm, have important roles to play in our forest.” And having said that, he turned Soo into an owl and warned her that she must stay that way until she discovered the value of worms.

Soo was not at all unhappy as an owl. In fact, she soon started enjoying herself. Gliding through the forest on silent wings, Soo was aware of all the sounds and move-

ments below her. She was even more certain that a mighty owl such as she did not need to give a hoot about worms!

In time, Soo became very lonely. She did not know any other owls. Then, one day, she heard another owl calling to her. It was a majestic male owl, who took Soo for a mate. Soon, Soo became a mother to three young owlets and was very happy for a time.

As the owlets grew, Soo discovered that she had to work harder and harder to find mice to feed her young. One day, she could find none at all! With her keen owl eyes and senses, Soo set out to learn what had happened to the mice. It did not take her long to discover that there was not enough food for them to eat.

There seemed to be nothing but dead plants and leaves everywhere! Instead of breaking apart and blending into the soil, they were just lying where they fell, covering the surface of the ground. New plants were not able to grow because there was not enough nutrition in the soil. Mice could not find tender plants or seeds to eat, so no baby mice were born!

Soo became very frightened for her owlets and, in a panic, flew through the forest in search of the old troll. When she spotted him, she cried out. "Oh, troll of the forest! The old plants are not coming apart, and new plants are not growing. There are not enough mice, and my owlets are starving!"

"Ah," said the old troll. "I see that you have at last discovered the value of the earthworm."

"What does the problem with the plants have to do with worms?" screeched Soo at the top of her lungs.

The wise old troll answered in a kind and patient voice. "Anything in the forest that is no longer growing must come apart so that the same materials may be used over and over to enrich the soil."

"So it is the worm's place to do the taking-apart!" cried Soo, suddenly realizing the importance of the slimy creature that recycled dead plants and added nutrition to the soil. She now understood how the worm helped all the creatures in the forest - even her.

The old troll was pleased with his student and offered to turn her back into a pixie. Soo thought for a moment and agreed to become a pixie again - but only long enough to sprinkle the antidote to the dozey dust on the soil. She told her teacher that she wished to remain and owl, raise her owlets, and be part of the forest, just like her new friends - the worms.

This story is from the book: "Squirmy Wormy Composters"; by: Bobbie Kalman & Janie Schaub; Artwork by Antoniette "Cookie" DeBiasi, Crabtree Publishing Company; 1992; ISBN: 0-86505-555-6 (library bound); pp, 18 - 19



Resources:

Reference Books:

“Worms Eat My Garbage”, Second Edition, by Mary Appelhof, Flower Press, Kalamazoo, Michigan, 1997

“Worms Eat Our Garbage”, by Mary Appelhof, Mary Francs Fenton, Barbara Loss Harris, Flower Press, Kalamazoo, Michigan, 1993

“The Worm Cafe: Mid-Scale Vermicomposting of Lunchroom Wastes”, by Binet Payne

“Worm Composting”, Michigan State University Extension Programs,
<http://www.msue.msu.edu/genesee/natres/compwor.htm>

“Bottle Biology”, Mrill Ingram, Kendall/Hunt Publishing Company, 1993, pp. 18 - 21

Books you can read to your class and use for Reference:

“Pee Wee’s Great Adventure, A guide to Vermicomposting”, Lorraine Roulston, Ill. Ryan Denning, Recycling Resource Service, 2006, ISBN: 0-9697883-3-9

“Pee Wee’s Family in a Nutshell”, Lorraine Roulston, Ill. Katie Sawatsky, Recycling Resource Service, 2005, ISBN: 0-9697883-2-0

“Pee Wee and the Magical Compost Heap”, Lorraine Roulston, Ill. Alie Toor, Recycling Resource Service, 1992, ISBN: 0-9697883-04

“Compost By Gosh!”. Michelle Eva Potman, Flower Press, 2003. ISBN: 0-942256-16-6

“Herman and Marquerite an Earth Story”, Jay O’Callahan, Laura O’Callahan, Peachtree Publishers, 2003, ISBN: 1561452831, Baby - Preschool

“The Worm Family” Tony Johnston, Stacy Innerst, Hardcourt Children’s Book, 2004, ISBN: 015205116, Baby - Preschool

“An Earthworm’s Life” (Nature Upclose), John Himmelman, Children’s Press, 2001, ISBN: 0516265350, 4 - 8 Years Old

“Diary of a Worm”, Doreen Cronin, Harper Collins Publisher, 2003, ISBN: 006000150X, 4 - 8 Years Old

“Wiggling Worms at Work”, Wendy Pfefer, Harper Trophy, 2003, ISBN: 0064451992, 4 - 8 Years Old

“Worm Gets a Job”, Kathy Caple, Candlewick Press, 2004, ISBN 076361694X, 4 - 8 Years Old

“Worms Can’t Fly”, Aislinn O’Lounclin, Lary O’Lounclin, Aileen Caffery, Crocodile Books, 2003, ISBN: 0863277861, 4 - 8 Years Old

