

## 7) Appendices

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### Overview

There are three appendices to this curriculum, each of which is detailed in the table below.

<b>Appendix</b>	<b>Purpose</b>	<b>Page</b>
A. Illustrated Glossary	Provides visual glossary pages for each of the major concepts in this curriculum	7-2
B. Key Concept Index	Allows teachers to cross-reference activities by key concepts	7-17
C. Subject Index	Allows teachers to cross-reference activities by subjects covered	7-19

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# Appendix A. Illustrated Glossary

## Overview

This section is a collection of illustrated glossary pages for students. They can be used to introduce or review basic topics pertinent to this curriculum.

## Glossary Table of Contents

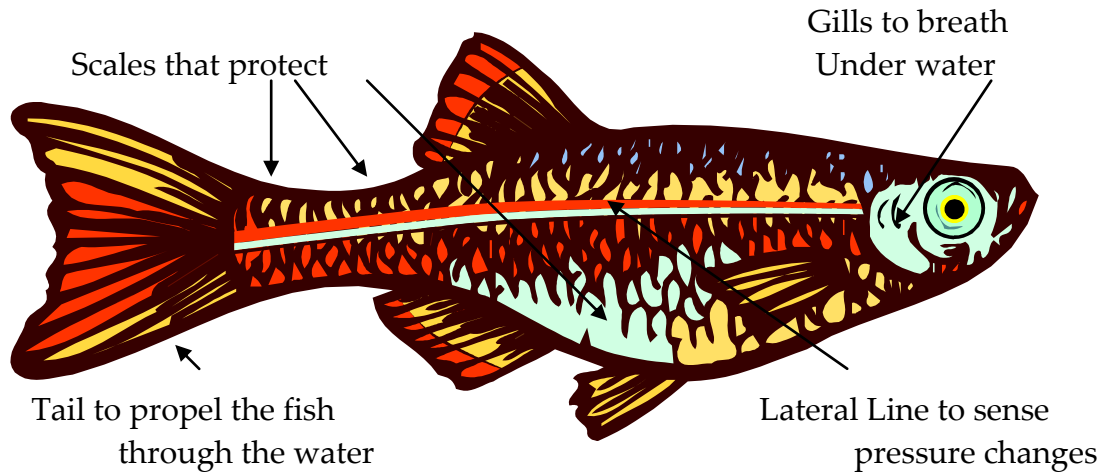
The table below explains the topics included in this glossary and their page number.

<b>Glossary Topic</b>	<b>Page</b>
Adaptations	7-3
Biodiversity	7-4
Composting	7-5
Energy Cycle: Food Chains/Webs	7-6
Erosion	7-7
Habitat	7-8
Niche	7-9
Predator/Prey	7-10
Recycling	7-11
Sedimentation	7-12
Soil	7-13
Vermiculture	7-14
Water Cycle	7-14
Watersheds	7-16

# ADAPTATIONS

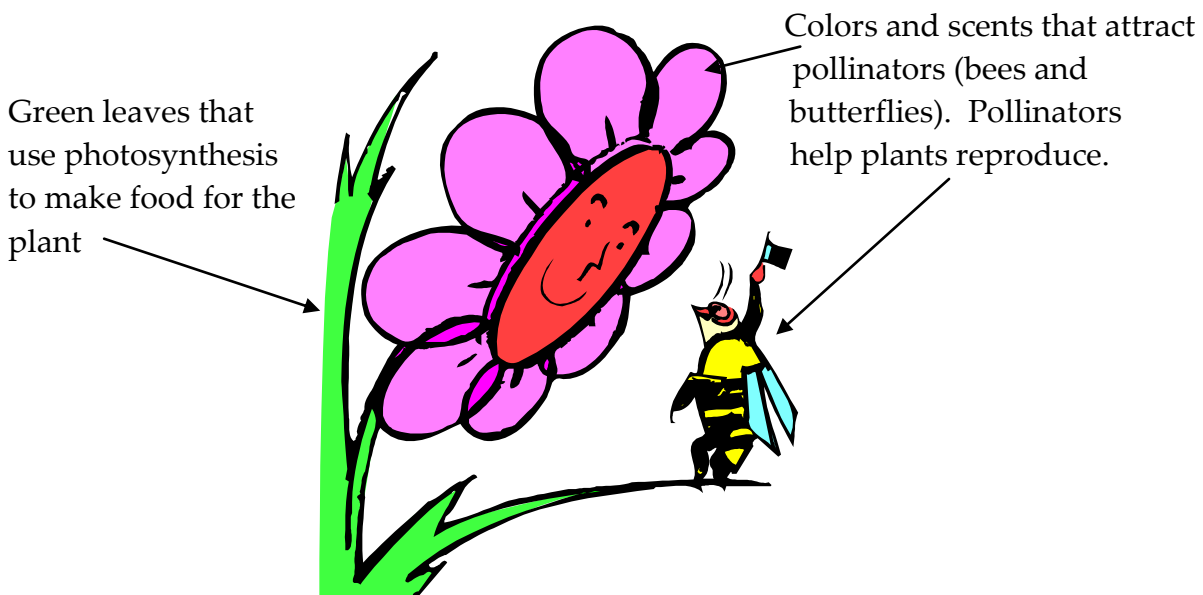
**Adaptation** - A physical structure or a behavior that helps a plant or an animal to live successfully in its surroundings.

## Fish Adaptations:



Fish that swim in schools (groups) are protecting themselves from predators. This is a **behavioral adaptation**.

## Plant Adaptations:

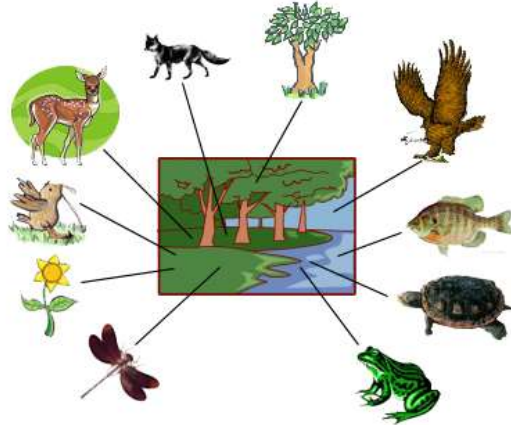


# BIODIVERSITY

**Biodiversity:** The variety of life forms in a given area. More variety equals a healthier, more stable environment.

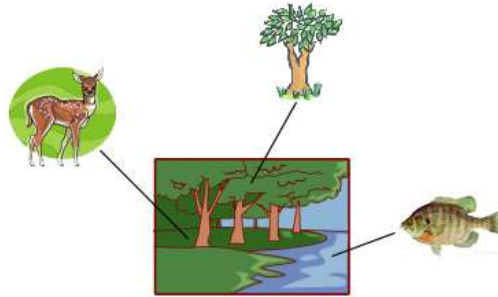
## VERY DIVERSE

Wide variety of plant and animal species means a healthy, stable environment that offers many options for food and homes.



