NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Reinstein Woods Environmental Education Center
93 Honorine Drive, Depew, NY 14043
P: (716) 683-5959 I F: (716) 686-0210 I ReinsteinWoods@dec.ny.gov
www.dec.ny.gov

Dear Educator:

Thank you for your interest in Reinstein Woods' environmental education programs. You have scheduled the program "Nature's Recyclers" as an in-school program. In this packet, you will find an overview of the "Nature's Recyclers" program and post- visit activities to supplement your program. Please try to go over the vocabulary list (found in the overview) with your students before the program.

We feel that our program will be of more value to students if related classroom activities are done after the lesson. The enclosed activities are designed to reinforce concepts learned during the program as well as to help align your lessons to the new NYS science standards. We have links to other activities on our Pinterest page.

The New York State Department of Environmental Conservation is currently sponsoring educational workshops for teachers. These workshops include Project WILD—a program that emphasizes awareness, appreciation, and understanding of wildlife—and Project WET, an education program that teaches about water resources. We also offer Project Learning Tree trainings for educators in grades PreK-12. To learn how you can attend a workshop to obtain these materials for use in your classroom, please contact Reinstein Woods or visit http://www.dec.ny.gov/education/1913.html.

We hope that this information is helpful to you and your students, and feedback is encouraged. Please take some time to complete and return the program evaluation following the lesson. We look forward to seeing you soon!

Sincerely,

Reinstein Woods Environmental Education Center Staff

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Reinstein Woods Environmental Education Center
93 Honorine Drive, Depew, NY 14043
P: (716) 683-5959 I F: (716) 686-0210 I ReinsteinWoods@dec.ny.gov
www.dec.ny.gov

NATURE'S RECYCLERS

Grades: Prek – 8th
Length: 45 min.
Maximum Students: 25

Objectives:

1. The body structure and behavior of worms help them function in their environments. Worms have specialized adaptations that help them survive.

2. Human activities can impact ecosystems. Worms can lessen the human impact of excess waste in the ecosystem by breaking down food waste into compost.

Background:

Americans generate 254 million tons of trash each year. Almost 20% of that trash is food waste. We throw away 96% of the waste that can be composted and recycled into fertilizer. The impact of excess consumption and waste can be seen in the strain on natural resources and damage to natural habitats as a result of production and waste disposal. Vermicomposting, the process of using worms to break down organic waste into compost, is one solution to the human impact of excess waste.

Worms are annelids, from the Latin word annulus meaning "ring." Worms are made up of joined, ringed segments. The most common species of worm used in vermicomposting is the red wiggler, *Eisena fetida*. Like other worms, the anatomy of this species allows it to thrive as a decomposer in moist, temperate environments.

Worms can provide this service in the very place food waste in produced. Keeping worms in a household or classroom is convenient while saving water, energy, soil and landfill space. A worm bin also offers a chance for students to work with and learn from live animals. If you are interested in keeping a worm bin in your classroom, please call us at (716) 683-5959.

A TED-Ed video on vermicomposting can be found at
http://ed.ted.com/lessons/vermicomposting-how-worms-can-reduce-our-waste-matthew-ross#digdeeper

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Reinstein Woods Environmental Education Center
93 Honorine Drive, Depew, NY 14043
P: (716) 683-5959 I F: (716) 686-0210 I ReinsteinWoods@dec.ny.gov
www.dec.ny.gov

Learning Standards

State learning standards addressed through our program are listed below. Any standard marked by an asterisk is met by completing the post-lesson activities.

2017 P-12 Science Learning Standards

P-LS1-1. Observe familiar plants and animals (including humans) and describe what they need to survive.

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive

K-ESS3-3. Communicate solutions that will reduce the impact of humans on living organisms and non-living things in the local environment.

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the Sun. *

Science and Engineering Practices

- Asking Questions and Defining Problems*
- Planning and Carrying Out Investigations
- Constructing Explanations and Designing Solutions*

Disciplinary Core Ideas

ESS3.A: Natural Resources
ESS3.C: Human Impacts on Earth Systems
LA1.A: Structure and Function
LS1.B: Growth and Development of Organisms
LS2.A: Interdependent Relationships in Ecosystems
LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

Cross Cutting Concepts:

- Systems and System Models
- Structure and Function

ELA/Literacy

- Responding to Literature: Create and present a poem, dramatization, art work, or personal response to a particular author or theme studied in class, with prompting and support as needed. * (Pre-K – 5th)
- Write opinion pieces on topics or texts, supporting a point of view with reasons and information. * (3rd – 5th)
- Write arguments focused on discipline-specific content. * (6th – 12th)

Mathematics

K.MD.2: Describe And Compare Measurable Attributes.
2.MD.1 Measurement And Data: Measure And Estimate Lengths In Standard Units.
3.MD.4 Measurement And Data: Represent And Interpret Data.*

Excellence in Environmental Education: Guidelines for Learning (K-12)

Strand 1—Questioning, Analysis and Interpretation Skills, Guideline C
Strand 2.2—The Living Environment, Guideline A, C, D

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Reinstein Woods Environmental Education Center
93 Honorine Drive, Depew, NY 14043
P: (716) 683-5959 I F: (716) 686-0210 I ReinsteinWoods@dec.ny.gov
www.dec.ny.gov

Spelling/ Vocabulary List

Anus: where worm manure (castings) are expelled from the worm, which is called vermicompost.

