Syllabus
AG 225. Organic Waste Management – 2 Credits
Term, Year
Meeting Day(s), Time, Place

Instructor: *Name and Title*
Office: *Location and office hours (if applicable)*
Phone: *Include personal number only if you are willing to release to students*
E-mail: *@tillamookbay.cc or @mail.tillamookbay.cc or other*

Course Description: Management and treatment of animal manure and organic waste, i.e., bio-waste. Provides insight and hands-on experience in the functionality of environmental technologies for the treatment of bio-waste.

TBCC Email: TBCC will use electronic communication methods to conduct official and legal College business. Students are responsible to check their TBCC email and the TBCC student portal (MyTBCC) for information from the College.

Course Learning Outcomes:

- Apply knowledge from the sciences and mathematics to environmental problems and solutions.
- Use the skills and modern environmental science techniques and tools necessary for a successful career in the field.
- Function effectively on multidisciplinary teams.
- Recognize contemporary environmental science issues and the impact of environmental science in a global and societal context.

Program Learning Outcomes:

- Perform critical reasoning, perceive assumptions, and make judgments based on the basic principles of agriculture, natural resources, and related fields.
- Fit into a business, agency, or academic setting and use concepts from agriculture and related fields to quantify and analyze issues and problems.
- Exhibit critical thinking skills when addressing issues in agriculture, natural resources, and related fields.

Institutional Learning Outcomes:

ILO #8 Analyze and evaluate information to address issues and solve problems.
ILO #13 Demonstrate the knowledge, skills, and professional attitude necessary to enter and succeed in a defined profession or advanced academic program.
ILO #14 Work ethically, effectively, and efficiently as individuals or as members of a team.

Competencies and Skills:

1. Knowledge of chemistry, microbiology, and mathematics will be applied to predict potential negative environmental impacts of solid waste management practices.
2. Life-cycle assessment (LCA) technique will be used to discuss best management practices in regards to recycling and disposal.
3. Students will work in teams of 2 for class paper/presentation.
4. Link between global warming and certain solid waste management facilities will be quantitatively examined. Case studies of solid waste management practices in other countries will be examined and discussed.

Instructional Materials:

Required Text: Tchobanoglous, G. & Kreith, F. (2002). Handbook of Solid Waste Management, 2nd ed. McGraw-Hill, New York.

Course Requirements:

1. **Quizzes.** Quizzes in weeks 2-10 will include multiple-choice and short-answer questions regarding the previous week's course content and activities.

2. **Current Industry Issues Summaries**. Students will complete the current issues summary (1-2 pages) from either Supplier News or Industry News sections of http://www.solidwaste.com. Three of these short papers will be required over the course of the term.

3. **Final Exam.** Students will complete a comprehensive final exam in Week 11 (Finals Week). The exam will include multiple-choice, short-answer, and essay questions.

Grading:

Weekly Quizzes	=	100 points each	30% of course grade
Industry Issue Papers	=	50 points each	30% of course grade
Final Exam	=	100 points total	40% of course grade

A = 90-100% B = 80-89% C = 70-79% D = 60-69% F = 0-59%

ADA Statement:

Students who have a documented disability and require a classroom adjustment or accommodation should contact the Disabilities Coordinator/Career Education Advisor and provide the Approved Academic Accommodation form to the Instructor.

Academic Support Statement:

The Learning Center provides assistance to students with writing and math assignments. Hours are posted in the Library and classrooms. Peer tutors are available to assist students in a variety of subjects. Contact the Library for more information on peer tutoring.

Class Registration Statement:

Students may attend this course only if registered. Students who are unable to attend must drop the course through Student Services. To have tuition charges removed, the course must be dropped by the student before the drop with refund deadline in the Class Schedule. Students who never attend, or stop attending, without dropping may receive a NS, W, or F and will be required to pay for the course.

Grading Options Statement:

Students taking credit classes can choose between receiving traditional letter grades (A-F) and Pass/No Pass (P/NP) if the department has permitted both options for a course. *If you do not select a grading*

option, you will automatically have the default grading option for that course. The default option is generally a letter grade, but could be pass/no pass. You can change your grading option through Student Services up until the eighth week of the term (for an eleven-week course). The only grading option available for each student is the one the student submitted during the selection timeframe. With the instructor's written permission, some courses may allow students to attend a course without receiving a grade or credit for the course. In order to Audit a class, you must return a signed form to Student Services. Your request must be processed by Student Services by the drop deadline for the course. You cannot opt into or out of (i.e. change your grading option from audit to a letter grade) after the drop deadline. Auditing a course does not satisfy requirements for entry into courses where prerequisites are specified.

Academic Integrity/Student Conduct Statement:

Students of Tillamook Bay Community College are expected to behave as responsible members of the College community while on campus and to be honest, ethical, and professional in their behavior and academic work. Tillamook Bay Community College strives to provide students with the knowledge, skills, judgment, and wisdom they need to function in society and careers as educated adults. Respect for others and behavior appropriate for a professional and educational environment is required of all. Behavior that violates the Code of Student Conduct, including any behavior disruptive to the educational process, is subject to disciplinary action. To falsify or fabricate the results of one's research; to present the words, ideas, data, or work of another as one's own; or to cheat on an examination is dishonest and corrupts the essential process of higher education. Academic dishonesty is also subject to disciplinary action. The full text of TBCC's Code of Student Conduct and Academic Integrity Policy can be found in the Student Rights and Responsibilities section of the TBCC Catalog.