## LESS DIVERSE

Little variety of plant and animal species means a less than healthy environment that is out of balance, offering fewer options for food and homes.



## MONOCULTURE

*(Only one species – grass)*

Very little variety of plant and animal species means an unhealthy environment that is out of balance, with almost no options for food and homes.



# COMPOSTING

**Composting-** when people help plant remains and other once-living materials to rot. This makes an earthy, dark, crumbly substance that is excellent for adding to house plants or enriching garden soil.



## Benefits of Composting

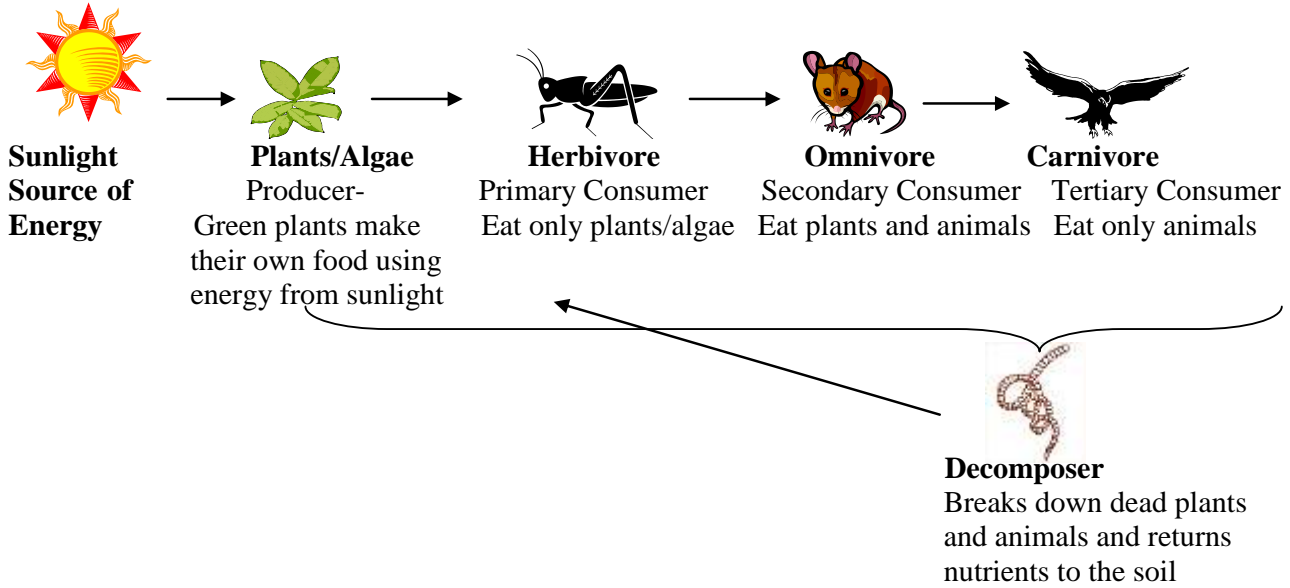
- Reduce the amount of trash going to the landfill;
- Recycle organic (once living) material
- Provide great nutrients to new plants

**How to Compost** – People compost in small and large areas, often in their backyards. This reduces the trash sent to the landfill, and creates great soil for plants. Look at the table below to see what to include in a compost pile.

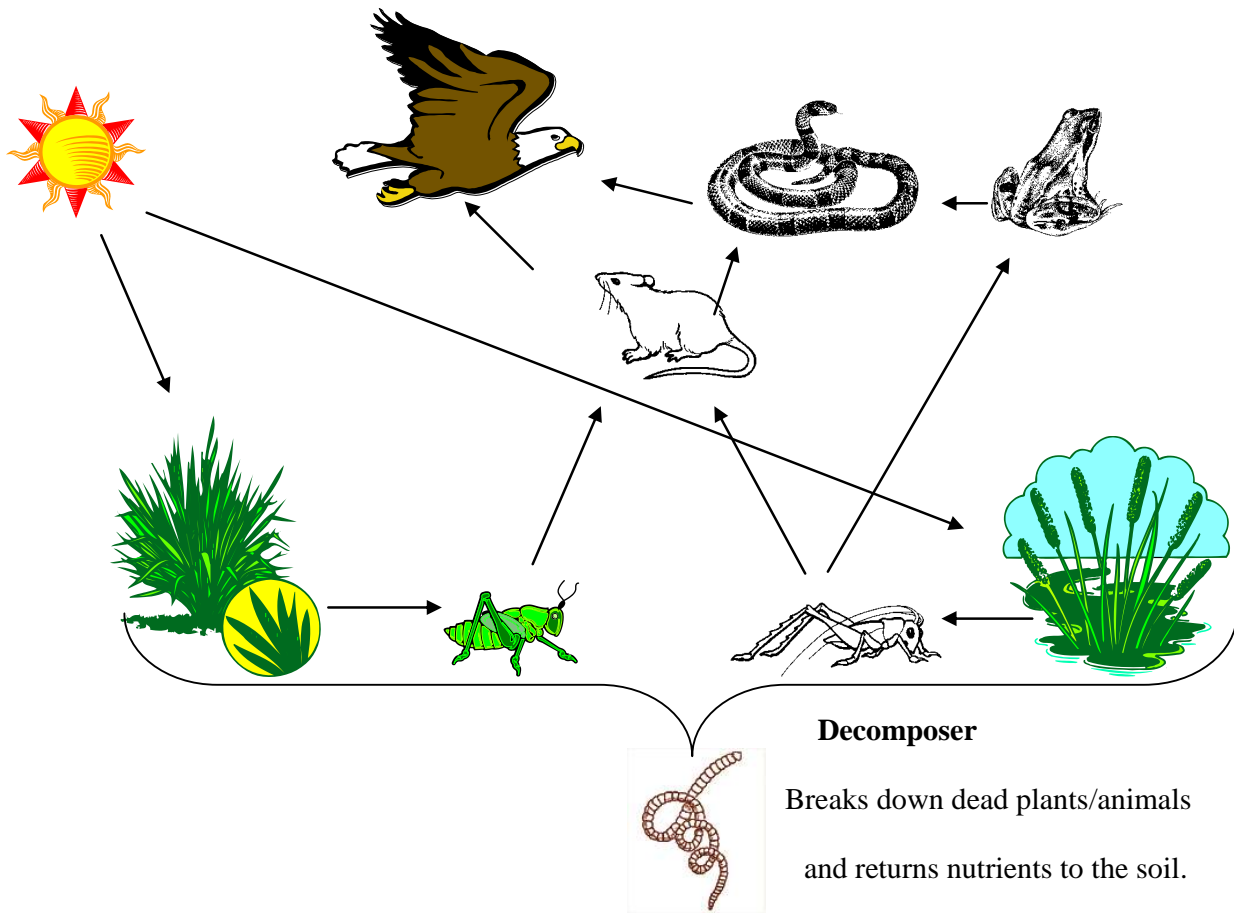
Component	Amount	Examples
Carbon Source	2 parts	dry leaves, chopped woody stems, straw, sawdust, or other dried plant matter
Nitrogen Source	1 part	moist kitchen scraps, young weeds, grass clippings, manure from plant-eaters
Air	enough air for organisms in the pile to survive	layering materials and turning the pile from time to time adds the oxygen needed
Microorganisms	Soil sprinkled throughout your pile will give you all you need.	earthworms, bacteria, fungi, sow bugs, etc.
Water	moist, but not soggy	N/A

# ENERGY CYCLE: FOOD CHAINS & FOOD WEBS

**Food Chain-** The path of food energy from one organism to the next.



**Food Web -** All feeding relationships in an ecosystem. A food web is many individual food chains together. Arrows point in the direction of energy flow.