Aortic Arches: "5 Hearts" regulates blood flow and produces a pulse.

Setae: tiny hairs that help the worm to move and sense its environment.

Cerebral Ganglion: Nerve bundle that serves as the brain.

Clitellum: used in reproduction; makes mucus to form an egg-carrying cocoon; only found on adult worms.

Coelomic Fluid: a yellow secretion that a worm makes to remoisten their bodies when conditions are dry. Also, thought to be a defense mechanism against predators as the liquid can smell bad.

Compost: Decayed organic materials which decompose into humus, the organic component of soil.

Compost Tea: concentrated organic liquid fertilizer that is made from compost.

Crop: stores food in the worm's digestive system.

Dorsal Blood Vessels: carry blood to the front of the worm's body.

Esophagus: connects pharynx with the crop.

Female Reproductive Organs: Includes the ovary and oviduct.

Gizzard: uses sandy grit from the soil to grind up the food.

Intestine: performs the final digestion and absorption of the nutrients from food.

Male Reproductive Organs: Includes the testes and sperm sac.

Mouth: entrance to the digestive tract of a worm.

Pharynx: pushes food down into the digestive system.

Segments: small rings that surround the worm's body.

Ventral Blood Vessels: carry blood to the back of the worm's body.

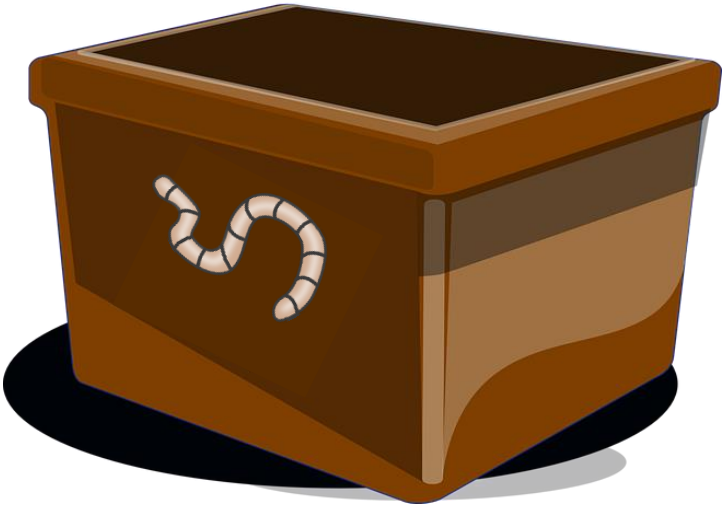
Vermicompost: compost created by providing organic waste as a food source to worms and then collecting their excrement.

Pre K – K

Name:

Lunch for a Worm

Cut out the food below. Does it belong in the garbage or in the worm bin? Paste above the correct location.

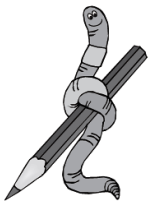


Wiggling Worms

Note: Gummy worms are often processed in plants that handle nuts and other allergenic foods. If allergies are an issue, use plastic worms and omit the tasting step.

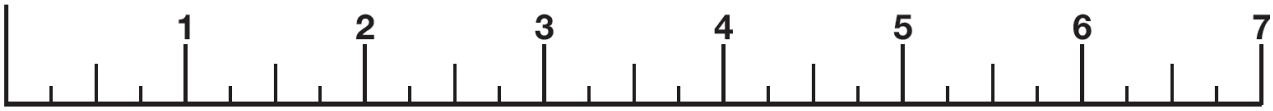
Directions: Copy a **Gummy Worm Dissection** sheet for each child. Give each child a gummy worm. Encourage children to work in teams to complete their dissections. They may assist one another with reading, measuring, and recording their observations. You may opt to complete the sheet as a class, giving oral directions and taking dictation to record student observations and measurements.

Gummy Worm Dissection



name _____

Draw and color your worm. Circle the head.



- How long is your worm? _____
- Stretch your worm as far as you can without breaking it.
  How long is it? _____
- Count the segments. How many segments? _____
- Compare your gummy worm to a real worm.
  What is the same?