Tentative Schedule by Week/Day and Date:

Week 1. Introduction/Regulations/Planning/Siting
Characteristics of Solid Waste

Week 2. Source Reduction and Toxicity
Weekly Quiz #1

Week 3. Collection of Solid Waste
Weekly Quiz #2

Week 4. Recycling/CLA
Weekly Quiz #3 and Industry Issue Paper #1 due

Week 5. Composting
Weekly Quiz #4

Week 6. Anaerobic Digestion
Weekly Quiz #5

Week 7. Other Organic Waste Treatment Methods
Weekly Quiz #6 and Industry Issue Paper #2 due

Week 8. Solid Waste Combustion to Energy
Weekly Quiz #7

Week 9. Landfilling
Weekly Quiz #8

Week 10. LCA/Solid Waste Management Across the Globe (Case Studies: Europe, China)
Weekly Quiz #9 and Industry Issue Paper #3 due

Week 11. Final Exam

Technology Statement: Most students need the following in order to take courses at TBCC. You are still encouraged to take this class, but if you lack technical or skill knowledge, please see me after class or make an appointment so that we can talk.

Technical (need):

1. Access to a computer (at home, school, or work) which you can use for extended periods of time.
2. Broadband internet access (cable modem, DSL, or other high speed).
3. Firefox 3.0 or later or Internet Explorer 7 or later. Safari and Chrome also work.
4. Permission/ability to install plug-ins or class software (e.g. Adobe Reader or Flash).
5. Highly recommended: up-to-date anti-virus software. If you are using your own computer check out the free anti-virus program at www.Avast.com.

Skills (ability):

1. Navigate web sites, including downloading and reading files from web sites.
2. Download and install software or plug-ins such as Adobe Reader or Flash.
3. Use email, including attaching and downloading documents/files from emails.
4. Save files in commonly used word processing formats (.doc, .docx, .rtf).
5. Copy and paste text and other items on a computer.
6. Save and retrieve documents and files on your computer.
7. Locate information on the internet using search engines.

Course Content and Outcomes Guide

DATE: 04/14/2014
SUBMITTED BY: Jeff Sherman/Emily Henry/Lori Gates
COURSE NUMBER: **AG 225**
COURSE TITLE: **Organic Waste Management**
CREDIT HOURS: **2**

LECTURE HOURS:
LECTURE/LAB HOURS:
LAB HOURS: 60

SPECIAL FEE:

COURSE DESCRIPTION and PREREQUISITES:
Management and treatment of animal manure and organic waste, i.e., bio-waste. Provides insight and hands-on experience in the functionality of environmental technologies for the treatment of bio-waste.

ADDENDUM TO COURSE DESCRIPTION:
This course is intended to articulate to Oregon State University (OSU).

Suggested Text: Tchobanoglous, G. & Kreith, F. (2002). Handbook of Solid Waste Management, 2nd ed. McGraw-Hill, New York.

INTENDED COURSE OUTCOMES:

- Apply knowledge from the sciences and mathematics to environmental problems and solutions.
- Use the skills and modern environmental science techniques and tools necessary for a successful career in the field.
- Function effectively on multidisciplinary teams.
- Recognize contemporary environmental science issues and the impact of environmental science in a global and societal context.

OUTCOME ASSESSMENT STRATEGIES:
Student learning outcomes will be evaluated through a variety of means, including (but not limited to) some or all of the following:

- Class Participation
- Quizzes
- Midterm

- Paper/Presentation
- Final Exam

COURSE CONTENT (Themes, Concepts, Issues) and SKILLS:

Instructional Activities:

1. Knowledge of chemistry, microbiology, and mathematics will be applied to predict potential negative environmental impacts of solid waste management practices.
2. Life-cycle assessment (LCA) technique will be used to discuss best management practices in regards to recycling and disposal.
3. Students will work in teams of 2 for class paper/presentation.
4. Link between global warming and certain solid waste management facilities will be quantitatively examined. Case studies of solid waste management practices in other countries will be examined and discussed.

Course Topics:

- Introduction/Regulations/Planning/Siting
- Characteristics of solid waste
- Source reduction and toxicity
- Collection of solid waste
- Recycling
- Recycling continued/LCA
- Composting
- Anaerobic digestion and other organic waste treatment methods
- Solid waste combustion to energy
- Solid waste combustion to energy continued
- Landfilling
- LCA/Solid waste management across the globe (Case studies: Europe, China)

OUTCOMES CROSSWALKS	
Identify which course outcome aligns to individual program learning outcomes. It is possible that all program outcomes may not be address by the course outcomes.	
Course Outcomes	**Program Outcomes**
Students who complete this course should be able to:	
Apply knowledge from the sciences and mathematics to environmental problems and solutions.	Perform critical reasoning, perceive assumptions, and make judgments based on the basic principles of agriculture, natural resources, and related fields.

Use the skills and modern environmental science techniques and tools necessary for a successful career in the field.	Fit into a business, agency, or academic setting and use concepts from agriculture and related fields to quantify and analyze issues and problems.
Function effectively on multidisciplinary teams.	
Recognize contemporary environmental science issues and the impact of environmental science in a global and societal context.	Exhibit critical thinking skills when addressing issues in agriculture, natural resources, and related fields.
Identify which course outcome aligns to individual institutional learning outcomes (ILOs). It is possible that all ILOs may not be address by the course outcomes.	
Course Outcomes	**ILOs**
Students who complete this course should be able to:	
Apply knowledge from the sciences and mathematics to environmental problems and solutions.	ILO #8 Analyze and evaluate information to address issues and solve problems.
Use the skills and modern environmental science techniques and tools necessary for a successful career in the field.	ILO #13 Demonstrate the knowledge, skills, and professional attitude necessary to enter and succeed in a defined profession or advanced academic program.
Function effectively on multidisciplinary teams.	ILO #14 Work ethically, effectively, and efficiently as individuals or as members of a team.
Recognize contemporary environmental science issues and the impact of environmental science in a global and societal context.	ILO #8 Analyze and evaluate information to address issues and solve problems

Lesson Plan: Waste Management Overview

Goal:
To understand and make decisions on how to manage different types of waste

Objectives:
At the end of this unit, students should be able to

1. Describe the different types of waste created in their daily lives.
2. Make informed decisions as to how to manage each different type of waste based on what "type" of waste it is.
3. Understand that there may be more than one way to manage individual pieces of waste.
4. Create a mini solid waste management plan for the items in the activity.