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# EROSION

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**Erosion**- Movement of soil by water or wind.



*Weathering* is the breaking down of rocks into soil. These small particles can then be *eroded* by wind or water.

Natural weathering and erosion have formed the Grand Canyon.



Humans have increased erosion along the banks of rivers by clearing land for agriculture. →



We can slow erosion along streams and rivers by:

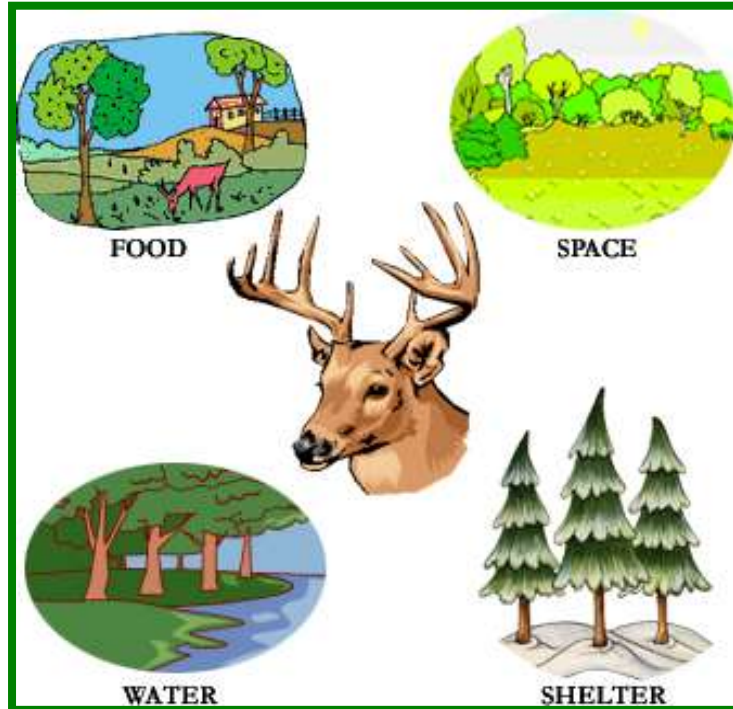
- planting buffer zones of trees and other plants with deep roots to hold soil in place
- placing physical barriers such as sea walls or rip-rap (rocks) to protect against wave action



# HABITAT

**Habitat:** The place where an organism gets everything it needs to survive: **FOOD**, **WATER**, **SHELTER** and **SPACE**.

The diagram below shows how a deer meets all of its needs in a habitat.



Some Habitat Types Include:



RIVER



MOUNTAINS



FOREST



TOWN



SCHOOL



DESERT

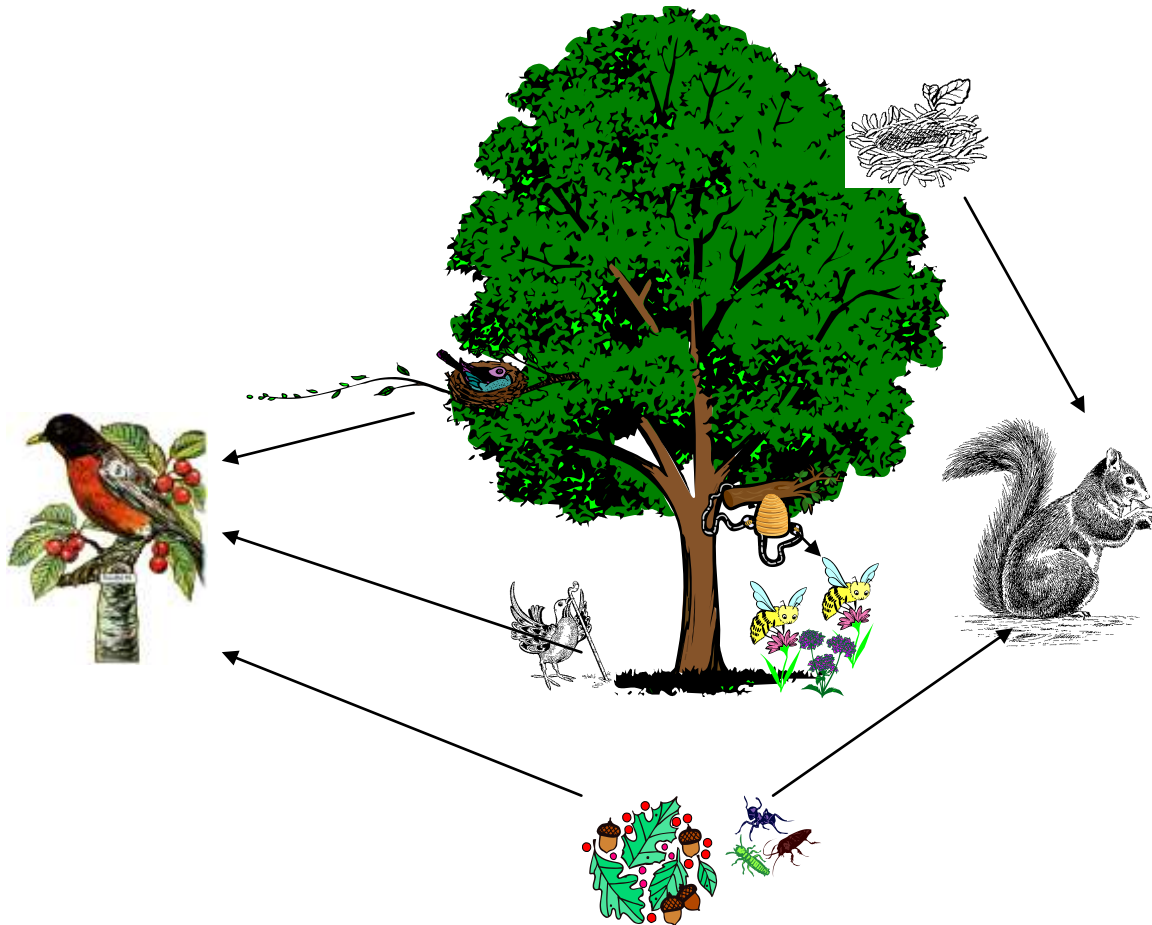


# NICHE

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**Niche-** The role of an organism within its natural environment that determines its relations with other organisms and ensures its survival. Think of niche like the job description of an organism – what it eats, where it lives, what it does, etc.