  What is different?
- List the colors and the taste of each color.

_____ color	_____ taste	_____ color	_____ taste
_____ color	_____ taste	_____ color	_____ taste

FEATURED RESOURCE: CRITTER CURATORS

Grades: 4th
Length: 3-5 45min periods
Subjects: STEM

http://www.stem4teachers.org/wp-content/uploads/2012/05/STEM_Critter_LessonPLanFinal.pdf

Overview

Critter Curators is a problem-based learning (PBL) lesson that introduces fourth graders to the hands-on study of living systems. In PBL, students act as scientists to solve a problem in a real- world context. They do so by collecting and analyzing data, and by considering practical parameters or constraints, in order to generate solutions to the problem.

In this lesson, the students play the role of museum curator and are given the task of creating an earthworm habitat exhibit for their classroom "museum." In order to design the habitat, students must investigate the connections among an earthworm's needs, habitat, and niche. The lesson is designed with structured inquiry components in which students pursue knowledge about the earthworm's preferences and needs. In the inquiry portion of the lesson, the central investigation question is: "What are the necessary components of a habitat for an earthworm?" To understand the earthworm's needs and preferences, students conduct inquiries to make reasonable considerations for the museum habitat. By using scientific process skills to make observations and inferences, collect and analyze data, and communicate their findings, the students carry out investigations which ask appropriate questions, such as "Do earthworms prefer light or dark?" and "Do earthworms prefer hot or cold?"

Students finally put their findings from the investigations together to design and construct a museum display that showcases the earthworms in their habitat. The lesson emphasizes collaboration and communication.

Resource Location:

http://www.stem4teachers.org/wp-content/uploads/2012/05/STEM_Critter_LessonPLanFinal.pdf

Science	Problem-based learning investigation into the necessary components of an earthworm habitat
Technology	Use a digital camera * Web-based research * Use measurement tools
Engineering	Design a habitat
Mathematics	Estimate and measure length * Graphing

FEATURED RESOURCE: DO THE ROT THING

Grades: K-12
Length: Varies
Subjects: Varies

http://www.cvswmd.org/uploads/6/1/2/6/6126179/do_the_rot_thing_cvswmd1.pdf

Explore 18 compost-related activities from introductory lessons to hands-on composting.

ACTIVITY 4

Introductory Activity
Grades 2-6

Objective
Participants will play a tag game that illustrates the cycle of life and the role of decomposers in the food web.

Time
30-40 minutes

* *Look in the back of this booklet for how this activity applies to the Vermont Framework of Standards and Learning Opportunities.*

Decomposition Tag

Materials Needed

- 2–5 light colored armbands
- 1–2 dark colored armbands

Management Skills

This game can accommodate any number of participants. It can be a "walking" tag game if it is to be played in a confined area.

Background Information

Without decomposers such as bacteria, fungi, worms, ants, beetles, and mites, decomposition would stop and resources which sustain life would be depleted. A seemingly endless variety of decomposers all serve different functions in the decomposition process.

Every compost pile has its own food web. In this activity, we will look at the role decomposers play in the cycle of life: life, death, decay, and re-birth.

Procedure

1. Introduce the life cycle and the role of decomposers in nature and in composting.

2. One participant will play the character "death" and wears a dark colored armband. If the group is large, you can have two.

3. Two to five participants are decomposer characters and wear light colored armbands. As a general rule, 1/5 of the class should be decomposers. All other participants are plants or animals.

4. Plant and animal characters "die" when they are tagged by the death character. When tagged, they freeze in place until one of the decomposers unfreezes them by walking around them three times. The decomposers unfreeze the plants and animals as fast or faster than death freezes them.

5. The game has no natural end. You should let participants play long enough to experience the concept, and stop the game well before participants get exhausted or lose interest.

Other Options

- To demonstrate that life would stop without the decomposers recycling dead things, you can allow the death character to tag and freeze the decomposer characters along with the plants and animals. The game, and life on earth, ends when everyone is frozen except the death character.

- Once everyone is dead on the ground, use guided imagery to encourage students to feel what it might be like to be part of the soil and, slowly, with water and sunlight grow into a plant.

FEATURED RESOURCE:

SOIL SCIENCE SOCIETY OF AMERICA

http://www.soils4teachers.org/

Grades: K-12

Length: Varies

Subjects: Varies

Dive deeper into the world of worms and get a better understanding of soil systems in these interactive lessons compiled by the Soil Science Society of America.

