ENVIRONMENT

The items with an asterisk (✱) are related to the learning activities that will take place on the field trip.

TABLE OF CONTENTS

1) ENVIRONMENT – TRACKS

The students will be divided into four groups and will make 4 rotations to view the 4 stations of the Environmental track. The Environmental stations allow the students hands-on experience. The 4 stations are Soil, Who Polluted the Potomac River, Habitat Game and Water Quality. The Environment section shows children how best management practices affect water quality and the environment. Children get to learn about soils, water quality indicators, and the animals that live in the habitats provided by our local farms.

Soil - There are several soil samples on display for the students to see and touch. See presentation.

Who Polluted the Potomac River- This station encourages the children's participation. The presenter uses a native script and prompts students when an event in the script causes the river to become more polluted. They fill vials with "river" water at each stage to show the changes in the water.

Habitat Game-This relay game shows the 4 major requirements for survival in a habitat.

Water Quality – This section is divided into 2 segments: Rainfall simulator and Insect display. The rainfall simulator provides a vivid demonstration of rainfall runoff results from different surfaces ranging from pavement to grass. The display for the insects has pictures and live bugs for the students to see to aid them in identifying these "good bugs."

2) SOILS

Soils
Presentation
by
The
Montgomery
Soil
Conservation
District

Soil is everywhere around us and under us. We could not survive without soil. Since we don't want to treat our soil like "dirt", we won't use the term "dirt" to describe it. Today we will use the term "soil" instead of "dirt".

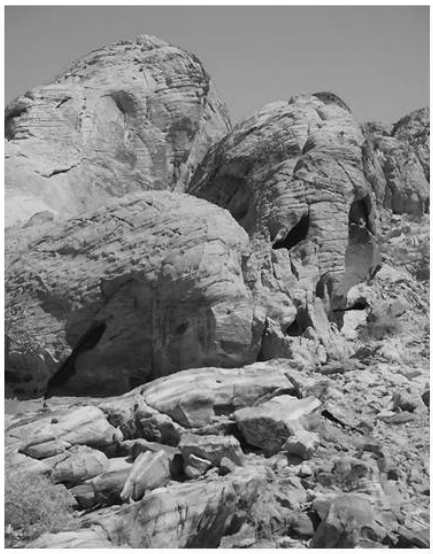
Soils have names just like we do

- Glenelg Silt Loam
- Brentsville Sandy Loam
- Baile Silt Loam

There are 300 named soils in Maryland and 17,000 named soils in the united states.

All humans have parents, a mother and a father. Well, soils have parent materials. They are:

- Minerals (Rocks)



- Organic Matter

Humans have different hair, skin, and eye color. Soils have different colors as well.

Glenelg Silt Loam is dark brown because it is rich in organic material

Brentsville Sandy Loam is red because of the iron in the soil

Baile Silt Loam is gray and tan because it is a wetland soil. The iron has been washed out of the soil from the rising and falling water table.

Soils have different textures

- Some are gritty and scratchy

- Some are silky smooth like flour

- Some are really sticky

Glenelg Silt Loam is silky and smooth like flour because it lacks a lot of sand

Brentsville Sandy Loam is rough because it has a lot of sand in it

Baile Silt Loam is sticky because it has a lot of clay in it

We use these soils to make things we use everyday

Sand can be used to make glass. It is super heated until it melts and then can be shaped into many things.

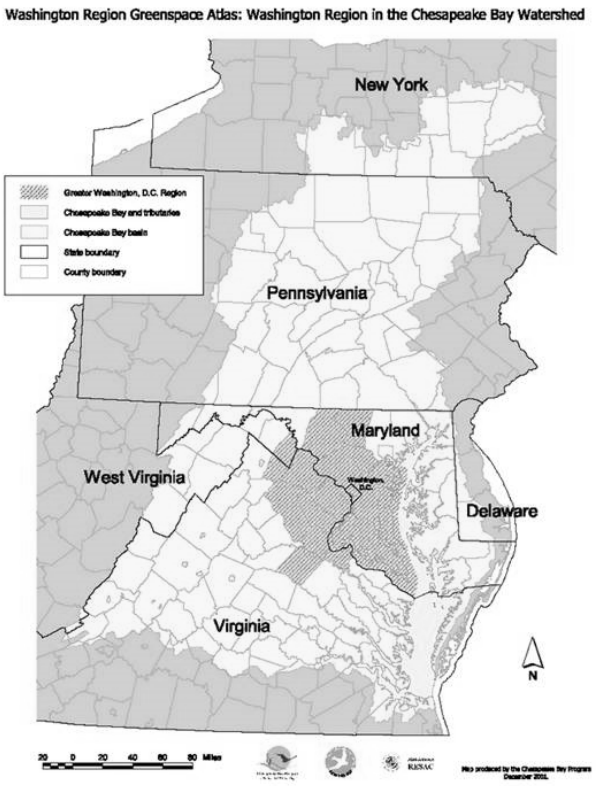
Clay is used to make pottery and ceramics as well as bricks for your home or school.

What happens when it rains and the soil is exposed?

One way to keep erosion from occurring is to plant grass. The grass roots help to hold the soil in place. The grass can also help to filter pollutants out before they reach the streams and rivers.

Chesapeake Bay Watershed

- Six states plus the District of Columbia are within the Chesapeake Bay watershed. Can you name them?



How many years does it take for the natural formation of topsoil?

- Here is a hint. How long ago did this person make his first voyage to the Americas for Spain?

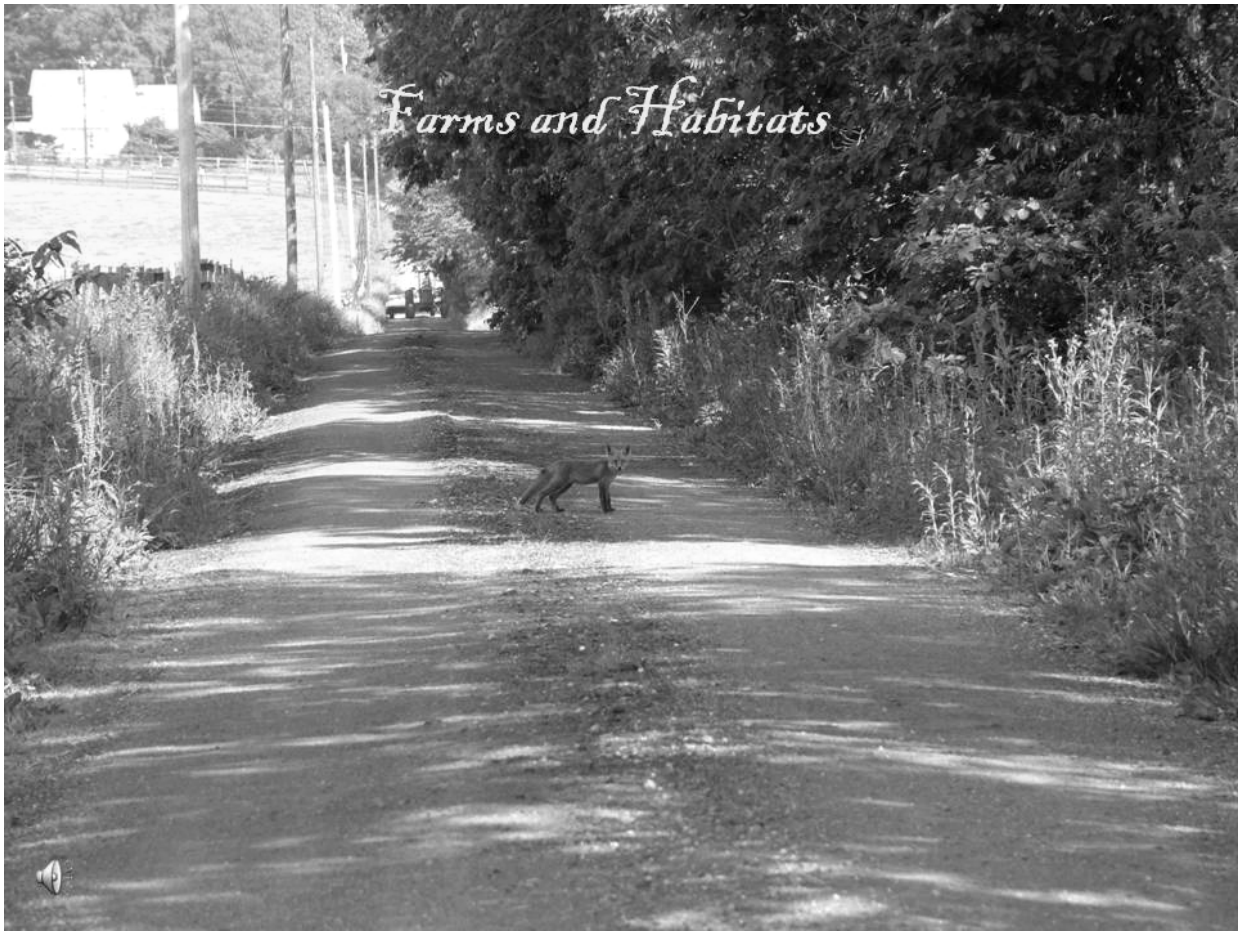
It takes about 500 years for 1" of topsoil to form. Six inches are needed for prime farmland soil used to grow good crops.

Our soils are very important resources and we need to protect them. Reducing erosion helps to keep the streams and rivers clean and helps us to grow food to feed ourselves.

Please help to conserve our soils.