Keywords: solid waste, organics, plastics and oil, metals and glass, textiles, paper and trees, garbage, reduce, reuse, recycle, compost, landfill

Scientific Concepts: observing, communicating, comparing, classifying, applying

Activities:
1. Group discussion and listing of daily solid waste (either each person's personal day/household, or the school's waste)
2. "Where Should It Go?" from Trash Does to School (with a few modifications).
http://cwmi.css.cornell.edu/TrashGoesToSchool/Where.html

Where Should It Go?
Recycle? Compost? Incinerate? Landfill?

GRADE LEVELS: K-3

SUBJECT AREAS: math, science

CONCEPT: Where should our garbage go?

OBJECTIVE: To understand that solutions to garbage disposal problems are varied and complex.

MATERIALS:
- 5 cardboard boxes or small garbage cans
- markers
- a bag of clean garbage (choose items that will fit into all categories below)
- handout: Where Does This Trash Belong?

KEYWORDS: incinerate, compost, landfill, recycle

BACKGROUND: Our solid waste problem is very complex. To solve this problem, each community must look at all the possible solutions and make a comprehensive solid waste plan. These plans may include reduction, recycling, composting, incineration, and landfilling. No single method will solve the problem, so each community has to decide which alternatives best meet the local needs.

We are all garbage producers and therefore part of the problem. We must also all be part of the solution.

PROCEDURE: In this activity, we want to make students think about where garbage can go. At present it may all go to a landfill or incinerator, or some may be recycled or composted.

1. Take 5 boxes and place them at on end of the room and ask the students to label them:

reduce (or avoid)	recycle	compost	incinerate	landfill

2. Take a bag of clean garbage and dump it out on the floor at the opposite end of the room.

3. Set up two teams and let them sort the garbage by taking one item at a time and placing it in a container.

4. After the students have sorted the garbage, go through the bins and ask why items were placed in certain boxes. Some items may appropriately fit into more than one box. The answers are not always clear, depending on options available in your community.

5. This can be done on paper also by drawing lines between the item and the container on the handout called Where Does This Trash Belong?

6. Discuss the following questions:
- Can all items be recycled? *No, some items are made from many different materials that are hard to separate.*
- Can everything be burned if we have an incinerator? *No, some items will not burn, and some are valuable resources that could be fixed, reused, or recycled.*
-If we have an incinerator, will we still need a landfill? *Yes, the ash from incinerators must be sent to a landfill, and there are also some hazardous items (like batteries) that should be landfilled rather than burned.*

FOLLOW-UP: Discuss the idea of waste reduction. (What items are not needed in the first place? Could we have used durable products rather than disposable ones? Could we have purchased products with less packaging?)

Back to Solid Waste Activities Grades K-3

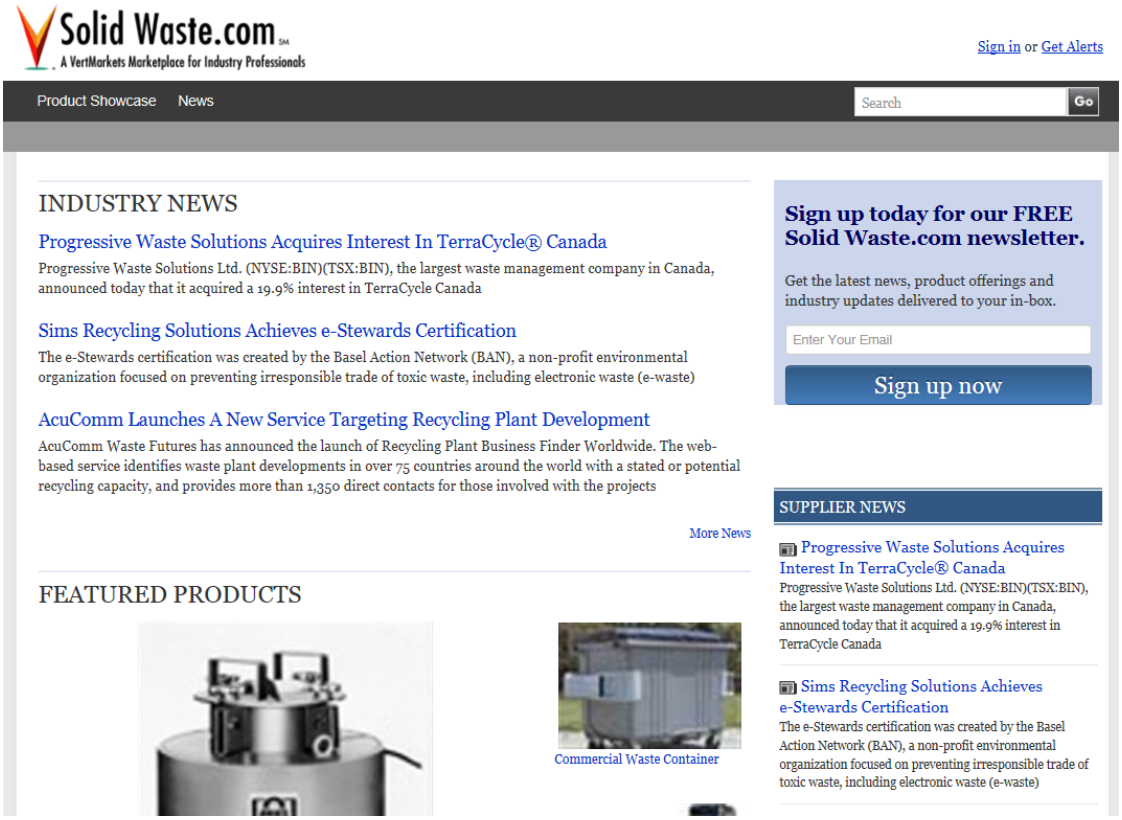
Department of Crop and Soil Sciences
Bradfield Hall, Cornell University
Ithaca, NY 14853
607-255-1187
cwmi@cornell.edu

Assignment: Current Issues and Impacts Papers

Paper (1-2 pages)

Using resources out of solidwaste.com, complete a current issues summary from either Supplier News or Industry News sections of the webpage.