Summary

Plants and some microorganisms are producers—they make their own food. All animals, including humans, are consumers, who obtain food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food. Energy is stored in organisms and is transferred to other organisms when they are eaten. Interactions based on feeding and nutrition are called trophic interactions. A map of this transfer of energy is called a *food web*. Food webs identify the relationships among producers, consumers, and decomposers in an ecosystem. Students consult the field guide at The Dirt on Soil - Learning Adventures and conduct a hands-on exercise.

Learning Objective

- To be able to identify what organisms are producers, consumers, and decomposers
- To learn about the ecologies, feeding habits, and food web structure of common soil organisms

Materials Needed

– Computers
– Desks
– Chairs
– String
– Blank index cards
– Markers
– Pens and paper

Celebrating the 2015 International Year of Soils

soils.org/IYS

Field Guide to Soil Food Webs

Ages of Audience

K-12

Recommended group size?

Less than 20

Where could you offer this?

Local school or library

Type of Lesson

1. Indoor
2. Small group exercise/discussion critical thinking
3. Computer game

Time Needed:

1. Scientist prep time + clean up time: Minimal, and no clean up
2. Participant/class time: 20 minutes to read field guide; 30 minutes of classroom activity and discussion

Method

1. Access the field guide and read about the different organisms found in soil and what they eat.
2. Write the name of the different organisms on the index cards.
3. Starting with the mole and earthworm, each written on a card, connect the two with string.
4. Ask the question “What else eats the earthworm?” Connect the earthworm card to the correct animal.
5. Complete the physical food web, either in pairs, small groups or individually.
6. A final assessment could be a quick sketch with arrows colored to distinguish predator-prey relationships.
7. A paragraph or two describing how a particular organism affects its surrounding ecosystem could round out the experience.
8. When everyone is done, discuss the questions below.

Discussion Questions

1. What animal has the most variety in its diet?
2. What organisms would be most affected if another organism were to cease to exist? How would they be affected?
3. Are there any organisms that contribute more to the soil than others? Why?
4. Are there any organisms that harm the soil?
5. Are there more of one type of organism than another? Why would that be?

This material is borrowed from:
http://school.discoveryeducation.com/schooladventures/soil/field_guide.html
and http://school.discoveryeducation.com/schooladventures/soil/teacher_tips.html

Modeling

Use large rubber bands to create model worms. Have students use the rubber band to practice moving like a worm.

Art

- Make a collage of what foods can and cannot be put into a worm bin.
- Paint with cooked spaghetti to make "worm art".
- Design a worm composting t-shirt or poster.

Engineering

Have students draw a design for a worm home that meets all the conditions for a worm to survive.

ELA

K-5th: Worm Poetry

Write worm poems as a class or individually using vocabulary words such as *red wiggler, cocoon, compost,* and *decomposer*.

3rd -5th: Interview a Worm

Read *Diary of a Worm*.
Have students write or record an "interview" with a worm. Students can use the knowledge gained through the program or do further research to answer questions about where a worm lives, what it eats, etc.

6th -8th: Arguing with Worms

Have students write an argument for or against starting a classroom worm bin using supporting information and resources.

Graph it!

Graph data collected from worm investigations:

- Line plot of worm lengths
- Bar graph of experiments results (i.e. do worms prefer light or dark areas?)

Additional Resources

Classroom Worm Bin: Guides and Activities

RW Goes to School
NYS DEC and Cornell Cooperative Extension

- Excellent guide to starting a worm bin in your classroom, complete with activities and a resource list.
- Available online at http://www.dec.ny.gov/docs/materials_minerals_pdf/rw.pdf

Worms Eat Our Garbage: Classroom Activities for a Better Environment
Mary Appelhof, Mary Frances Fenton, and Barbara Loss Harris

The Worm Café: Mid-scale Vermicomposting of Lunchroom Wastes
Binet Payne

Fiction

Diary of a Worm
Doreen Cronin

The Amazing Earthworm
Lilo Hess

Yucky Worms
Vivian French

The Compost Heap
Sharon Katz Cooper

Wiggling Worms at Work
Wendy Pfeffer

Internet

Online Worm Dissection Lab
NYSDEC

Adventures of Herman
Interactive online worm activities
University of Illinois Extension

Recycling and Composting
NYSDEC Conservationist for Kids

Take it Outside!

- Dig for worms in your schoolyard. What areas have the most worms? Do worms prefer shade or sun? Hard or soft soil?
- Go on an FBI (fungus, bacteria and invertebrate) hunt in search of signs of decomposers.
- If your school allows, start an outdoor compost pile with your class.
- For older students, make a mustard solution to draw worms out of the soil. Find more details at: http://www.caryinstitute.org/educators/teaching-materials/urban-ecosystems/schoolyard-inquiries/worm-worlds

We've done the searching for you!

Find links to these resources and additional activities on our Nature's Recyclers Pinterest Board.

Click the link below:

Pinterest