The End

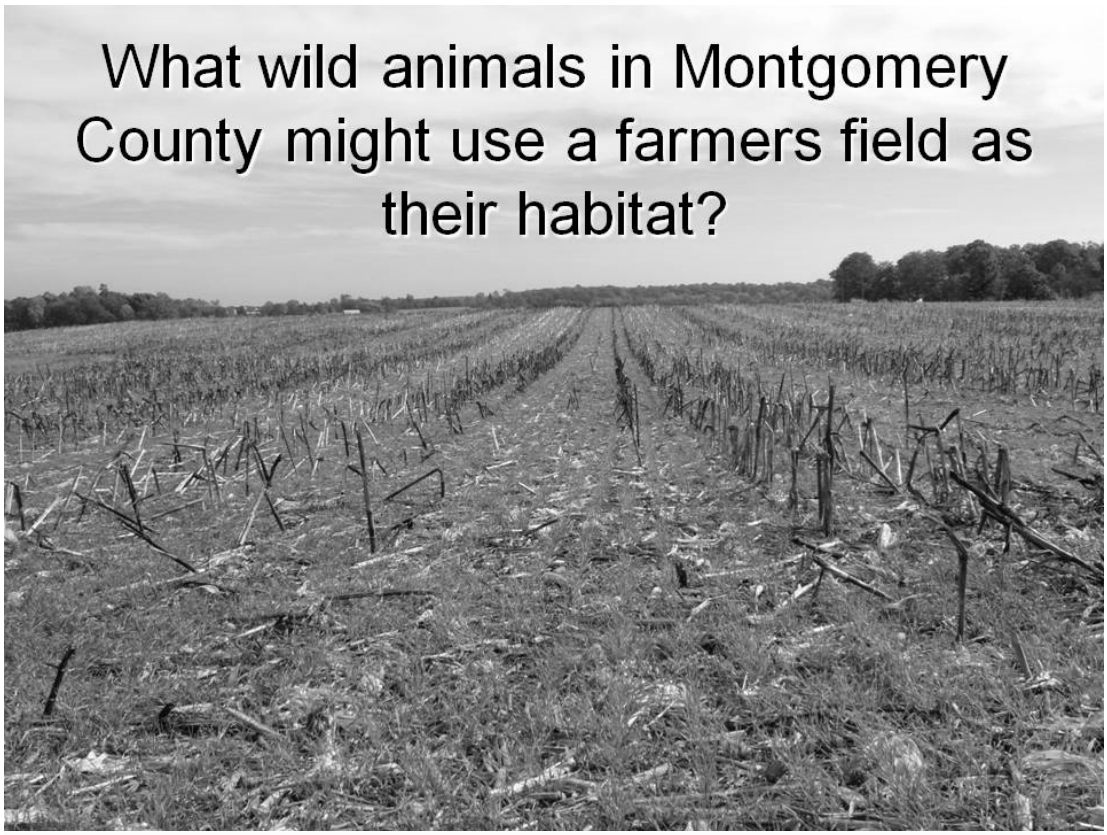
3) WILDLIFE HABITAT



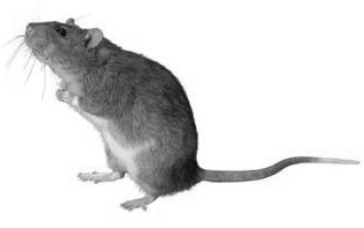
Farms provide lots of things that we use in our everyday lives. They also provide lots of habitat for wild animals.

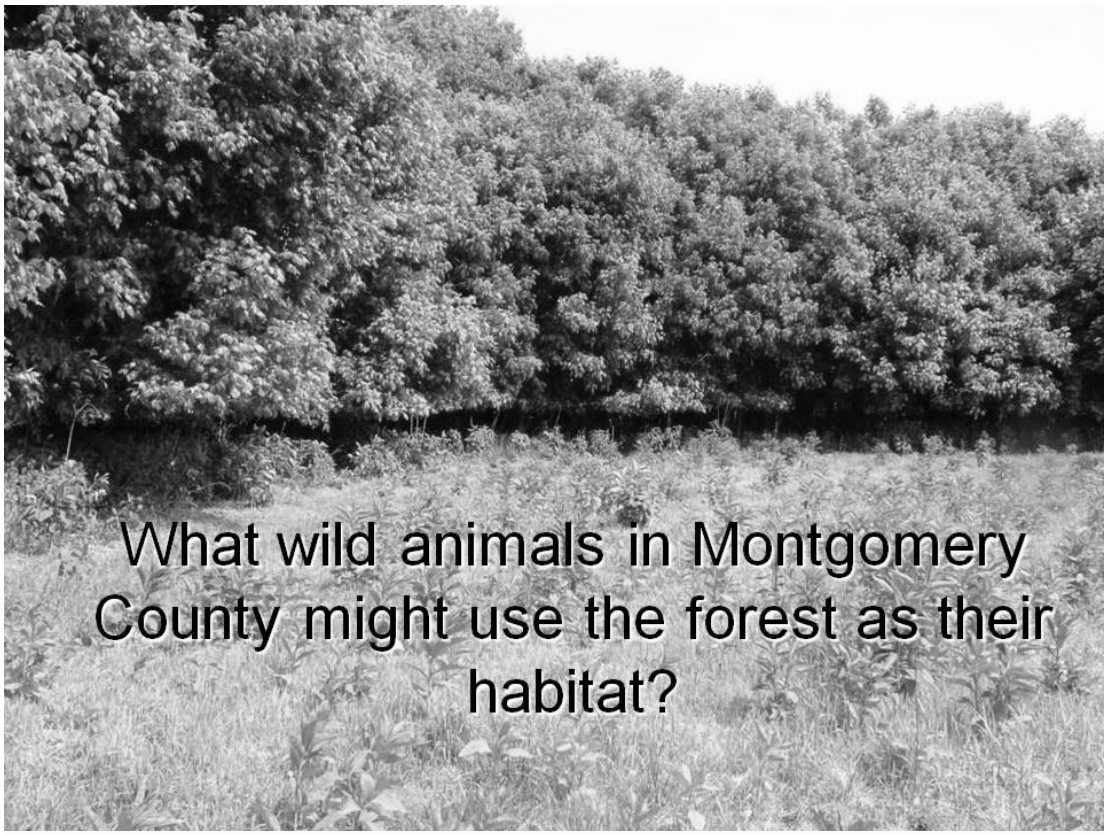
Question: What are three things that wild animals need to survive that they might find in their habitat?

- FOOD 
- WATER 
- SHELTER 



Animals that might live in a farmers field





Some animals that might live in the forest




Some animals that might live in the stream

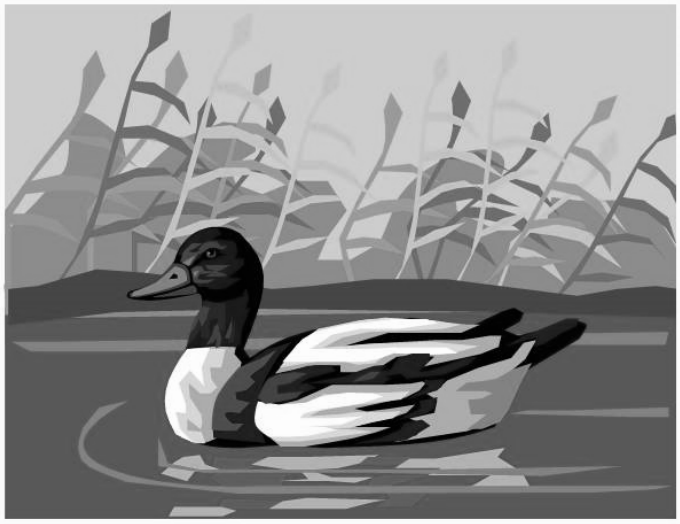
Animals in all types of habitat have to compete for food, water, and shelter. These resources are in limited supply. The animals may have a difficult time finding everything they need year after year.

Why might a little Field Mouse get all of it's food, water, and shelter before a White Tailed Deer?

A mouse is very small compared to a deer and needs a lot less food and water to survive. It can also hide very easily. A mouse might live it's whole life under your front porch.

A hungry deer has to travel a long way to get all of it's food when resources are scarce. This can be very dangerous for the deer and sometimes for people.

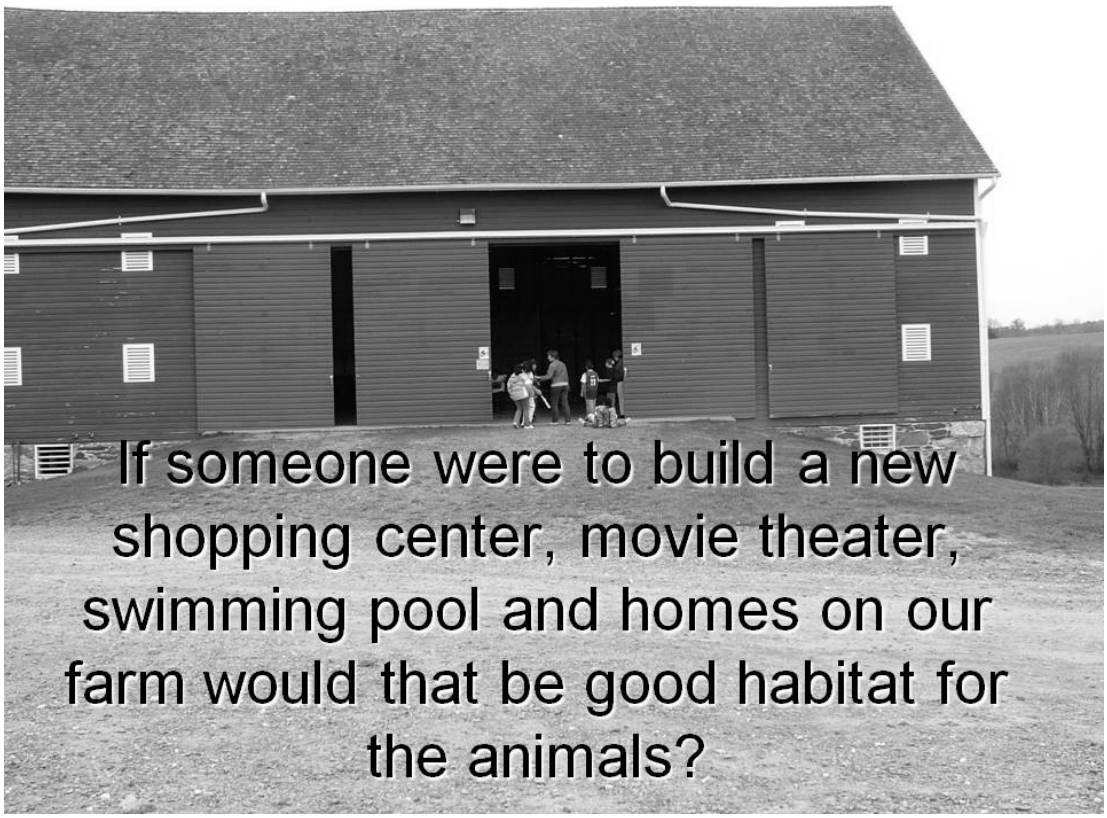
What might happen to a duck if there is a severe drought?