**Example:** A robin, bee and squirrel share a habitat, but each has a special niche, because they have specialized food sources that they don't share with others. This specialization allows them all to survive using the same habitat.



# PREDATOR/PREY

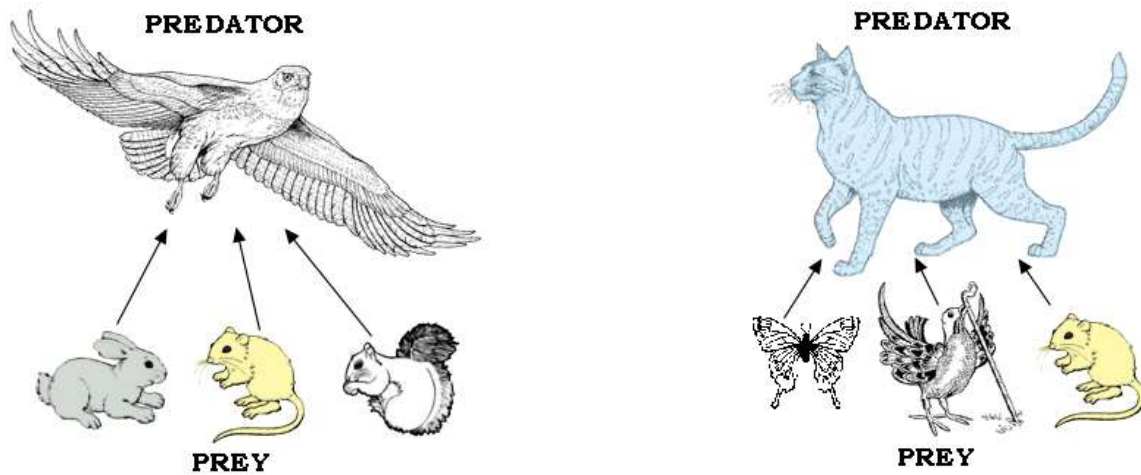
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**Predator:** an animal that hunts, kills and eats other animals

**Prey:** an animal that is hunted and killed for food by another animal

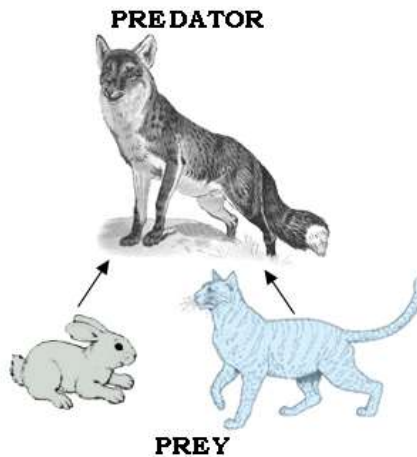
Some prey animals are food for more than one kind of predator.

Example: Both the hawk and cat eat mice, as shown in the diagram below. Arrows show the energy transferred as a predator eats the prey.



Some predator animals become prey to larger predators.

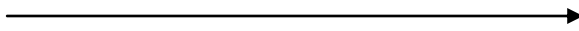
Example: The cat is a predator when it eats the bird in the diagram above; the cat becomes prey when eaten by the fox as in the diagram below.



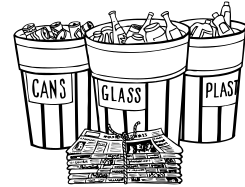
# RECYCLING

**Recycling**-The process by which wastes can be reused or converted into other materials or products. Recycling helps reduce landfill space and can save energy, money and natural resources like metal and oil.

Universal symbol for recycling:



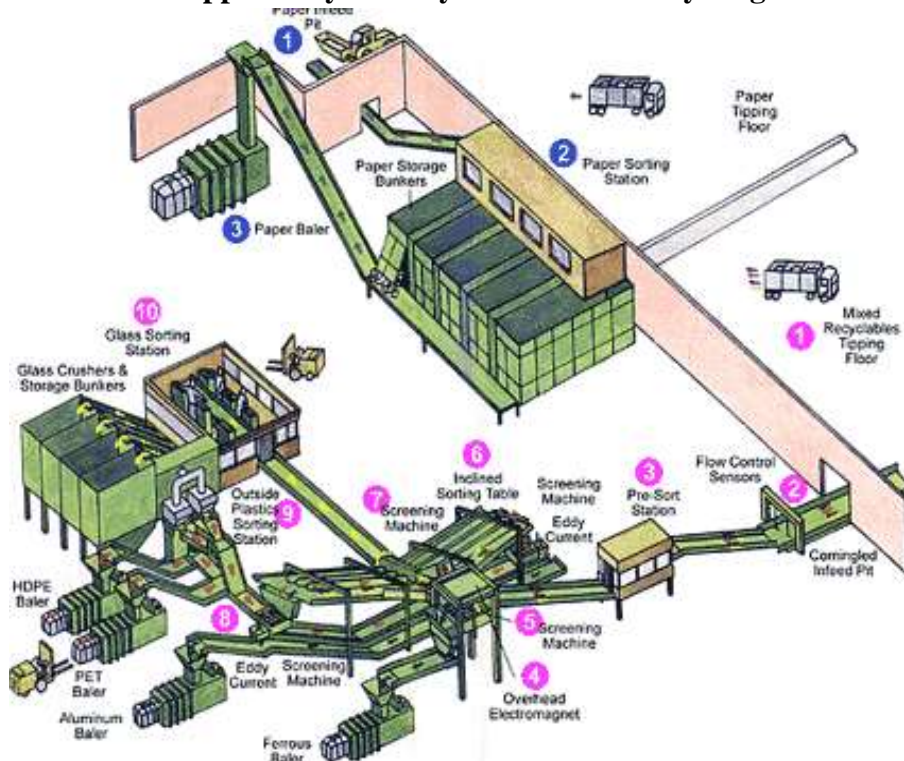
**Glass, paper, cardboard, plastics and metals can be recycled.**



There are numbers inside the recycling symbol on the bottom of plastic containers, as shown in the diagram below. While all plastics are technically recyclable, not all towns/counties have the machinery to recycle them all. Numbers 1&2 are the most commonly recycled.



**What happens to your recyclables at the recycling center:**

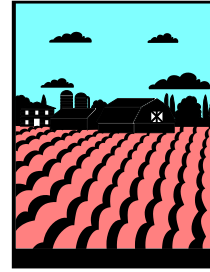


# SEDIMENTATION

**Sedimentation-** When loose materials such as rock fragments/soils are transported by wind, water or glaciers and deposited in an area.