- Make sure to:
  - connect to a current event related to solid waste
  - keep length between 1 and 2 pages, double spaced 11-12pt font
  - use proper grammar and punctuation
  - describe the perceived impact of this current issue and your opinion of the issue



Lesson Plan: Composting Biology

(Adapted from Cornell University)

Goal:

To understand what composting is and how it works

Objectives

At the end of this unit, students should be able to:

1. Describe the process of composting.
2. Identify compost "workers"
3. Understand the cycle for organic materials.
4. Determine what types of materials decompose.

Keywords: organics, compost, composting, microorganisms, macro organisms, decomposition, nutrient cycle, primary and secondary decomposers/consumers, predators

Scientific Concepts: Observing, communicating, comparing, ordering, relating

Activities:

1. "Discover Composting Microorganisms Record" from Composting: Wastes to Resources, Cornell University.
2. "Food Web Game" courtesy of Allison L H Jack, Department of Plant Pathology and Plant-Microbe Biology, Cornell University, Ithaca, NY.
3. "Watching Wastes Rot I" from Composting: Waste to Resources

Discover Composting Microorganisms Record

Name: _____

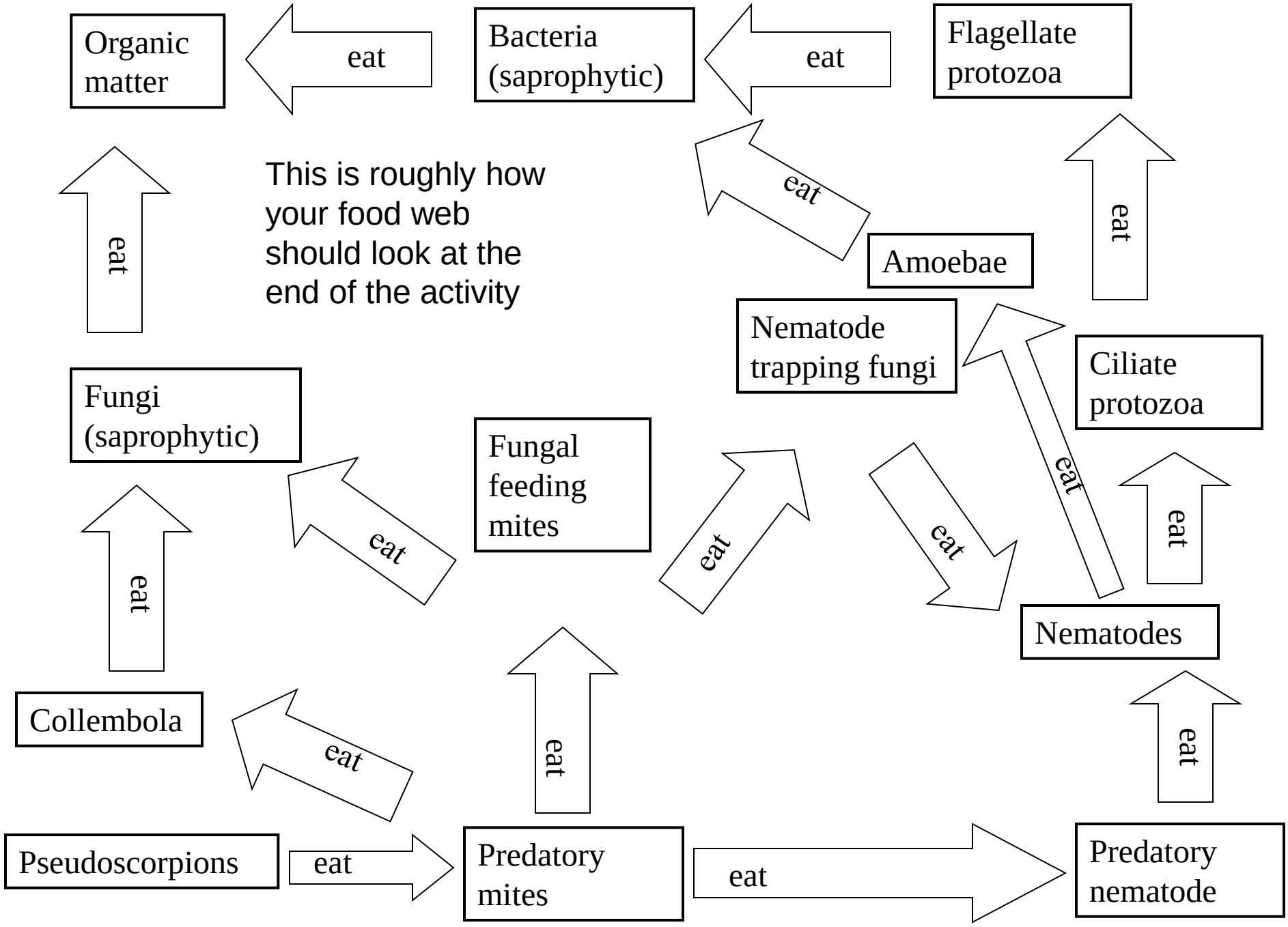
Date: _____

Draw pictures of the microorganisms that you see in your compost sample. Can you name any of the organisms?