It might not have enough water to live in and find it's food. It also might become vulnerable to predators if it's pond dries up. This however might be good for a hungry fox.

What happens to a fox when the forest is cut down and it has no shelter?

- He will probably be very cold during the winter and may not survive.



No, that probably isn't a good idea because the wild animals would lose valuable habitat. But, who might benefit from this?

Humans would. This would be good habitat for us. However, farms provide us with food as well as great habitat for many wild creatures.

What are some things you can do around your home or in your community to help the wild animals get all the food, water, and shelter they need to survive?

There are lots of things you can do to help the animals and the environment!

The End

4) THE WATER CYCLE

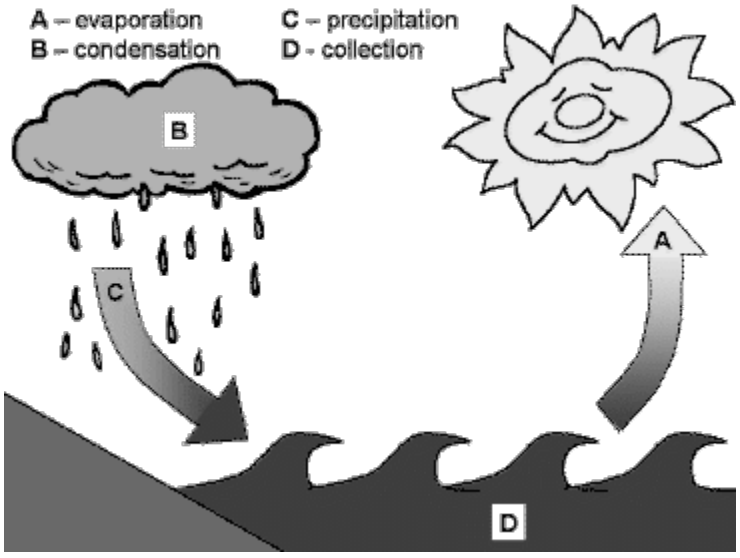
Source: http://www.kidzone.ws/water/

Run and get a glass of water and put it on the table next to you. Take a good long look at the water. Now -- can you guess how old it is?

The water in your glass may have fallen from the sky as rain just last week, but the water itself has been around pretty much as long as the earth has!

When the first fish crawled out of the ocean onto the land, your glass of water was part of that ocean. When the Brontosaurus walked through lakes feeding on plants, your glass of water was part of those lakes. When kings and princesses, knights and squires took a drink from their wells, your glass of water was part of those wells.

And you thought your parents were OLD



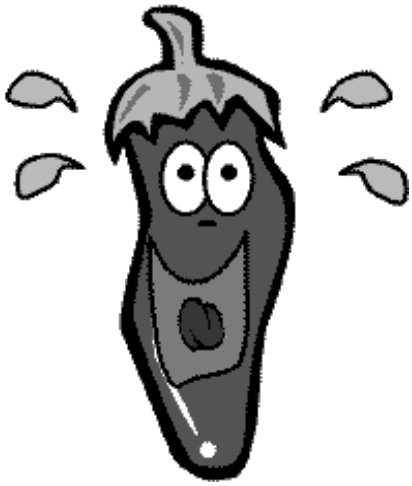
The earth has a limited amount of water. That water keeps going around and around and around and around and (***well, you get the idea***) in what we call the "Water Cycle".

This cycle is made up of a few main parts:

evaporation (and transpiration)
condensation
precipitation

Evaporation:

Evaporation is when the sun heats up water in rivers or lakes or the ocean and turns it into vapor or steam. The water vapor or steam leaves the river, lake or ocean and goes into the air.



Do plants sweat?

Well, sort of.... people perspire (sweat) and plants transpire. Transpiration is the process by which plants lose water out of their leaves. Transpiration gives evaporation a bit of a hand in getting the water vapor back up into the air.

Condensation:

Water vapor in the air gets cold and changes back into liquid, forming clouds. This is called condensation.

You can see the same sort of thing at home... pour a glass of cold water on a hot day and watch what happens. Water forms on the outside of the glass. That water didn't somehow leak through the glass! It actually came from the air. Water vapor in the warm air turns back into liquid when it touches the cold glass.

Precipitation:

Precipitation occurs when so much water has condensed that the air cannot hold it anymore. The clouds get heavy and water falls back to the earth in the form of rain, hail, sleet or snow.

Collection:

When water falls back to earth as precipitation, it may fall back in the oceans, lakes or rivers or it may end up on land. When it ends up on land, it will either soak into the earth and become part of the "ground water" that plants and animals use to drink or it may run over the soil and collect in the oceans, lakes or rivers where the cycle starts

all over again.

THE WATER CYCLE

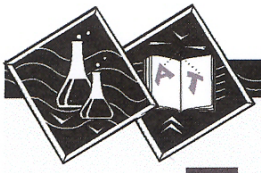
Sunshine	**The sun shines on water in rivers, lakes, streams, wetlands and oceans and makes the water warmer. This turns the water into vapor or steam. The water vapor leaves the lake or ocean or river and goes into the air, where it becomes a cloud.**
Evaporation	**Evaporation is when the sun heats up water in rivers or lakes or the ocean and turns it into vapor or steam. The water vapor or steam leaves the river or lake or ocean and goes into the air, where it becomes a cloud.**
Rain	**When the temperature is warm, like during the spring or summer, clouds get so full of water that rain starts to fall. The rain falls onto the land and runs into streams and rivers. The water in the streams and rivers runs into lakes and finally into the ocean. Some of the rain that falls soaks into the ground and stays there until plants drink it or until it goes deep enough into the ground that it is called "groundwater" and goes to people's wells.**
Snow	**Snow is just like rain except it falls when the air is cold, like during late fall and winter. Snow usually stays on top of the ground until it melts, then it turns into water and runs into streams and rivers. Some of the water from melted snow also goes into the ground for plants and people to drink.**
Mountains and Ice	**Some of the snow that falls onto mountains stays there a long time because it is so cold most of the time at the top of mountains. This snow turns into ice and sometimes becomes glaciers. Snow and ice on the top of mountains can stay there sometimes for hundreds of years before it finally melts and runs into the streams and rivers.**
Rivers and Streams	**Rivers and streams carry the water that comes from rain and melted snow into the ocean. They sometimes can carry this water a long way. The Mississippi River in the middle of the United States carries rain and melted snow from**

	Minnesota and Canada all the way to the Gulf of Mexico. When the weather is warm, sometimes the sun makes the rivers and streams warm, some of the water turns into steam or vapor, and it leaves the river and goes into the air where it becomes a cloud.
Oceans	**Oceans are like really big lakes. Rivers and streams carry all of the water that comes from rain and melted snow into the oceans. When water gets into the oceans, it mixes and becomes salty. When the sun shines on the oceans, the water gets warmer and becomes vapor, which goes into the air and becomes a cloud. Most of the water on the earth is in the oceans.**

RETURN TO DRINKING WATER PAGE RETURN TO KIDS PAGE

Last updated on Friday, August 29th, 2003
URL: http://www.epa.gov/region07/kids/wtrcycle.htm

Source: http://www.epa.gov/region1/students/pdfs/ww_disap.pdf



THE CASE OF THE DISAPPEARING WATER

Grades
4 - 6

OBJECTIVES

- Demonstrate knowledge of the concepts of "evaporation."
- Explain evaporation in the context of the water cycle.

ESTIMATED TIME

- 45 minutes to read and start the experiment
- 15 minutes to reach conclusions at the end of the experiment.

MATERIALS

- ❑ Clear measuring cups
- ❑ Water
- ❑ Copies of activity handouts

BACKGROUND INFORMATION

The states in which water exists—***solid***, ***liquid***, and ***gas***—are often referred to as ***phases***. As heat is added or removed, water goes through a phase change. In its solid phase, water molecules are structured and orderly, in its gaseous phase water molecules lack structure and order.

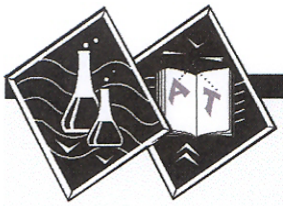
In nature, the energy, or heat of the sun causes water to evaporate into its gaseous, or vapor, phase. Likewise, when we boil water over a burner we are causing it to change from a liquid to a gas. The process by which a substance changes from a liquid to a gas is called ***evaporation***.

Water is continuously being heated and cooled—evaporating, condensing, freezing—depending on its environmental circumstances. As water travels its never-ending cycle between earth and sky, it encounters and mixes with a variety of substances. Some of these substances are ***pollutant***s in the sense that they are harmful to living things. Pollution can result both from natural sources and human activities.

Fortunately, through the water cycle, nature provides a variety of mechanisms for cleaning water. For example, evaporation is a natural water cleanser. When water evaporates, it leaves most dissolved substances and waste materials behind. Pollutants can also be filtered out when water moves through soil. Some pollutants settle out in slow-moving water bodies. Nature even employs a host of microscopic organisms to help keep water clean. Unfortunately, however, if pollutants remain in the environment, clean water can easily become polluted all over again as it moves through its cycle.

TEACHING STRATEGY

1. Tell the students that they are going to be water detectives who are being asked to solve the case of the disappearing water.
2. Allow students to read the activity handouts.
3. Coach students as necessary, but encourage independent thinking as much as possible.