## Causes of Sedimentation:

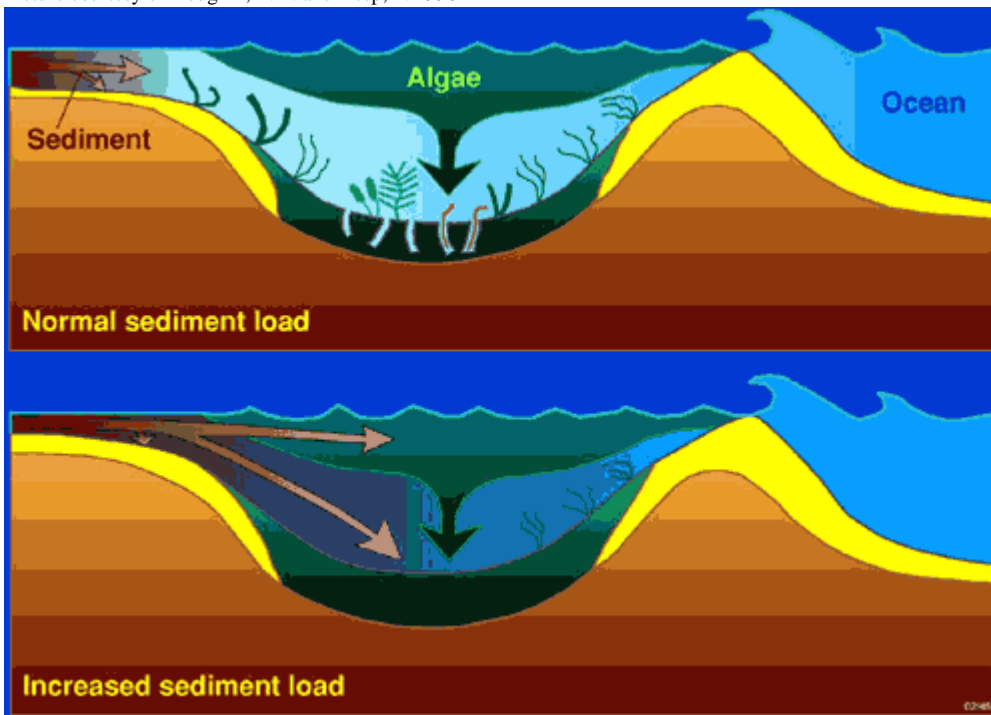
The main cause is soil run-off from agricultural fields.



## Problems of Sedimentation:

- Decreases water depth
- Kills/injures plants and animals by covering them.
- Reduces overall water quality

Picture courtesy of Hodgkin, E. P. and Hesp, P. 1998



The first picture to the left shows a normal stream/bay.

The second picture shows how increased sediment covers plants and animals, killing them, and resulting in poor water quality.

## Ways to slow sedimentation:

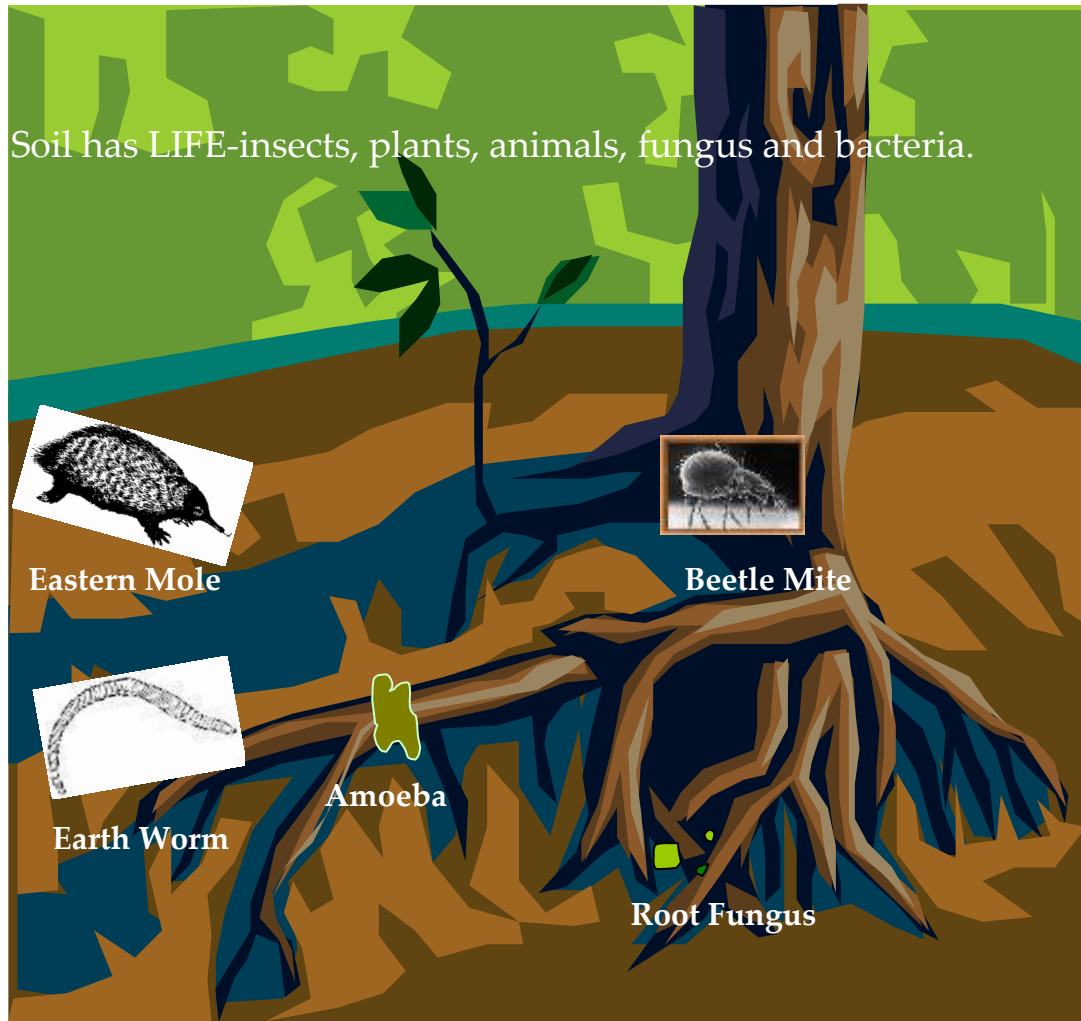
- Plant trees or green plants between agricultural fields and water bodies (these are called buffer zones).
- Build physical barriers such as sea walls or rip-rap (rocks) to hold soil in place.
- Use farming techniques that reduce soil erosion and sedimentation.



# SOIL

**Soil-** A mix of minerals, organic matter, water, air, living things and chemicals.

**It's not just dirt! Think of it as a thin living skin that covers the earth.**



Soil acts as a **FILTER** to make clean water.



Soil **RECYCLES** dead and decaying plant and animal (including human) materials.