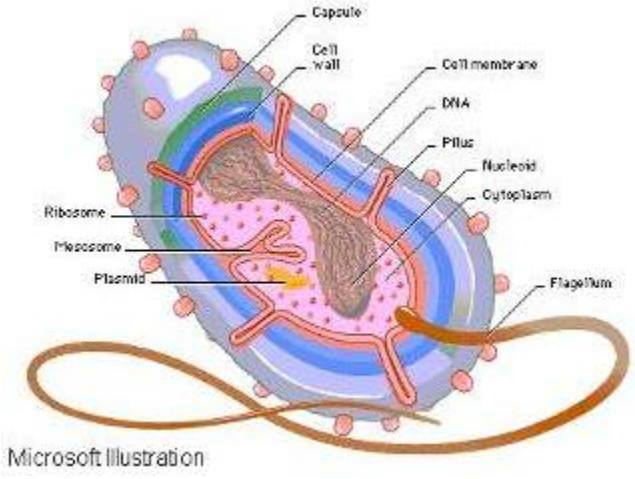
Food Web Instructions

- Best used with a little bit of background information on each organism and microscope viewings of soil arthropods and microorganisms (if compound microscope is available)
- Cut a bunch of long pieces of string or yarn
- Each person gets one card (cut each slide in half) and a few pieces of yard
- Start with “Organic matter” holding one end of a string and ask “who eats organic matter?”, then hand the other end of the string to them
- Continue building the food web in this fashion until everyone is connected
- Point out that the arthropods form the base of terrestrial food webs and are eaten by voles, birds etc. Have people self identify as primary or secondary consumers, predators etc.
- Loosely based on an activity I learned about in Master Recyclers in Oregon on the life cycle of a piece of garbage.
- For background reading on the soil food web: http://soils.usda.gov/sqi/concepts/soil_biology/soil_food_web.html

Allison Jack 2009 alh54@cornell.edu

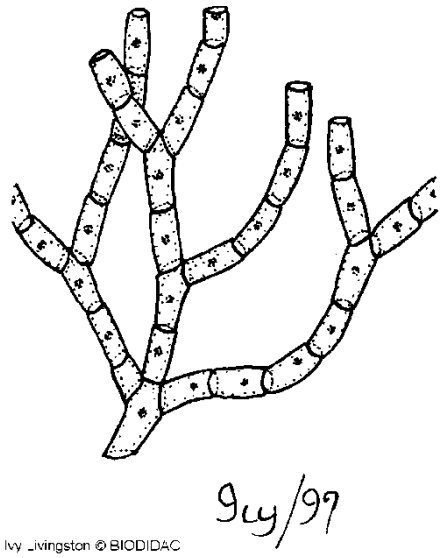

Organic matter
eat
Bacteria (saprophytic)
eat
Flagellate protozoa
eat
eat
This is roughly how your food web should look at the end of the activity
eat
Amoebae
Nematode trapping fungi
Ciliate protozoa
Fungi (saprophytic)
eat
Fungal feeding mites
eat
eat
eat
eat
Nematodes
eat
Collembola
eat
eat
Pseudoscorpions
eat
Predatory mites
eat
Predatory nematode

Bacteria (decomposers)



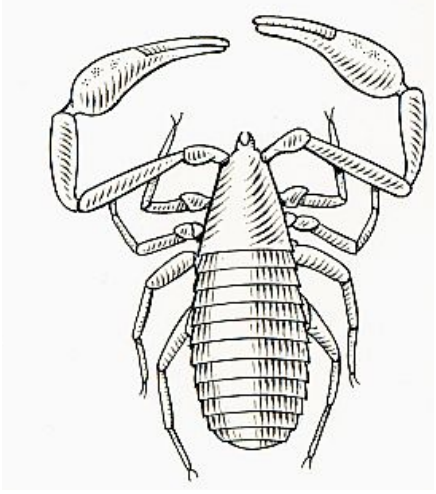
You eat organic matter

Fungi (decomposers)