NOTES

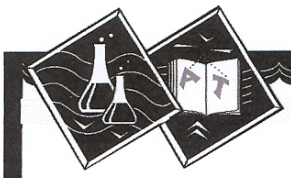
4. Make sure students develop a hypothesis before beginning the experiment.
5. Make sure students remember to check the water level each day.
6. When the experiment is over, be sure the students record their results and conclusions.
7. Allow the students to work in small groups.

Follow-up Questions

1. For what reasons might the results of each group's experiment differ? *Environmental variables, e.g., one group's measuring cup may be exposed to more or less sun than the other's.*
2. Suppose that during the days Mrs. Flowers was gone the weather was sunny and hot; however, when the water detectives conducted their experiment, the weather was cloudy and cool. How would this variable affect the experiment?
3. What is a variable? *Something that is subject to change or variation; not constant.*

Alternate Strategy

- See "The Easy Evaporation Experiment" in this unit if you wish to perform this experiment without the story.



THE CASE OF THE DISAPPEARING WATER

by Susan M. McMaster

The Water Detectives Anonymous were called to the home of Mrs. Flowers. When they arrived on the scene, Mrs. Flowers' grown son, Frank Flowers, was frantic. His mother was missing! The detectives asked Frank how long his mother had been missing.

"That's just it," Frank said. "I've been traveling a lot and kept forgetting to phone her. Now I feel terrible. I have no idea where she is or how long she's been missing."

"Do you know of some places where she might have gone?" asked one water detective.

Frank wrinkled his brow and thought hard. "Well," he said, "her habits are very predictable. If she has been gone less than a day, she probably just went shopping. If she's been gone for less than 3 days, she may be visiting one of her sisters. She always says 'Guests are like fish, they start to stink in 3 days!' She would never visit anyone for more than 3 days."

"If she's been gone more than 3 days, but less than 7," continued Frank, "she's probably taking a vacation on a cruise ship. I'm sure she can't afford more than a 7-day cruise. If she's been gone more than 7 days but less than 6 weeks, she's probably received the grant that she applied for—she wants to study art in Europe. If she's been gone more than 6 weeks, she is probably at her mountain cabin. However, she never stays there more than 2 months. If she's been gone longer than 2 months, aliens must have captured her and taken her to another galaxy. She loves her plants and her home. She would never stay away longer than 2 months for any reason.

"I think we can help you solve this mystery," said another water detective who had been looking around the house.

"Did you find a note?" asked Frank hopefully.

"No," said the detective, "but I did find this glass measuring cup in the window."

"Oh," said Frank, "that's nothing. Mother is very particular. Every morning she fills the measuring cup to exactly one cup. Then she puts it in the window sill to warm in the sun for a little while before she waters her African Violets. She is very careful about how much water she uses because she doesn't want to over-water or under-water the plants."

STORY: THE CASE OF THE DISAPPEARING WATER

"Aha!" said the water detective, "Just as I suspected, this is precisely where we must begin our search. The measuring cup now has exactly 3/4 of a cup of water."

"Are you saying someone stole 1/4 of a cup of water?" asked Frank.

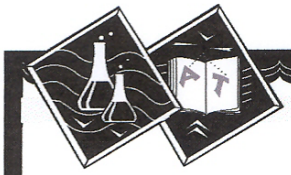
"No wonder his mother didn't bother to tell him where she was going!" muttered one of the detectives.

"No, sir," said another water detective, trying to keep a straight face. "It's a matter of evaporation. Ya' see, water evaporates into the atmosphere. The warmth of the sun changes the liquid into water vapor that we can't see. After awhile the water vapor condenses and forms into clouds. Eventually, the water comes back to the ground as rain or snow or hail. Over time, the water evaporates again. It's part of the water cycle."

"To make a long story short," said another detective. "We're going to conduct an experiment. We'll put a cup of water in a sunny place and keep track of how long it takes to evaporate. Based on that experiment, we will estimate how long ago Mrs. Flowers left the measuring cup in the window sill."

"What a relief!" said Frank. "What should we do now?"

"I suggest you water the plants," replied yet another detective.



THE CASE OF THE DISAPPEARING WATER

Step 1: Read "The Case of the Disappearing Water."

Step 2: Write down the facts of the case:

1. Original amount of water in the measuring cup _____.
2. Amount of water in the measuring cup now _____.

Step 3: Write down where Frank Flowers said his mother might be.

- If Mrs. Flowers has been gone for less than a day, she probably

  _____.
- If she's been gone for less than 3 days, she may be

  _____.
- If she's been gone more than 3 days but less than 7, she's probably

  _____.
- If she's been gone more than 7 days but less than 6 weeks, she's probably

  _____.
- If she's been gone more than six weeks but less than two months, she is

  _____.
- If she's been gone longer than two months,

  _____.

Step 4: Develop a hypothesis: (Tell what you think will happen before you do the experiment.)

1. How long do you think the water was left on the window sill?_____.
2. Where do you think Mrs. Flowers went?_____.

Step 5: Perform an experiment to establish approximately how long it took for the water to evaporate.

Supplies:

- ❑ Clear measuring cup
- ❑ Water

Directions:

1. Write down today's date._____
2. Fill a measuring cup to the 1-cup line.
3. Put the cup in a sunny window.
4. Record how many days it takes for the water in the measuring cup to be at the three/fourths cup line.

Step 6: Write your conclusions.

1. It took approximately _____ days for the water to evaporate.
2. Where should Frank begin looking for Mrs. Flowers? _____

_____.

Step 7: Make notes about your observations in your water detective's notebook:

_____.

_____.

_____.

Supplementary Activities:

- Have students fill cups half full with water and then add other substances (e.g., food coloring, salt, mud). Set the cups in locations that are sunny and shady. Have students observe what happens to water in sunny versus shady locations and what happens to the substances in the water as the water evaporates.

CARETAKERS all ACTIVITY SHEET 2B

NAME _____

THE WATER CYCLE

WORD BANK

EVAPORATION
When water changes from liquid to gas.

CONDENSATION
When gas changes back to liquid.

PRECIPITATION
When water returns to the earth as rain, snow or sleet.

GROUND WATER
Water beneath the surface of the earth.

DIRECTIONS:

1 Label the arrows in the picture using the correct words from the WORD BANK.

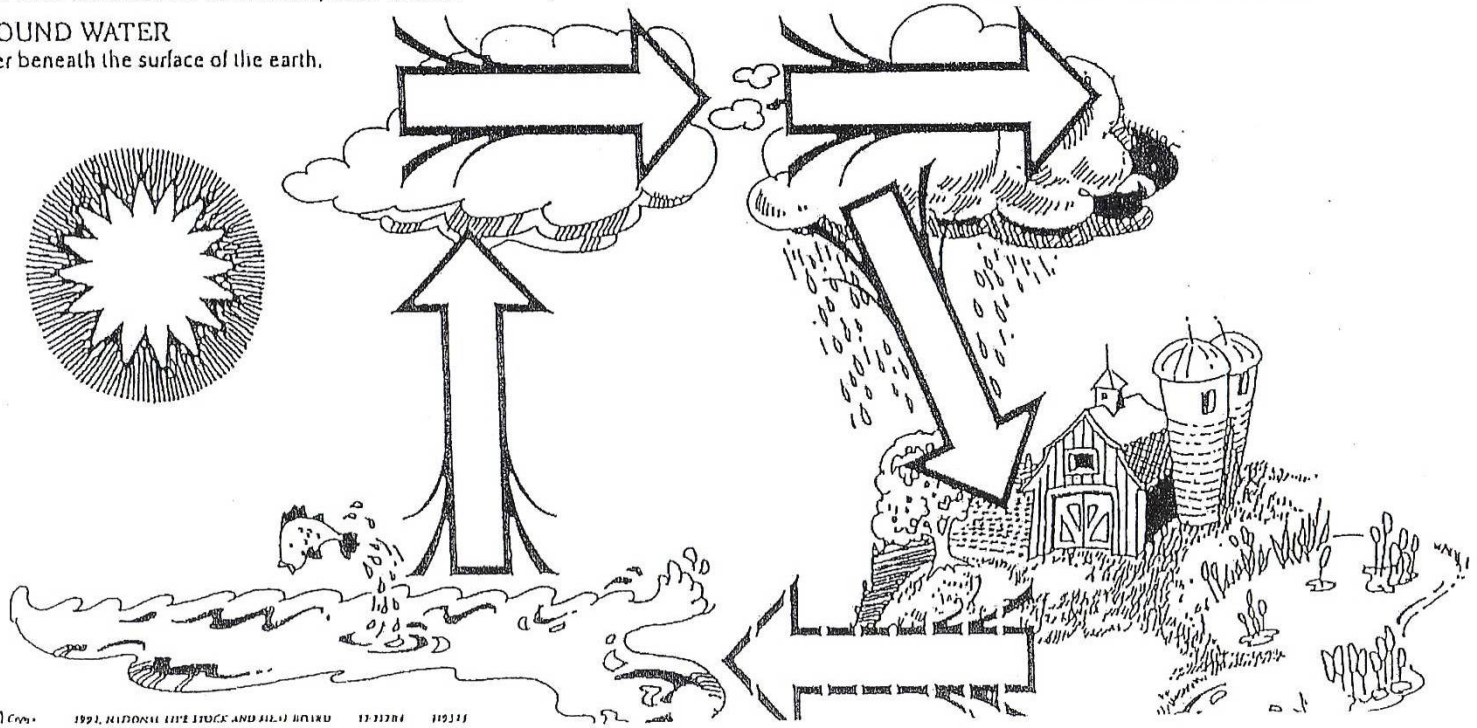
2 What is the heat source in this picture? _____

3 Draw a circle around the part of the picture where water returns to the surface from under the ground.

4 Where does condensation take place in this picture?

_____

5 On the back of this page, write your personal observation of the water cycle. It might be about a rainstorm, a snowfall, or even a foggy day.