Soil has **LAYERS** like pizza:

**Ground Level and Topsoil** (the toppings) where plants grow.

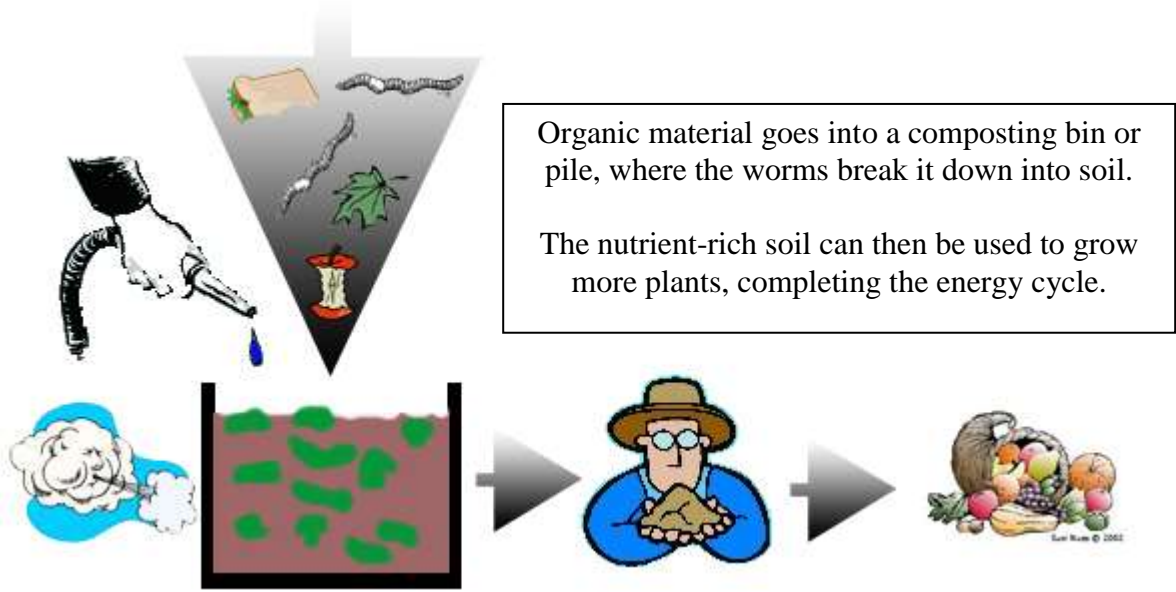
**Subsoil** (the cheese) where roots dig to find water and nutrients.

**Weathered Parent Material** (the sauce) is minerals, rock particles and nothing living.

**Bedrock** (the crust) is solid rock!

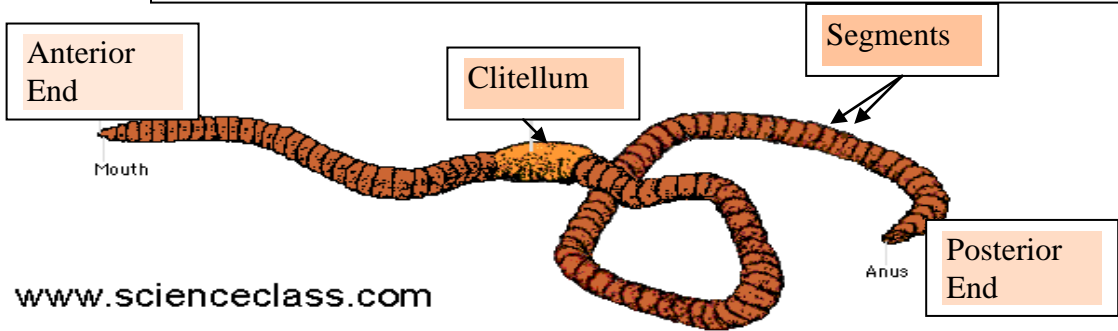
# VERMICULTURE

**Vermiculture:** Using earthworms to add air to soil and break down organic matter into compost.



Worms create tunnels that allow air and moisture into the compost pile. Air and moisture are important to the worms and other organisms that are breaking down the organic material.

Worms eat the organic material and leave behind a nutrient rich soil that is great for growing new plants.



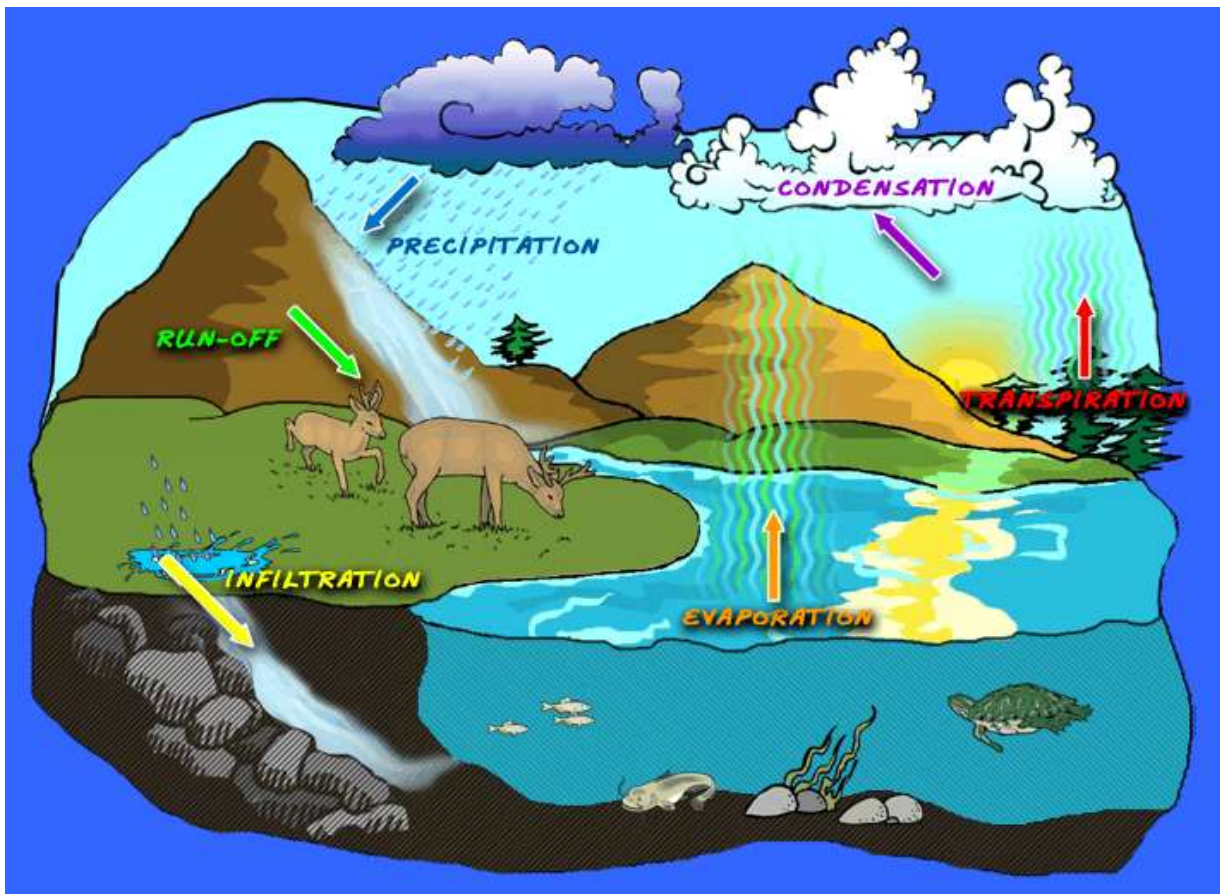
[www.scienceclass.com](http://www.scienceclass.com)

Part	What It Is/What it Does
Anterior End	Front end of the worm, the mouth is located here
Posterior End	Back end of the worm, the anus is located here
Clitellum	The enlarged area about 1/3 of the way from the anterior end. Used for reproduction.
Setae	Small bristly hairs on the exterior of the worm; helps in moving the worm; 4 pair per segment (use a magnifying glass)
Segments	Individual sections of the worm's body; the first is the anterior end, the last is the posterior end.