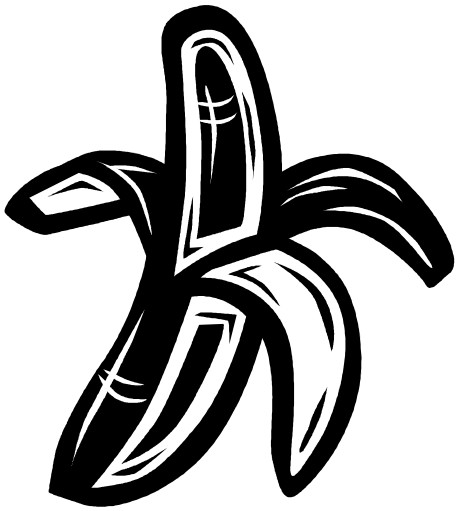
You eat organic matter

Pseudoscorpion



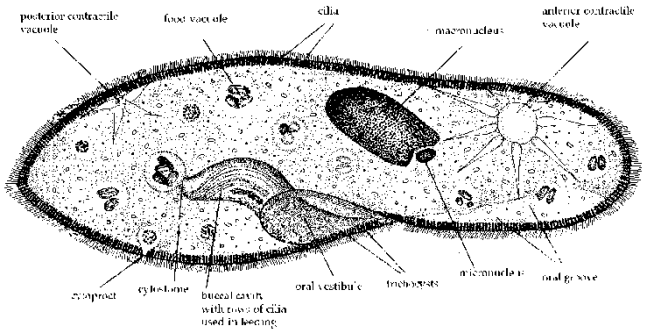
You eat predatory mites and collembola

Organic matter



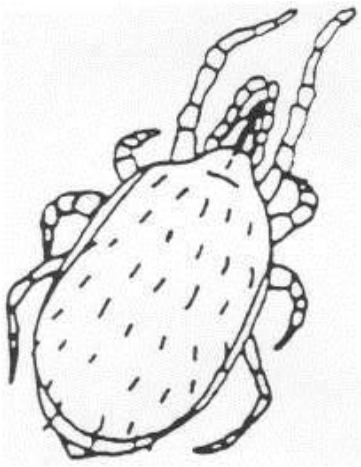
You form the base of the food chain

Ciliate protozoa



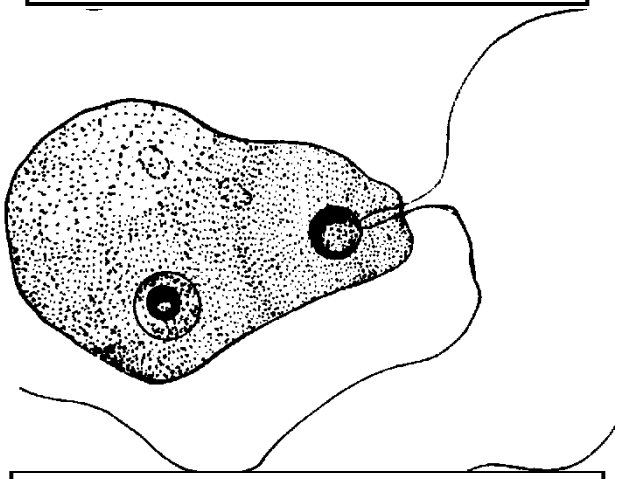
You eat flagellate protozoa

Predatory mite



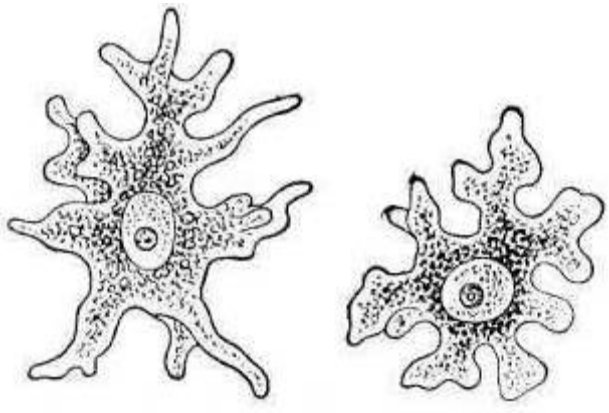
You eat springtails, fungal feeding mites, and predatory nematodes