“Wormy Worm”, Chris Raschka, Hyperion, 2000, ISBN: 078680582X, Baby - Preschool

“Wonderful Worms”, Linda Glaser, Loretta Krupinski, Millerbrook Press, 1994, ISBN: 1562947303, 4 - 8 Years Old

Continue Books you can read to your class and use for Reference:

“The Worm Book: The Complete Guide to Worms in Your Garden”, Loren Nancarrow, Janet Hogan Taylor, Ten Speed Press, 1998, ISBN: 0898159946

“There’s a Hair in My Dirt! A Worm Story”, Gary Larson, Harpercol, 1999, ISBN: 0060932740

“Toil in the Soil”, Michelle Myers Lackner, The Millbrook Press, Brookfield, Connecticut, 2001, ISBN: 0-7613-1807-0

“Squirmy Wormy Composters”, Bobbie Kalman and Janine Schaub, Crabtree Publishing Company, 1992, ISBN: 0-86505-555-6, 8 - 11 Years Old

Resource Web Sites:

Worm Woman = <http://www.wormwoman.com/acatalog/index.html>

The Worm Guide: A Vermicomposting Guide for Teachers =
<http://www.ciwmb.ca.gov/Schools/Curriculum/Worms/default.htm>

Worm Digest = <http://www.worndigest.org/>

Composting With Red Wiggler Worms = <http://www.cityfarmer.org/wormcomp61.html>

The Burrow = <http://www.jetcompost.com/burrow/index.html>

Worm Composting (Vermiculture) = <http://www.mastercomposter.com/worm/wormcomp.html>

Red Worms = <http://www.wormman.com/redworms.htm>

Where to Purchase Red Worms:

Local Bait Seller or Dealer

Where to Purchase Red Worms Web Sites:

D & D Worm Ranch (an Iowa Business) = <http://www.dndwormranch.com/index.htm>

<http://www.magicwiggler.com/Order.html>

<http://www.wormswrangler.com/redworms.html>

<http://www.wormman.com/redworms.htm>

<http://www.wormswork.com/>

<http://www.earlybirdwormfarm.com/click.php?>



Glossary:

Acid normal product of decomposition.

Aggregation clustering, as of soil particles, to form granules that aid in aeration and water penetration.

Aeration getting oxygen into the compost by mixing or turning.

Aerobic requires oxygen. Aerobic conditions in a compost bin are desirable. Aerobic organisms use oxygen to carry out their life functions. Because oxygen is present, the bin will not smell.

Albumin a protein in cocoons that serves as a food source for embryonic worms.

Alkaline containing bases (hydroxides, carbonates) which neutralize acids to form salts.

Anaerobic does not require oxygen. Under anaerobic conditions, a compost bin will smell. Anaerobic organisms can grow without the presence of oxygen.

Anterior toward the front.

Bedding materials like newspaper and leaves used as an organic medium for worm composting.

Bed run worms of all sizes, as contrasted with selected breeders.

Bio-degradable capable of being broken down into simpler components by living organisms.

Breeders sexually mature worms as identified by a clitellum.

Browns carbon rich compostable materials. Usually dry as well.

Buffer a substance which renders a system less sensitive to fluctuations between acidity and alkalinity.

Calcium Carbonate used to reduce acidity in worm bins and agricultural soils. See lime.

Carbon is an element that takes many forms. Is a building block of all living things.

Castings see worm castings, vermicast.

Clitellum a swollen region containing gland cells which secrete the cocoon material. Also called girdle or saddle.

Cocoon worm eggs or egg cases, they can carry from 2 to 20 worms.

Compost the end result of the composting process or the process itself. Compost is a dark, rich soil conditioner known as humus which has been created through the biological reduction of organic material.

Composter container, usually a bin or box used for composting.

Composting the controlled biological decomposition of organic solid waste materials by microorganisms under aerobic (in the place of oxygen) conditions.

Compost Tea water in which finished compost has been ‘steeped’ to concoct a liquid fertilizer for plants.

Compostable Materials organic materials that will break down in a compost bin.

Compost Critters micro and macroorganisms that live in the soil and help break down organic matter.

Composting the biochemical process which occurs when organic matter is broken down by decomposer organisms into a nutrient rich soil conditioner called humus.

Consumer an organism that feeds on other plants or animals.

Curing the final phase of composting. Microbial activities continues, but at a slower rate. During this process less heat is generated by the micro-organisms, and the pile begins to cool down. Curing can take from several days to months.

Decay to rot, break down or decompose.

Decompose to separate into original parts or elements; disintegrate; to rot. The breaking down of Organic Waste into Carbon, Water, and other minerals.

Decomposition the process of breaking down organic matter into its basic elements including nutrients needed for plant growth. Decomposition occurs in nature and in controlled environments like compost bins.

Earthworm a segmented worm of the Phylum Annelida, most of whose 4400 species are terrestrial.

Ecosystem a mutually dependent system consisting of plant, animal life and inorganic matter.

Egg a female sex cell capable of developing into an organism when fertilized by a sperm.

Egg case See cocoon.

Enchytraeids small, white, segmented worms common in vermicomposting systems.

Excrete to separate and to discharge waste.

Feces waste discharged from the intestine through the anus. Manure.