CARETAKERS all ACTIVITY SHEET 2B

NAME _____

THE WATER CYCLE

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When water changes from liquid to gas.

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When gas changes back to liquid.

PRECIPITATION
When water returns to the earth as rain, snow or sleet.

GROUND WATER
Water beneath the surface of the earth.

DIRECTIONS:

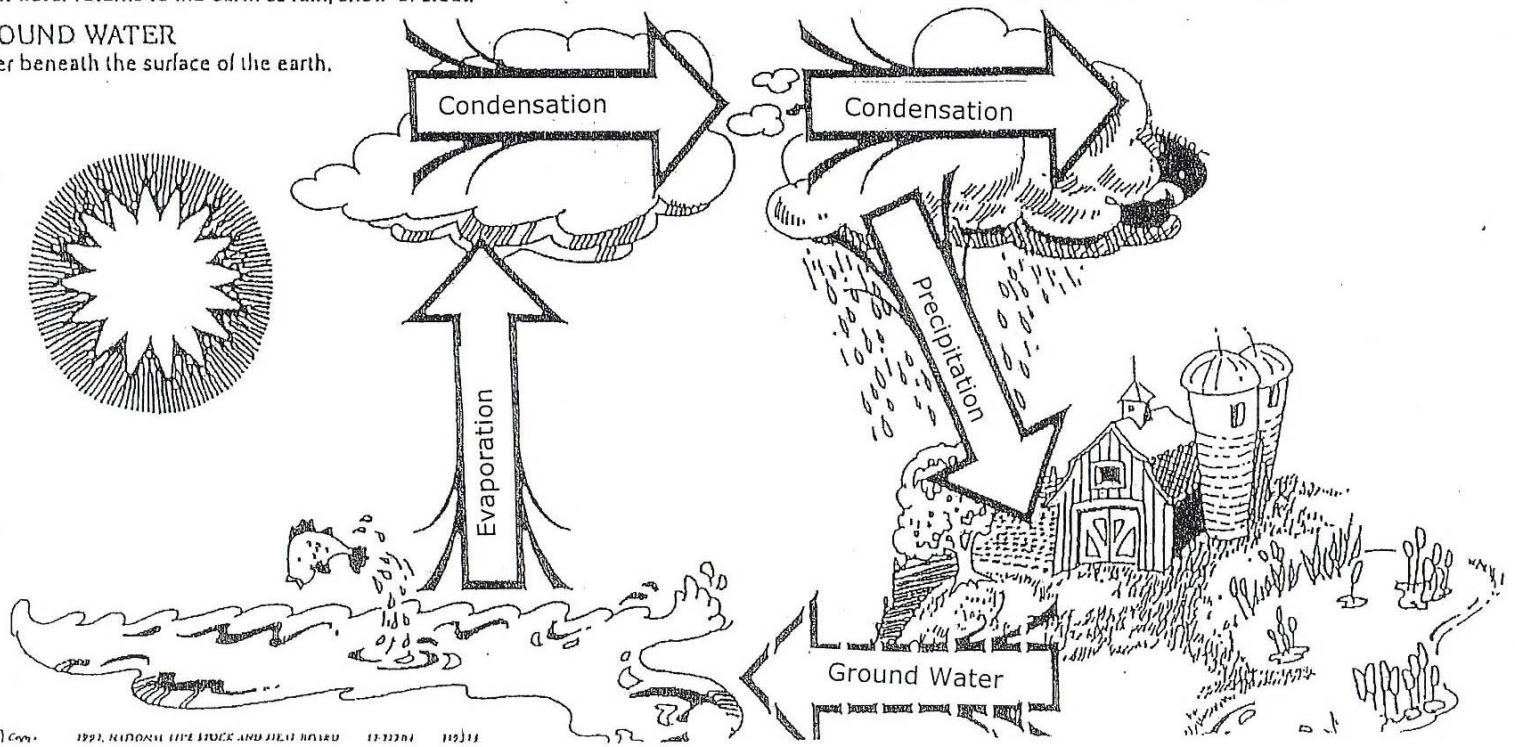
1 Label the arrows in the picture using the correct words from the WORD BANK.

2 What is the heat source in this picture? Sun

3 Draw a circle around the part of the picture where water returns to the surface from under the ground.

4 Where does condensation take place in this picture? Clouds, Sky

5 On the back of this page, write your personal observation of the water cycle. It might be about a rainstorm, a snowfall, or even a foggy day.



United States Environmental Protection Agency | Office of Water 4601 | EPA 810-F-98-001 June 1998

EPA ENVIRONMENTAL EDUCATION

WATER PURIFICATION BY EVAPORATION AND CONDENSATION

GRADE LEVEL: 4 – 7

BACKGROUND: The following demonstration illustrates how the water cycle helps to purify water. The key terms are evaporation and condensation. Evaporation is defined as the process through which a liquid becomes a vapor. Condensation is the process through which a vapor becomes a liquid, and is the opposite of evaporation. In the case of water, the main mechanisms for evaporation and condensation are heating and cooling, respectively.

MATERIALS NEEDED:
4 cups of dirt or sand
a dozen stones
2 quarts of water
a large glass bowl with tall sides (mixing bowl)
a short glass
clear plastic wrap
a sunny day.

PROCEDURE: Mix the dirt (or sand) and water in a large bowl. Stand a clean and empty short glass in the center of the bowl. Place the bowl outside in the sun. Cover the bowl with the plastic wrap and weigh down the edges with the remaining rocks. Place one rock on the plastic wrap directly over the cup. Allow the bowl to remain in the sun for several hours. Look in the cup (it should contain some relatively clean water free of mud). Look in the bowl (it should contain the dried dirt).

FOLLOW-UP QUESTIONS:

1. What are the two processes responsible for purifying the water? (Evaporation and Condensation)
2. Where else do you see condensation? (Cold drink outside on a hot day)
3. How does this process work on Earth?
4. What is the plastic wrap? (Our atmosphere)
5. What is the condensation? (Clouds and rain)
6. What would happen if the plastic wrap was dirty? (Air pollution)

VARIATIONS: Add food coloring to water to demonstrate that this process does not remove all pollutants. This may be done simultaneously with the procedure above.

United States Environmental Protection Agency | Office of Water 4601 | EPA 810-F-98-004 June 1998

EPA ENVIRONMENTAL EDUCATION

NON-POINT SOURCE POLLUTION

GRADE LEVEL: 4 – 7

BACKGROUND: This activity is designed to demonstrate to students what an average storm drain collects during a rainfall event and how the water from storm drains can impact the water quality and aquatic environments of local streams, rivers, and bays.

MATERIALS NEEDED:

"Waterway"	"Pollutants"
Aquarium	Green Food Coloring (pesticides/fertilizer)
Rectangular Box	Vegetable Oil (motor oil)
Water	Soil/Sand/Pebbles (erosion)
Watering Can	Grass Clippings (or Shredded Paper) and Twigs
Spray Bottle	Cafeteria Waste and Trash

PREPARATION: Fill the aquarium half-way with water and place it on an accessible area where it can be easily viewed by the students. Cut a hole in the bottom of the box and place the box on top of the aquarium. The box represents the storm drain and the aquarium represents the waterway that the storm water mixes into after entering the storm drain. Leave the sides of the aquarium uncovered so that the students can view its contents.

PROCEDURE:

1. Introduce this activity with a discussion of storm drains and storm drain systems and their purposes. Discuss where the water and objects that float down into a storm drain go. Have students list all of the things that they can think of that might enter a storm drain during a rain storm.

2. Assign a group of students to each pollutant. Discuss each pollutant, including its use or origin and how it could enter the storm drain.

3. Have each group of students place their pollutant into the storm drain. Use the watering can to create rain to wash the pollutant into the waterway. While washing each pollutant into the waterway, review the pollutant and its use or origin. Discuss the following questions: How does the pollutant damage the environment? Do the people who are responsible for the pollutant want to damage the environment? Why did they do what they did? How can this type of pollution be stopped?

4. After adding all of the pollutants, examine the contents of the waterway. Discuss how the waterway has changed and how viewing this change makes the students feel.

FOLLOW-UP QUESTIONS:

1. What types of the pollution are natural?

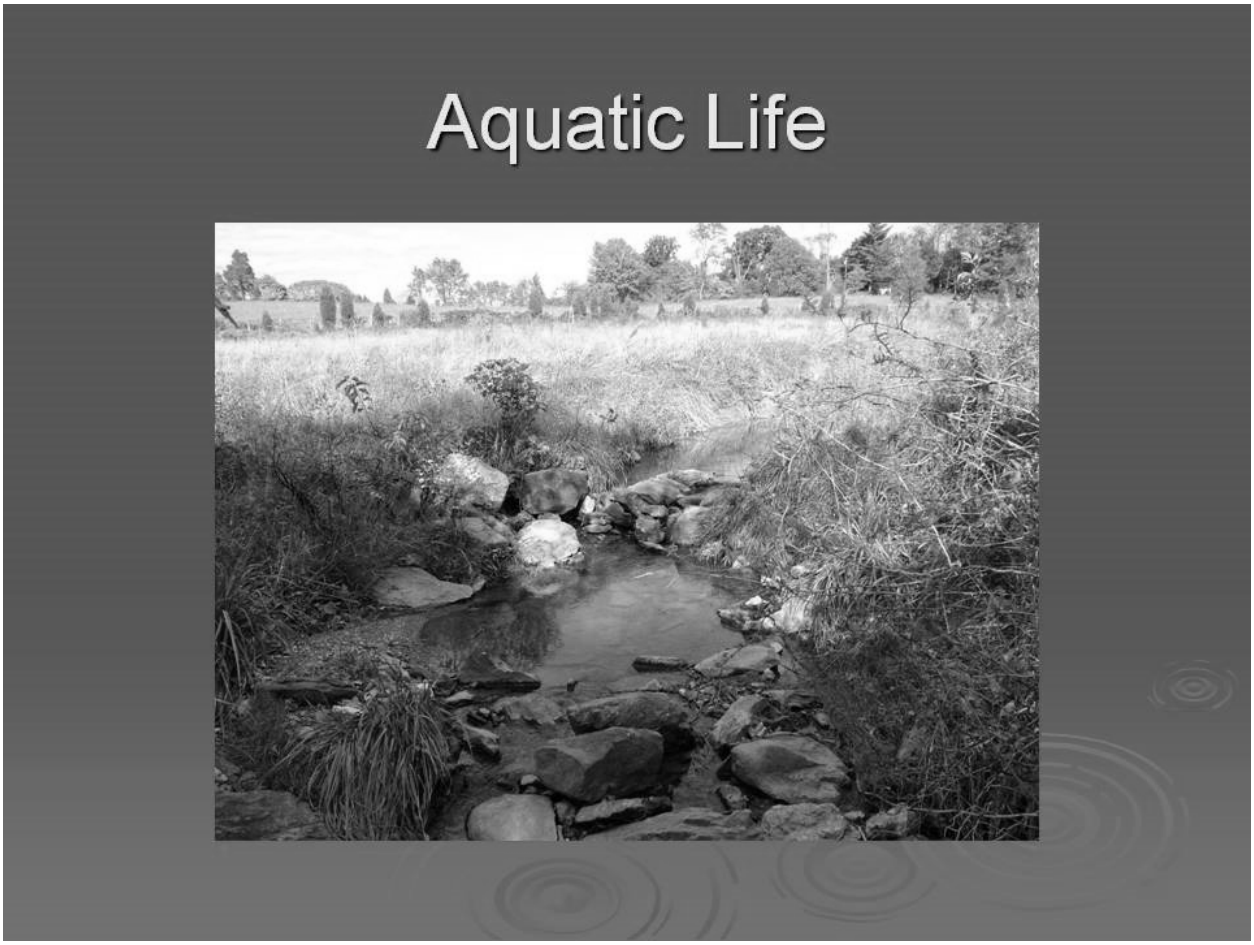
2. What types of pollution are added by people living in the local communities?

3. How can we remove the pollution from the water?

4. What could be done to stop pollutants from entering storm drains?

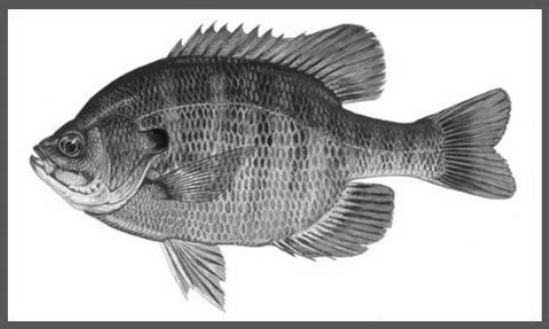
VARIATIONS: Have the groups of students responsible for the pollution think of ways to remove the pollution from the aquarium. Try some of the removal methods. Which pollutants were easy to remove? Which were difficult to remove?

5) Aquatic Life and Stream Insects



Our creeks, streams, and rivers provide freshwater habitat for many different creatures.

Can you think of some animals that might live in our local streams?



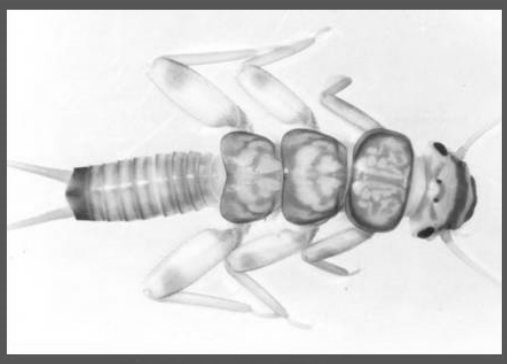
Some creatures can only be found in clean, unpolluted waters. These are called "water quality indicator" species.

The members of Group 1 Taxa are sensitive to pollution and include:

- Mayflies Nymph
- Stoneflies Nymph
- Caddisflies Larvae
- Hellgrammites and Fishflies

Group 2 Taxa are resistant to mild levels of pollution. If you find only these organisms then the waterway may require some attention.

- Damselfly Nymph
- Cranefly Nymph
- Dragonfly Larvae



Stonefly Nymph

Caddisfly Larvae

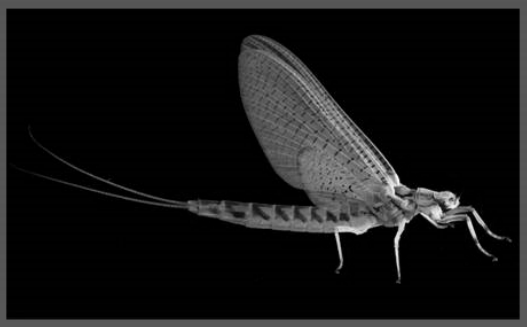
Mayfly Nymph

Hellgrammite

Dragonfly Nymph

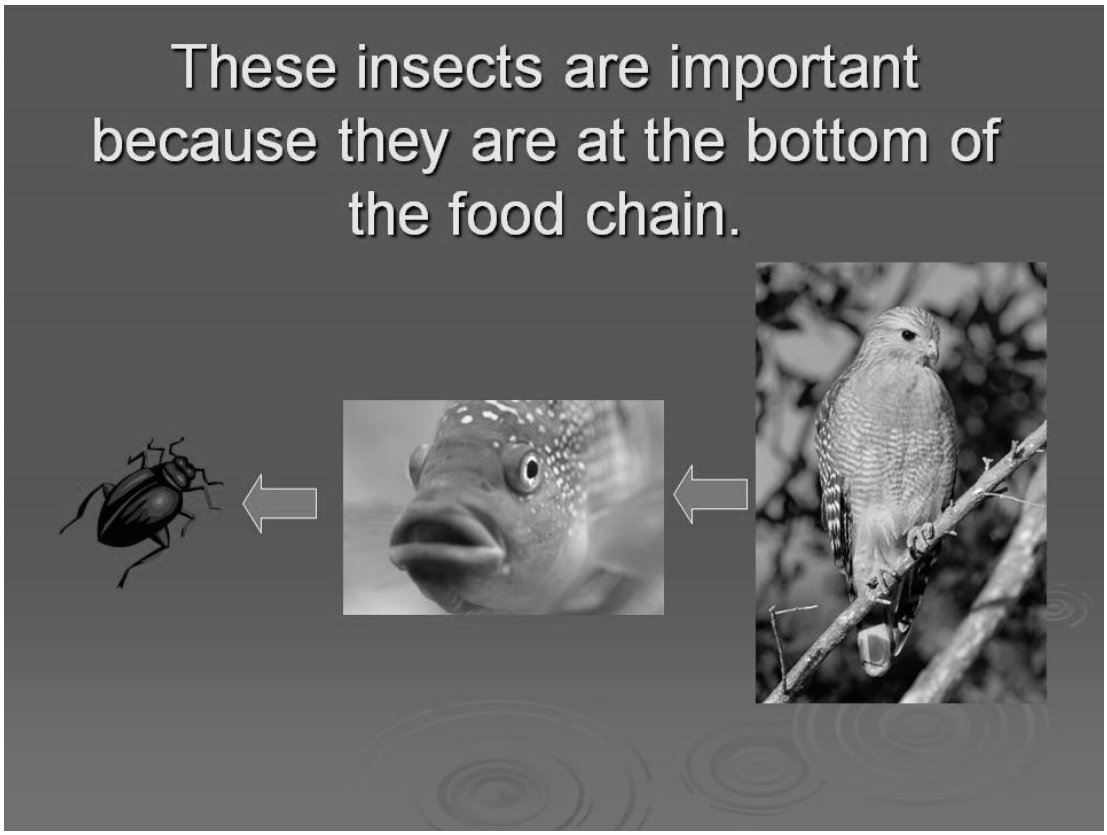
Cranefly Larvae

All of these larvae will become winged insects in their adult stage



Adult Mayfly

Dobsonfly (Adult Hellgrammite)


These insects are important because they are at the bottom of the food chain.


Who is at the top of the food chain?

We are……

Humans are at the top of the food chain.

If the food chain is broken then the animals at the top of the food chain will eventually run out of food.

It's important to protect our environment. If we keep our streams, rivers, and the Chesapeake Bay clean and healthy, we can save important habitats. By doing so we can ensure that creatures both great and small will have a place to thrive in the future.

BIOLOGICAL INDICATORS OF WATERSHED HEALTH

Source: http://www.epa.gov/bioindicators/html/dragonflies.html

Information Source:

McDonald, B., W. Borden, J. Lathrop.1990. Citizen Stream Monitoring: A Manual for Illinois. Illinois Department of Energy and Natural Resources, ILENR/RE-WR-90/18. Springfield, Illinois.