Flagellate protozoa



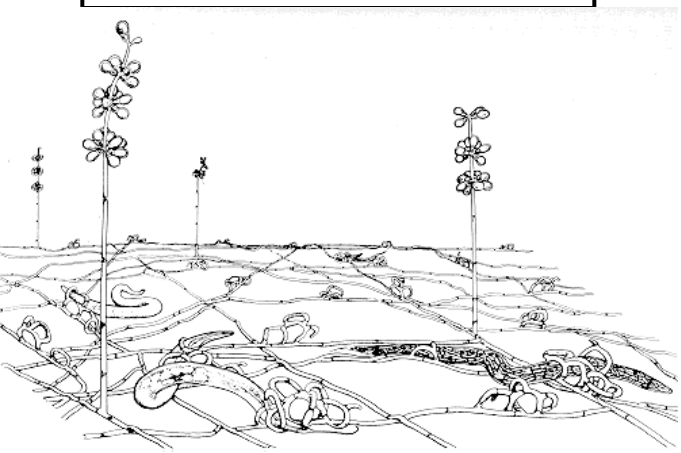
You eat bacteria

Amoebae



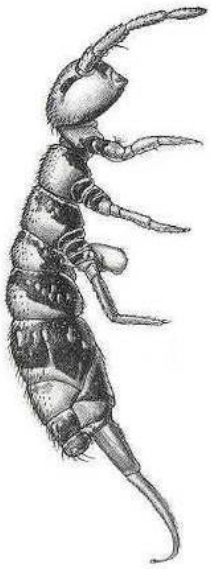
You eat bacteria

Nematode trapping fungi



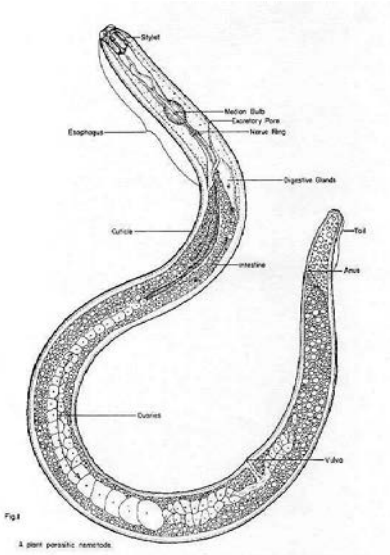
You eat nematodes

Springtail



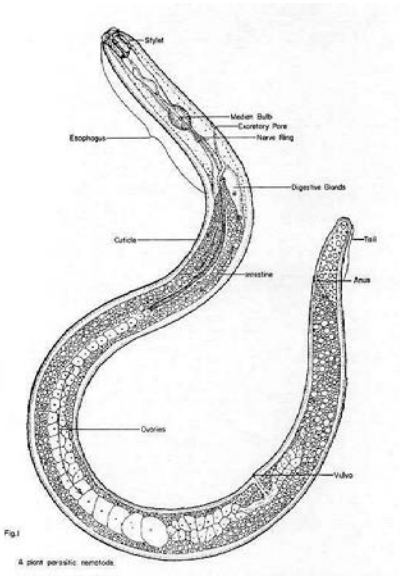
You eat fungi

Nematode



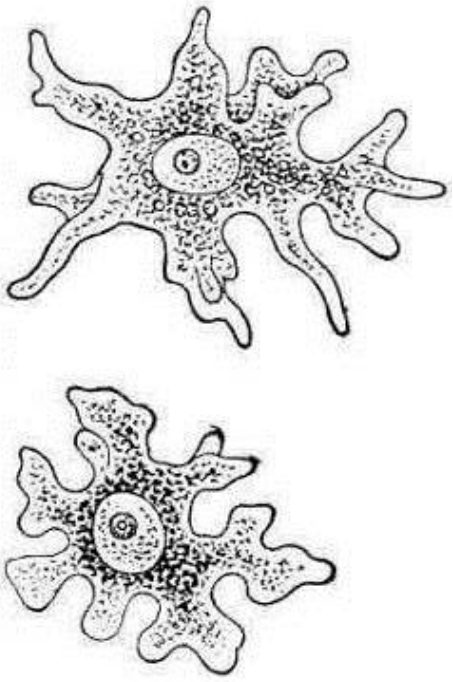
You eat amoebae and ciliate protozoa

Predatory nematode



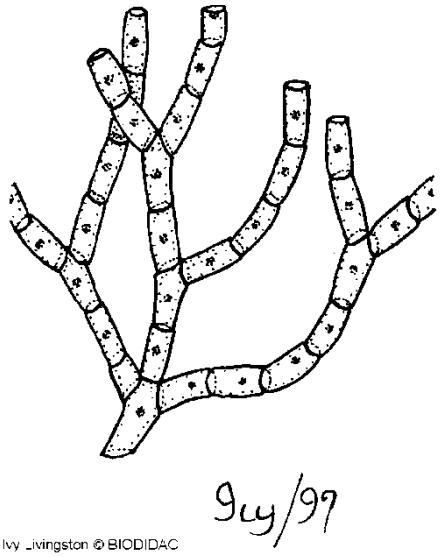
You eat nematodes

Amoebae



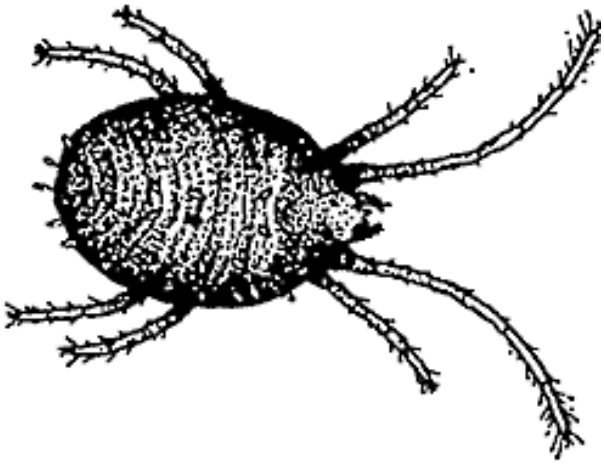
You eat tardigrades

Fungi (decomposers)



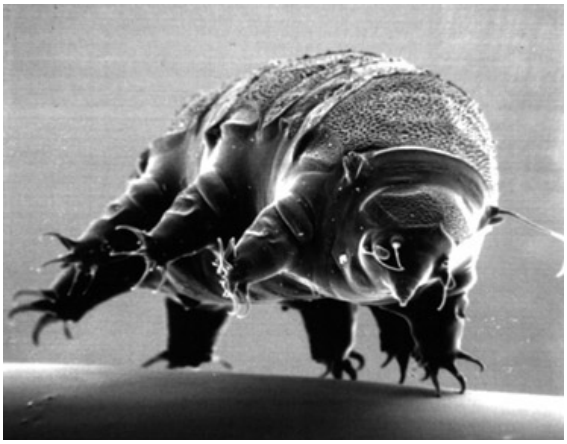
You eat organic matter

Fungal feeding mite



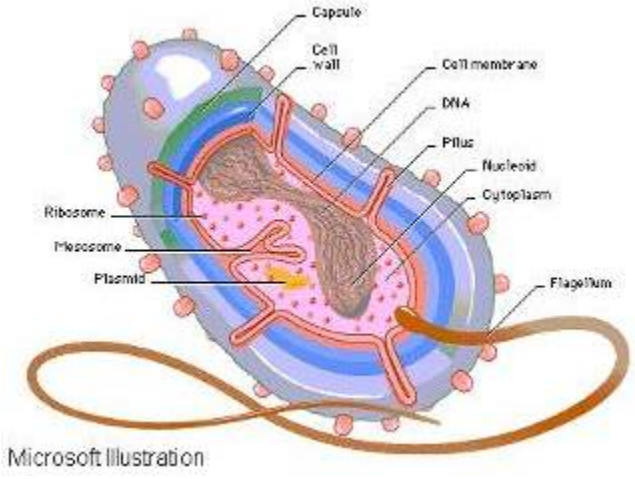
You eat fungi and nematode trapping fungi

Tardigrade



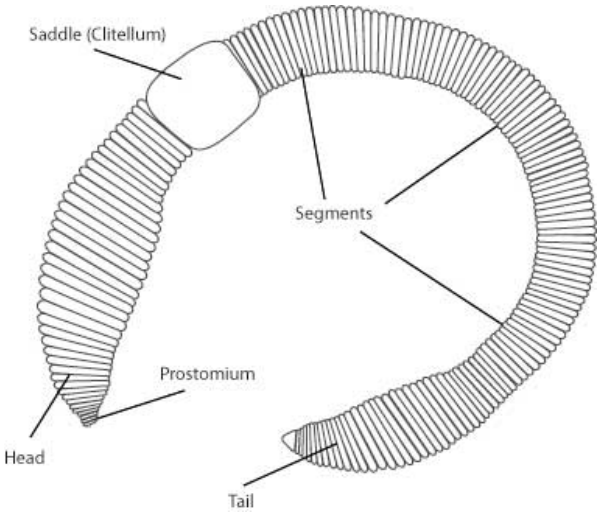
You eat protozoa

Bacteria (decomposers)