Fertilizer a substance (natural or man-made) used to enrich the soil and to provide food for plants.

Food Scraps in the Compost Module, food scraps generally refer to uncooked fruit and vegetable scraps or any compostable food materials.

Fungi a living organism that must exist on a living or dead plant or animal. Fungi help out with decomposition.

Girdle see clitellum.

Gizzard region in anterior portion of digestive tract whose muscular contractions help grind food.

Greens nitrogen rich compost materials (usually wet).

Grit coarse or fine abrasive particles used by worm in gizzard to grind food.

Hatchlings worms as they emerge from a cocoon.

Humus finished compost, formed through the break down of plants and animal matter. Humus retains and slowly releases nutrients to plants.

Hydrated lime Calcium hydroxide. Do not use in worm bins. See also lime.

Inoculate to provide an initial set of organisms for a new culture.

Inorganic Waste is waste composted of matter other than plant or animal and contains no carbon. Example: Glass, Metal

Landfill an area of land where people bring their waste to get rid of it. A big hole that is lined in the ground that soon fills up with layers of waste, sand, waste, sand until it is a mountain of waste that is topped off with a special cover and left.

Leachate liquid that has been generated by solid waste decomposition and which has extracted, dissolved or suspended materials in it. The leachate from a compost bin or worm bin is full of nutrients and is an excellent liquid fertilizer.

Leaf Mold decomposed or mostly decomposed leaves.

Lime a calcium compound which helps reduce acidity in worm bins. Use calcium carbonate, ground limestone rock, egg shells, or oyster shells. Avoid caustic, slaked, and hydrated lime.

Litter (Leaf) organic materials on forest floor containing leaves, twigs, decaying plants, and associated organisms.

Macroorganisms organisms that are visible to the eye.

Microorganisms organisms that cannot be seen without magnification.

Mulch a layer of partially decomposed plant materials placed on top of garden beds and around plants and shrubs.

Natural Resources is the land we live on, water we drink, air we breath and the minerals that are found on Earth. There are two types of Natural Resources: Renewable and Non-renewable.

Nematodes or roundworm an invertebrate that is naturally found in the soil. They are normally 1mm or less in length and prey upon bacteria, protozoa, fungal spores and each other.

Night crawler a common name for *Lumbricus terrestris*, a large, burrow inhabiting earthworm.

Nitrogen is an element necessary for life. Nitrogen's unique structure helps it to form amino acids which build into proteins. Proteins are essential to build the muscles and sinews of living things.

Non-renewable Resource are resources that we can not grow or make more of, once it is gone it is gone. Examples: Oil, Natural Gas and others..

Optimal most favorable conditions, such as for growth or for reproduction.

Organic or Organic Matter any organic material that is or once was living or was once produced by a living organism.

Overload to put too much food into a worm bin that can be processed aerobically.

Peat Moss sphagnum moss which is mined from bogs, dried, ground, and used as an organic mulch. Although acidic, its light, fluffy texture and excellent moisture retention characteristics make it a good medium for shipping worms. No longer recommended as a worm bedding because it is a limited resource and suitable alternatives exist.

pH and expression for degree of acidity and alkalinity based upon the hydrogen ion concentration. The pH scale ranges from 0 to 14; pH7 being neutral; less than 7, acid, greater than 7, alkaline.

Pharynx muscular region of the digestive tract immediately posterior to the worm's mouth.

Posterior toward the rear, back, or tail.

Prostomium sensitive fleshy lobe protruding above the mouth.

Red Worm a variety of earthworm suitable for vermicomposting. The Red Wiggler is a red worm.

Regenerate to replace lost parts.

Renewable Resources is a resources that we can make or grow more. Examples: Trees

Saddle see clitellum

Secrete to release a substance that fulfills some function within the organism. Secretion of slime by a worm helps retain moisture and protect its body from injury by coarse soil particles.

Segment one of numerous disc-shaped portions of an earthworm's body bounded anteriorly and posteriorly by membranes.

Setae bristles on each segment used in locomotion.

Sexually mature possessing a clitellum and capable of breeding.

Screening to sift out uncomposted matter from humus to create a fine compost.

Slaked lime calcium hydroxide. DO NOT USE in Worm Bins.

Soil tiny rocks, sand, silt, clay plus decomposers plus organic matter.

Soil Conditioner something that enriches the physical condition of soil and increases its organic content.

Sow Bug invertebrate that feeds upon rotting woody materials and highly durable leaf tissues. The sow bugs that roll up like an armadillo are known as pill bugs.

Sperm male sex cells.

Vermicompost to carry out composting with worms or the end product from composting with worms. Vermicompost contains worm castings, broken down organic matter, bedding, worm cocoons, worms and other organisms.

Vermicomposter a worm bin or person who composts with worms.

Vermicomposting composting with worms.

Vermiculture worm farming or raising earthworms.

White worms see enchytraeids.

Worm Bin a container especially prepared for worms to live in and eat organic garbage. A vermicomposting system.

Worm Castings worm manure or worm 'poop'.

Wet Garbage usually refers to food scraps, grass clippings, and garden waste; compostable, organic materials.