# WATER CYCLE

**Water Cycle-** The movement of water from the atmosphere to the earth and back to the atmosphere through precipitation, runoff, infiltration, percolation, storage, evaporation, and transpiration.



**Precipitation-** The force of gravity pulls water droplets or ice crystals (snow) down to the Earth's surface.

**Run-Off-** When water moves along the top of the ground.

**Infiltration-** When rain hits the Earth's surface and some of it sinks into the ground.

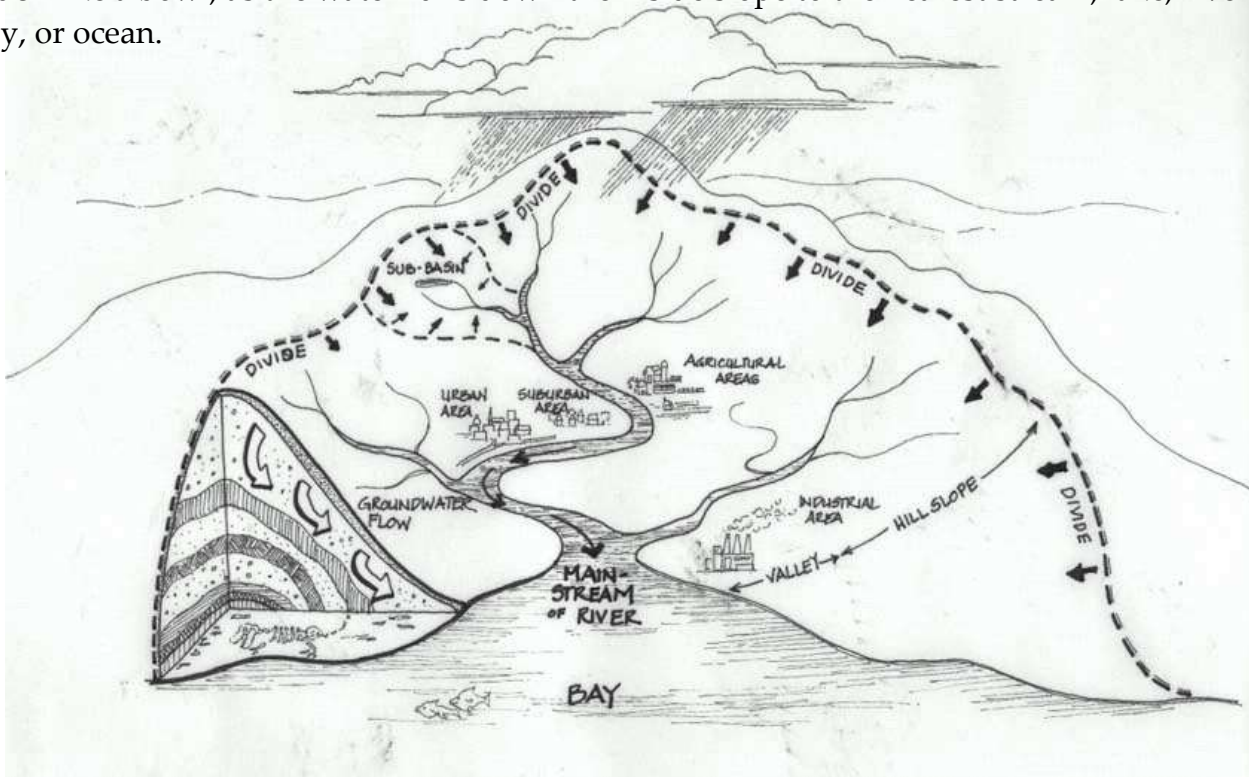
**Evaporation-**Energy from the sun changes liquid water into vapor, a gas.

**Transpiration-** Water enters plants through roots and moves into the plants and exits by evaporating through the leaves.

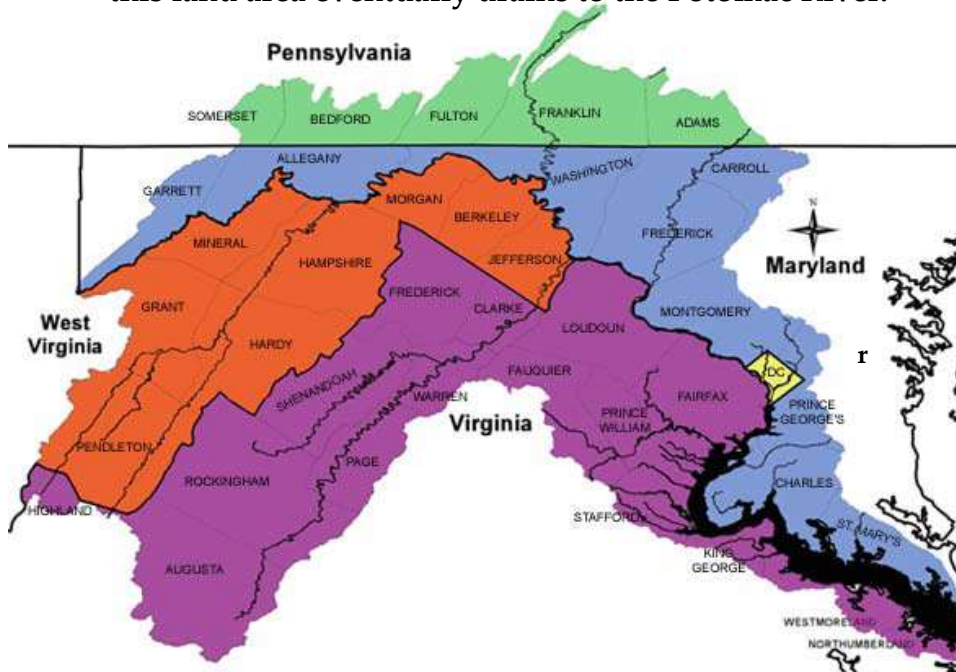
**Condensation-**Water vapor in the air travels as a gas until it meets cooler air where it changes back into water, snow or ice.