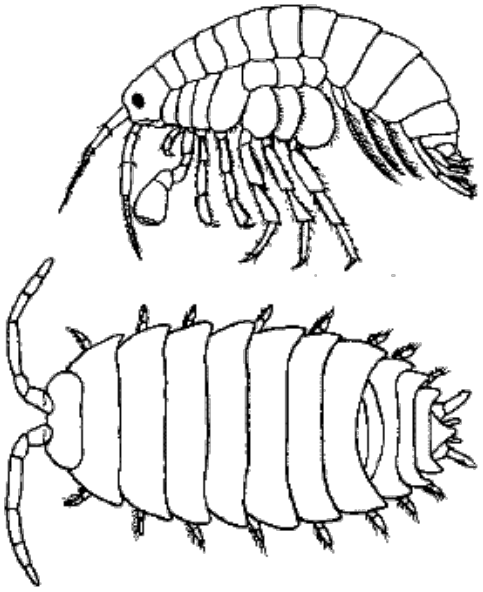
You eat organic matter

Earthworm



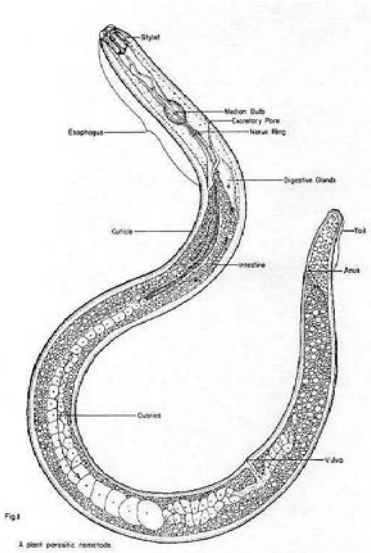
You eat organic matter, bacteria and fungi

Isopod



You eat organic matter

Nematode



You eat amoebae and ciliate protozoa

Watching Wastes Rot I Record

Name: _____ Date experiment started: _____

Fill in the following table each time you check your pots. Under "Waste," write the name of the item that you buried in the pot. Under "Compost," describe the condition of the item buried in compost each time you check it. Include such things as how decomposed the item looks, what color it is, and whether or not you see fungi (spots or thin strands) on it. Under "Sterile Mix," describe in the same way the condition of the item buried in sterile mix.

Date: _____ Time since waste was buried: _____

	Waste	*Compost*	*Sterile Mix*
1.	_____	_____	_____
		_____	_____
		_____	_____
2.	_____	_____	_____
		_____	_____
		_____	_____
3.	_____	_____	_____
		_____	_____
		_____	_____
4.	_____	_____	_____
		_____	_____
		_____	_____
5.	_____	_____	_____
		_____	_____
		_____	_____

Which items decomposed most quickly?

Which items didn't decompose at all?

In general, did items decompose more quickly in compost or in sterile mix? Why do you think this is true?

Quiz: Organic Waste

1. Define Organic Waste:

2. What are the benefits/risks/unknowns of organic waste to soil?

3. Describe by-products of organic waste and their potential benefits to consumers.

4. Describe collection methods of organic waste on dairy farms?

5. What is the current policy in Tillamook for digesting dairy mortalities?

6. What does RECYCLE mean?
    a. to burn
    b. to make into
    c. to break down
    d. to throw away

7. What does BIODEGRADABLE mean?
    a. burn
    b. use again
    c. break down or rot
    d. d. throw away

Assignment: Creating a Food Web

(Adapted from Cornell University)

Background: We have seen that insects, worms, bacteria and fungi do the work of making compost (converting organic matter, such as banana peels and leaves into a soil-like material). Each of these has a job in the food chain of the compost pile. Primary decomposers or consumers eat organic matter. Secondary consumers eat the primary consumers and predators, and third level consumers eat secondary consumers. We will replicate a compost web in the classroom.

Procedure: Each student will create a food web chart. Arrows point to which member of the food web is eaten or eats another member (example below). Students will create the chart from the list of food web ingredients:

Fungi

Bacteria

Bacteria (saprophytic)

Ciliate protozoa

Nematode trapping fungi

Collembolan

Fungal feeding mites

Organic matter

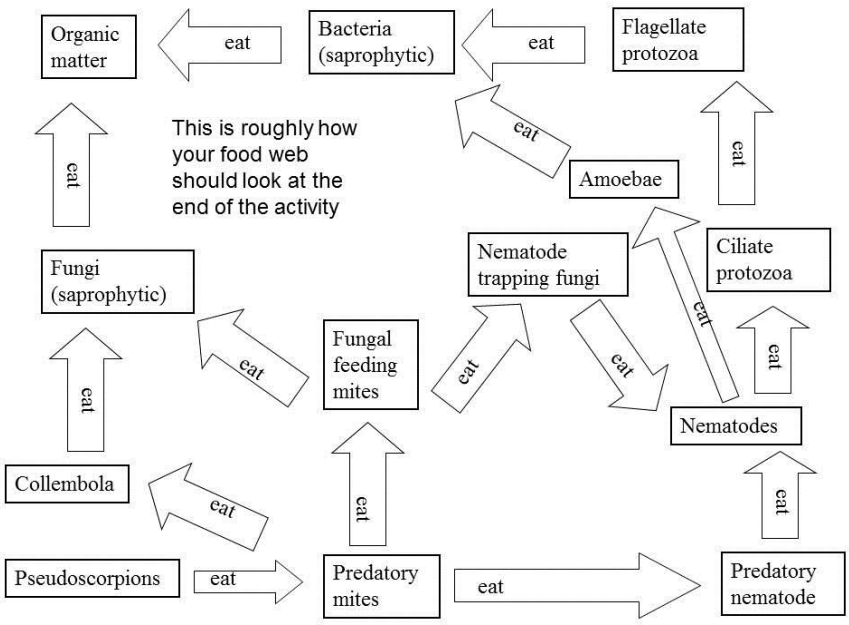
Flagellate protozoa

Amoebae

Fungi (saprophytic)

Predatory mites

Predatory nematode



Scoring Guide for Current Issues and Impacts Papers

Current issue related to solid waste (yes or no). 10 points

Length (1-2 pages). 10 points

Grammar and Punctuation. 10 points

Impact statement and opinion. 20 points

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