Benthic Macroinvertebrates

Sensitive Benthos

- Stoneflies
- Water Penny Beetles
- Mayflies
- Dobsonflies
- Alderflies
- Snipeflies
- Mussels
- Riffle Beetles

Moderately Tolerant Benthos

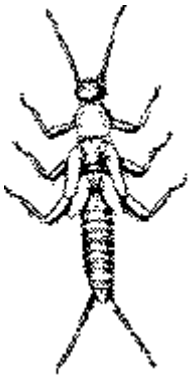
- Damselflies
- Dragonflies
- Crayfish
- Amphipods
- Blackflies
- Caddisflies
- Isopods
- Craneflies

Pollution Tolerant Benthos

- Midgeflies
- Worms
- Leeches
- Pouch Snails

Source: http://people.virginia.edu/~sos-iwla/Stream-Study/Catalog/SensitiveTaxa.HTML

Macroinvertebrates That Are Sensitive to Pollution
Found in Good Quality Water

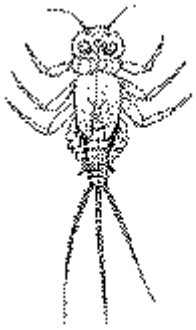


Stonefly

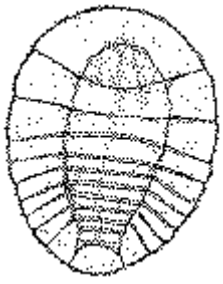
Riffle Beetle Adult

Gilled Snail

Planarian



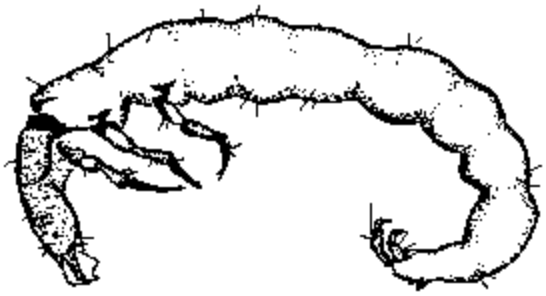
Mayfly



Water Penny

CADDISFLY LARVA

Very Sensitive



Facts

- Some make houses or cases for themselves out of different materials such as rocks, sand, gravel, twigs or leaves using a glue-like substance secreted from their back end
- Some spin webs to trap food from the flowing water
- One generation hatches per year
- Although most species are very sensitive to pollution, some are pollution tolerant

Description

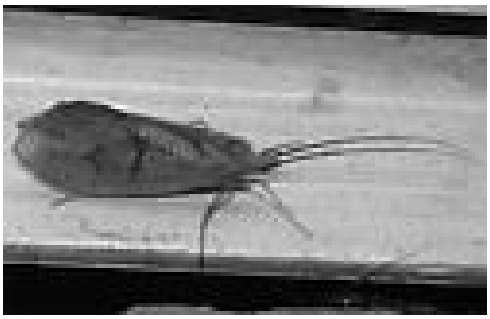
- Up to 1 1/2 inches long
- Very small or no antennae
- Six segmented legs on upper middle section of body
- Filamentous gills may be on the end of the body or on the underside
- Two small, thick extensions at the end of the body and each has a single hook at the end

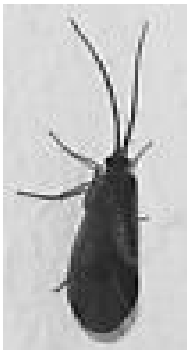
Words Found in Glossary

- antennae
- filament
- secreted
- segmented

CADDISFLY

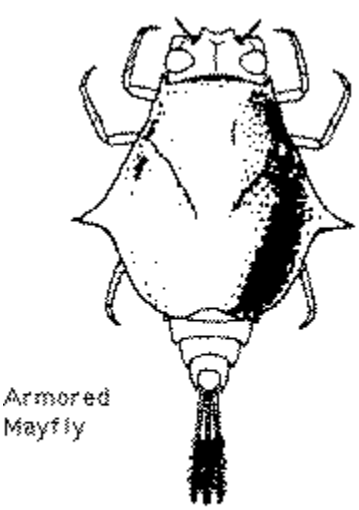
Source: http://bugguide.net/node/view/15740



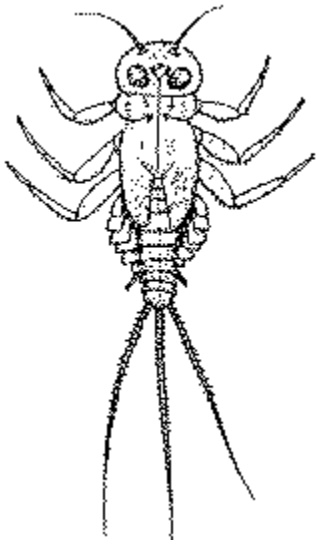


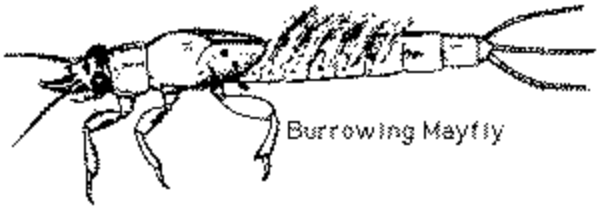
MAYFLY

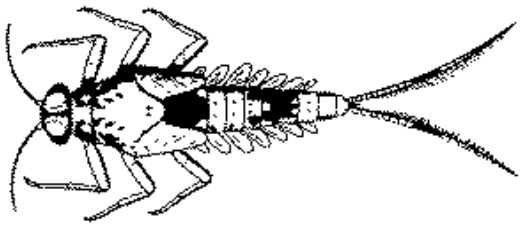
Very Sensitive



Armored Mayfly







Facts

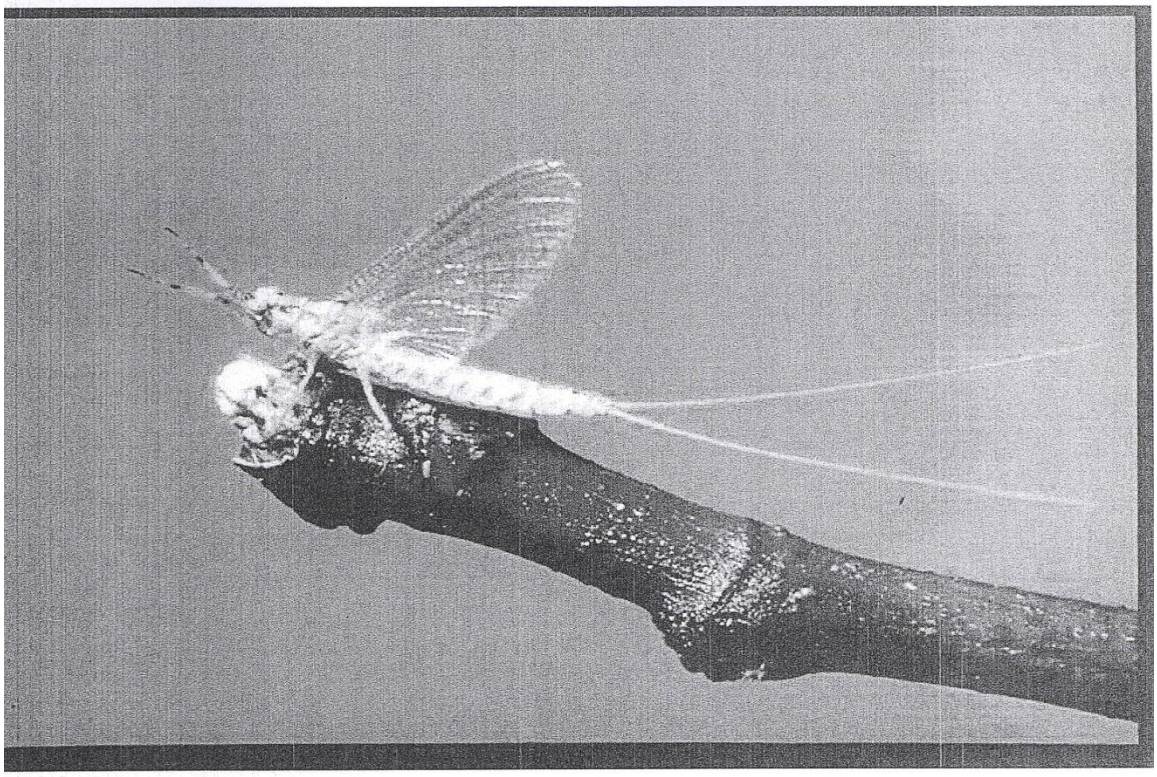
- About 700 species in North America
- Develop in the stream during period of two weeks to two years
- Live on exposed rock surfaces in fast current or buried in soft stream beds
- Large numbers of flying adults may emerge from stream at the same time

Description

- Plate like or feathery gills along the side of the abdomen
- Two or three long hair like tails
- Six segmented legs on middle section of body
- Each leg has one claw on the end
- The body can be up to one inch long
- Body is usually flat

Words Found in Glossary

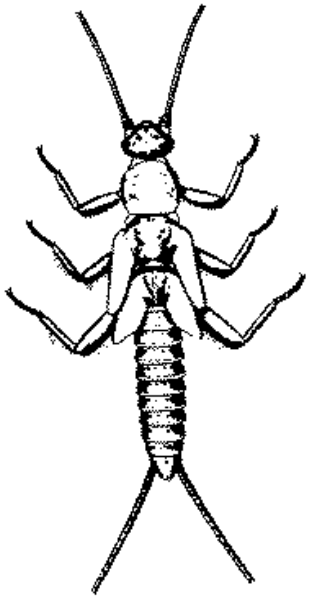
- abdomen
- plate like
- segmented
- species



A mayfly, (Ephemeroptera). Photo by J. W. Stewart.