# WATERSHED

**Watershed-** A land area that drains water to a particular stream, river, or lake. Its boundary can be identified by locating the highest points of lands around the waterway. The land works much like a bowl, as the water runs down the inside slope to the nearest stream, lake, river, bay, or ocean.



Every place on Earth is part of a watershed. Here is the Potomac Watershed. All water from this land area eventually drains to the Potomac River.



## Appendix B. Key Concept Index

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### Overview

The Key Concept Index, on the next page, references each of the activities by the key concepts and lists the duration/page reference for each activity. You can use this index to quickly identify all of the activities that cover a certain concept, such as “watershed, or to identify which lessons meet largest percentage of the key concepts relevant to your instruction.”

The activities in *Unit 6. Issue Investigation, Reflection and Action Projects* vary in the key concepts covered, based on teacher design and implementation, so they were omitted from this index.

The symbols used in this index are shown in the key below:

**◆ = Key Concept is covered by this activity**

**A = 15 minutes or less**

**B = 15-30 minutes**

**C = 30-45 minutes**

**D = 45-60 minutes**

**E = 60+ minutes**

**V = time required varies**

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Unit	Activity Number	Activity	Duration	Key Concepts																							
				Adaptation	Biodegradation	Biodiversity	Classification	Composting	Energy Cycle: Food Chains/ Food Webs	Habitat	Journaling	Land Use	Landforms	Mapping	Natural Resources	Niche	Observation	Predator/Prey	Pollution	Population	Runoff & Erosion	Sedimentation	Soils	3 R's: Reduce, Reuse, Recycle	Trash Reduction	Water Cycle	Water Quality
Unit 2. Introduction to Watersheds	2.2	Crumpled Paper Watershed	B																								
	2.4	Journaling	D																								
	2.3	Mapping Basics	V																								
	2.6	Mapping Your Surroundings	C																								
	2.1	Sprinkle A Day	B																								
	2.5	Watershed Address	E																								
Unit 3. Waste Management	3.6	Complete the Compost Heap	C																								
	3.5	Compost in a Bag: Moving Beyond Rot	V																								
	3.4	Composting	D																								
	3.9	Cup of Compost	C																								
	3.7	Take Out The Trash	E																								
	3.10	Rethink, Reduce, Reuse, & Recycle	D																								
	3.3	Trash Tally	C																								
	3.1	Trash Timeline	A																								
	3.8	Vermicomposting: Worms in Your Lunchroom	V																								
	3.2	Who Polluted the Potomac	B																								
Unit 4. Erosion & Runoff	4.9	Bernie's Toes	A																								
	4.10	Designing a Schoolyard	D																								
	4.5	Does Your Soil Perc?	E																								
	4.1	Earth: From Crust to Apple Core	B																								
	4.4	Great Terrain Robbery	B																								
	4.6	Sediment: Choking the Life Out of the Bay*	C																								
	4.3	Soil Study	E																								
	4.2	Sweet Resources	D																								
	4.7	Water Quality Testing	E																								
	4.8	Wetland Metaphors*	A																								
Unit 5. Ecosystem Diversity	5.4	Animal Adaptations Field Study	D																								
	5.1	Classified Information: Fishing for a Name & Creature Feature	C																								
	5.3	Eat Like a Bird	B																								
	5.8	Ecosystem Food Web Mural	V																								
	5.7	Frankenfish	D																								
	5.2	Let's Take a Dip	E																								
	5.6	Macroinvertebrate Field Study	E																								
	5.5	Oh Deer!*	C																								

# Appendix C. Subject Index

## Overview

This index shows the subject areas that each lesson covers, as well as the duration of the lesson.

The symbols used in this table are shown in the key below.:

 = Subject is covered by this activity

**A = 15 minutes or less**





























**B = 15-30 minutes**

**C = 30-45 minutes**

**D = 45-60 minutes**

**E = 60+ minutes**

**V = time required varies**

Unit	Activity Number	Activity	Duration	Subjects Covered							
				Art	English	Math	Environmental Science	Life Science	Physical Science	Earth Science	Social Studies
Unit 2. Introduction to Watersheds	2.2	Crumpled Paper Watershed	B								
	2.4	Journaling	V								
	2.3	Mapping Basics	D								
	2.6	Mapping Your Surroundings	E								
	2.1	Sprinkle A Day	B								
	2.5	Watershed Address	C								

*Continued on next page*



# Appendix C. Subject Index, Continued

Unit	Activity Number	Activity	Duration	Subjects Covered							
				Art	English	Math	Environmental Science	Life Science	Physical Science	Earth Science	Social Studies
Unit 3. Waste Management	3.6	Complete the Compost Heap	C				●	●			
	3.5	Compost in a Bag: Moving Beyond Rot	V		●		●	●			
	3.4	Composting	D			●	●	●		●	●
	3.9	Cup of Compost	C				●	●			
	3.7	Take Out the Trash	E		●	●	●	●			
	3.10	Rethink, Reduce, Reuse, & Recycle	D		●		●				●
	3.3	Trash Tally	C			●	●				●
	3.1	Trash Timeline	A				●				●
	3.8	Vermicomposting: Worms in Your Lunchroom	V	●	●		●	●			
	3.2	Who Polluted the Potomac?	B		●		●	●			●
Unit 4. Erosion & Runoff	4.9	Bernie's Toes	A		●	●	●		●		●
	4.10	Designing a Schoolyard	D	●	●		●	●	●	●	●
	4.5	Does Your Soil Perc?	E		●	●	●			●	
	4.1	Earth: From Crust to Apple Core	B			●	●			●	●
	4.4	Great Terrain Robbery	B				●			●	●
	4.6	Sediment: Choking the Life Out of the Bay*	C	●	●		●	●		●	●
	4.3	Soil Study	E	●	●		●			●	
	4.2	Sweet Resources	D				●			●	●
	4.7	Water Quality Testing	E			●	●	●	●		
	4.8	Wetland Metaphors*	A		●		●	●		●	●

Continued on next page



# Appendix C. Subject Index, Continued

Unit	Activity Number	Activity	Duration	Subjects Covered							
				Art	English	Math	Environmental Science	Life Science	Physical Science	Earth Science	Social Studies
Unit 5. Ecosystem Diversity	5.4	Animal Adaptations Field Study	D	●	●		●	●			
	5.1	Classified Information: Fishing for a Name & Creature Feature	C		●			●			
	5.3	Eat Like a Bird	B				●	●			
	5.8	Ecosystem Food Web Mural	V	●	●		●	●			
	5.7	Frankenfish	D	●	●		●	●			
	5.2	Let's Take a Dip	E		●	●	●	●			
	5.6	Macroinvertebrate Field Study	E		●	●	●	●		●	
	5.5	Oh Deer!*	C		●	●	●	●			
Unit 6. Issue Investigation, Reflection & Action Projects	6.3	Circle of Concern	D		●		●	●		●	●
	6.1	Environmental News	E	●	●		●	●		●	●
	6.2	Issue Investigation Framework	E		●	●	●				

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