STONEFLY LARVA

Very Sensitive



Facts

- About 500 species in North America
- Are found in cool, clean streams with high levels of dissolved oxygen
- Develop in the stream for period of three months to three years
- Are either predators or feed on fungi and bacteria from rotting leaves

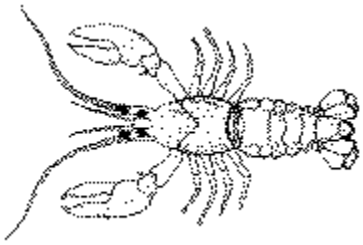
Description

- Two long antennae
- Two hair-like tails
- Gills often located on or behind each leg
- Six segmented legs on middle section of body
- Each leg has two hooks on the end

Words Found in Glossary

- larva (larvae)
- predator
- fungi
- bacteria
- antennae
- segmented
- species

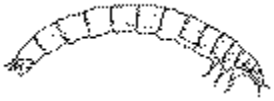
Macroinvertebrates That Are Somewhat Sensitive to Pollution
Found in Good or Fair Quality Water



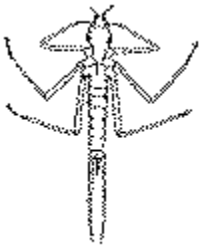
Crayfish

Alderfly

Crane Fly



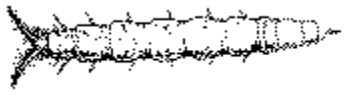
Riffle Beetle Larva



Damselfly

Sowbug

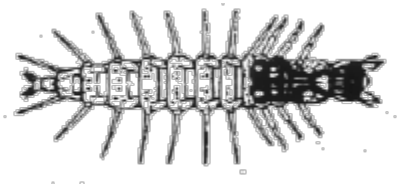
Dragonfly



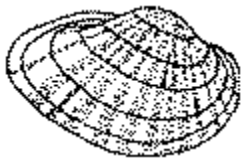
Watersnipe Fly

Scud

Whirligig Beetle Larva



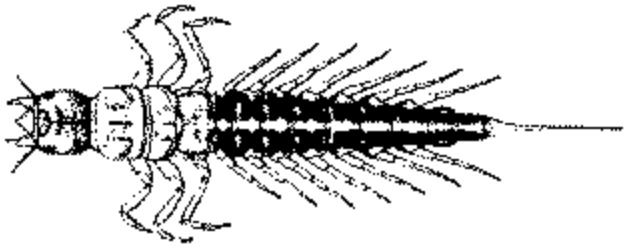
Fishfly



Clam or Mussel

ALDERFLY LARVA

Somewhat Sensitive



Facts

- Carnivorous and may bite
- Develop over period of one to three years
- May be light colored

Description

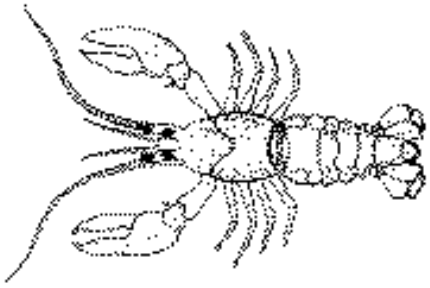
- Mouth has large, chewing pinchers
- Smooth underside without gill tufts
- Abdomen has strand-like appendages extending from each side
- Three pairs of segmented legs on middle section of body with tiny pinchers at the end of each
- Straight, single feathery tail

Words Found in Glossary

- abdomen
- appendages
- carnivorous
- gill tufts
- segmented

CRAYFISH

Somewhat Sensitive



Facts

- They grow by shedding ("molting") their shells
- Must hide while their new shell hardens to protect their soft bodies
- Often found hiding under rocks during the day and foraging on the stream bed during the night
- Females may be seen with eggs or young clinging to the underside of their abdomen
- Most live only two years, but some may live up to six or seven years

Description

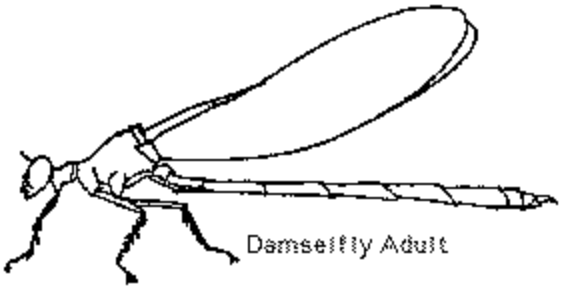
- Up to six inches long
- Eyes stand out from the body
- Two or four antennae
- Body covered with hard, plate like shell
- Ten legs, two of these are large claws
- Color is red, orange, brown or dark-colored

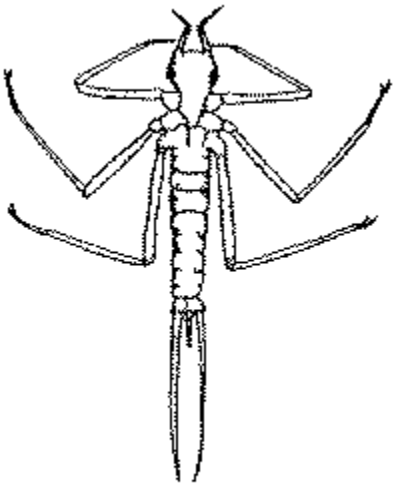
Words Found in Glossary

- abdomen
- antennae
- forage
- plate like

DAMSELFLY

Somewhat Sensitive





Facts

- Develop over one to four years

Description

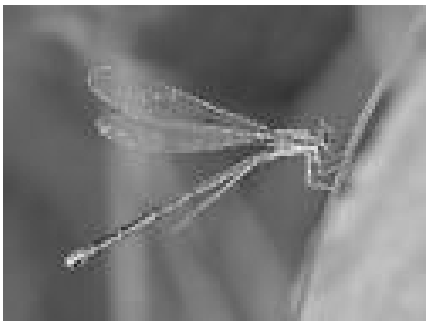
- Large eyes
- Large scoop-like lower lip
- No gills on the sides or underneath the abdomen
- Six long segmented legs on upper middle section of body
- Long spindly legs
- Narrow body with three oar-shaped tails (gills) that look like fans

Words Found in Glossary

- abdomen
- gills
- larva (larvae)
- segmented

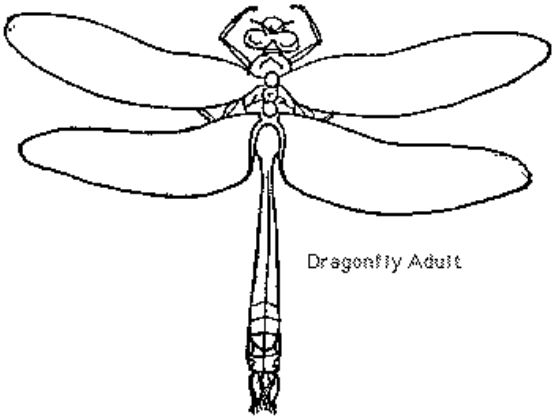
DAMSELFLY

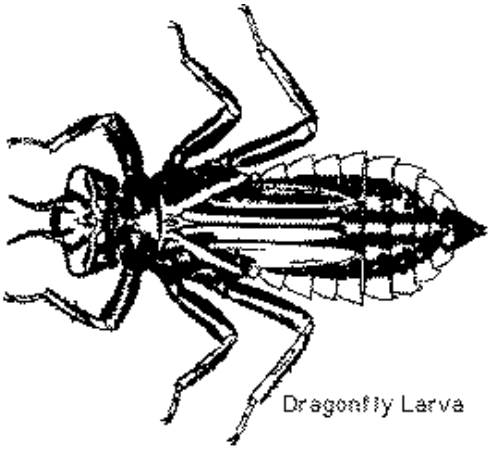
Source: http://bugguide.net/node/view/15740

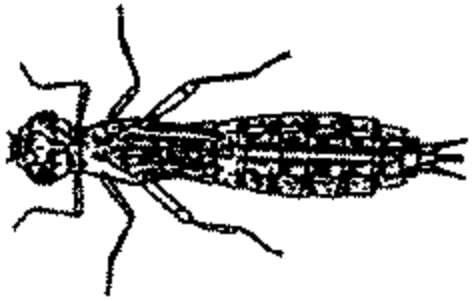


DRAGONFLY

Somewhat Sensitive







Facts

- Develop over one to four year period

Description

- Large eyes
- Large scoop-like lower lip
- Wide oval or round abdomen that may end in three wedge-shaped extensions
- No gills on the sides or underneath
- Six long segmented legs on upper middle section of body

Words Found in Glossary

- abdomen
- gills
- larva (larvae)
- oval
- segmented
- wedge-shaped

Dragonflies

Information Source:

McDonald, B., W. Borden, J. Lathrop.1990. Citizen Stream Monitoring: A Manual for Illinois. Illinois Department of Energy and Natural Resources, ILENR/RE-WR-90/18. Springfield, Illinois.

Metamorphosis:

Incomplete (see our life cycle page for more information)

Dragonfly Nymph

Nymphs:

vary in shape, but most have robust, elongated, or "spider-like"
bodies, often with algae growing on their backs; six legs at side of body or near front on elongated species; two large eyes at sides of heads; a pair of small wings begins to develop on back; color varies from brown, black, but often green; length up to 2 inches

Reproduction:

Eggs are deposited on surface of water and drift to bottom.

Adults:

Similar to adult damselflies, but the two pairs of wings are flat or horizontal at rest; some species can attain lengths of over 4 inches.

Food:

Predaceous, nymphs feed upon other aquatic macroinvertebrates, small fish, and tadpoles.

Scientific Name:

Class: Insecta
Order Odonata
Suborder Anisoptera

Indicator Role:

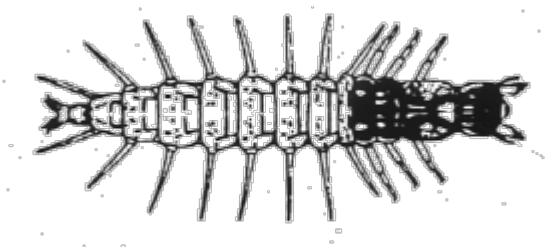
Dragonflies are found in slower moving streams and in ponds, often reflecting waters with lower dissolved oxygen levels.

Adult Dragonfly

Source: Free-Nature-Photos.org

FISHFLY

Somewhat Sensitive



Facts

- Carnivorous and may bite
- Develop during period of one to three years

Description

- Mouth has large, chewing pinchers
- Retractable breathing tubes extend from top of abdomen (not visible without magnification)
- Smooth underside
- Abdominal segments with many strand-like appendages extending from each side
- Three pairs of legs on middle section of body with tiny pinchers at the end of each
- Back end is forked with two short tails and two hooks on each tail
- Light colored
- Often confused with hellgrammite (dobson fly larva) but does not have fluffy gills on underside

Words Found in Glossary

- abdomen
- appendages
- carnivorous
- retractable
- segmented

Macroinvertebrates That Are Tolerant of Pollution

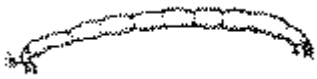
Found in Any Quality Water

Aquatic Worm

Lunged Snail

Black Fly

Leech



Midge Fly

Rainfall Simulator

The rainfall simulator will relate different ground covers and farming methods to soil erosion and soil conservation. Good conservation practices are discussed. A stream is used to demonstrate and discuss water quality issues. Leachate from the different cover crops is collected and shown to the students.