

Reading the River  
Summer, 2006

Wetlands  
10<sup>th</sup> grade Biology Unit

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## **Format to Share Information on Wetlands**

**Grade Level:** 9-12

**Objectives:**

The students will be able to:

1. analyze articles to determine points of interest concerning the given topic
2. determine the importance of wetlands to their community
3. justify reasons for their future acts pertaining to wetland preservation

**Program of Studies**

**Scientific Inquiry**

**Scientific Ways of Thinking and Working**

S-HS-SI-4

Students will use evidence, logic, and scientific knowledge to develop and revise scientific explanations and models.

S-HS-SI-5

Students will communicate designs, procedures, and results of scientific investigations.

S-HS-SI-6

Students will review and analyze scientific investigations and explanations of others.

**Geochemical Cycles**

S-HS-ESS-7

Students will investigate how Earth's internal and external sources of energy drive geochemical cycles (e.g., carbon moving from carbon dioxide reservoirs to carbonate reservoirs).

**Biological Change**

S-HS-LS-6

Students will examine diversity of organisms and biological classification

**The Interdependence of Organisms**

S-HS-LS-8

Students will analyze energy flow through ecosystems.

S-HS-LS-9

Students will examine interrelationships and interdependencies of organisms in ecosystems and the factors that influence the interactions between organisms.

S-HS-LS-10

Students will explore how human activities alter ecosystems.

**Applications/ Connections**

**Patterns, Systems, Scale and Models, Constancy, and Change Over Time**

S-HS-AC-3

Students will explore the impact of scientific knowledge and discoveries on personal and community health.

S-HS-AC-6

Students will investigate how science can be used to solve environmental quality problems (e.g., overconsumption, food distribution).

S-HS-AC-8

Students will analyze how science and technology are necessary but not sufficient for solving local, national, and global issues.

**Core Content**

<b>Unifying Ideas</b>
<b>SC-HS-4.7.1 Students will</b> <ul style="list-style-type: none"><li>• <b>analyze relationships and interactions among organisms in ecosystems;</b></li><li>• <b>predict the effects on other organisms of changes to one or more components of the ecosystem.</b></li></ul> Organisms both cooperate and compete in ecosystems. Often changes in one component of an ecosystem will have effects on the entire system that are difficult to predict. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years. DOK 3
<b>SC-HS-4.7.2 Students will</b> <ul style="list-style-type: none"><li>• <b>evaluate proposed solutions from multiple perspectives to environmental problems caused by human interaction;</b></li><li>• <b>justify positions using evidence/data.</b></li></ul> Human beings live within the world's ecosystems. Human activities can deliberately or inadvertently alter the dynamics in ecosystems. These activities can threaten current and future global stability and, if not addressed, ecosystems can be irreversibly affected. DOK 3
<b>SC-HS-4.7.3 Students will</b> <ul style="list-style-type: none"><li>• <b>predict the consequences of changes to any component (atmosphere, solid Earth, oceans, living things) of the Earth System;</b></li><li>• <b>propose justifiable solutions to global problems.</b></li></ul> Interactions among the solid Earth, the oceans, the atmosphere, and living things have resulted in the ongoing development of a changing Earth system. DOK 3

## **Materials**

- 5 wetland articles:
  - \* Wetlands  
(<http://www.greentreks.org/watershedstv/intheflow/wetlands.asp>)
  - \* Water Quality Won on Local Level  
([http://www.greentreks.org/watershedstv/intheflow/personalbuffer\\_zones.asp](http://www.greentreks.org/watershedstv/intheflow/personalbuffer_zones.asp))
  - \* Finding the Connection to Wetlands  
(<http://www.greentreks.org/watershedstv/intheflow/connectiontowetlands.asp>)
  - \* Our Environmental Responsibility  
([http://www.greentreks.org/watershedstv/intheflow\\_onenvirresponsibility.asp](http://www.greentreks.org/watershedstv/intheflow_onenvirresponsibility.asp))
  - \* Wetlands and forested buffers are vital  
(<http://www.greentreks.org/watershedstv/intheflow/wetlands2.asp>)
- several popsicle sticks (depending on class size) numbered 1-5
- entry/exit ticket question: “How important do you believe it is to help keep and protect wetlands? Justify your answer.”

## **Procedure**

- Allow each student to draw a popsicle stick with a number 1-5 upon entering the classroom.
- At beginning of class, have students answer the entry ticket question.
- Divide class into 5 groups according to the number each student drew. Pair the ones together, twos together, etc.
- Give each group one of the articles.
- Allow approximately 15 minutes for each group to read and discuss article using a note taking guide worksheet. Instruct group to pick out main ideas and be able to relate information to rest of class along with answering any questions from me or classmates.
- Assign each member within the group of ones, etc. a new number 1-5. After the 15 minute group discussion, instruct the ones to gather at table 1, the twos at table 2, etc. Now each member of the new group relay’s the information from their article to the “new” group members. The group members are required to take notes using the note taking worksheet.
- If time allows, have students reflect on their newly acquired information by answering the following questions: How does or will this information affect you and your future? Has what you learned today impacted your future activities in relation to water and wetlands?
- Allow the last 5 minutes of class time for students to answer the exit ticket question (same question as the beginning of class).

## Assessment

Students will be assessed on their class participation, note taking, and depth of reflection. The following rubric will be used:

	<b>30 points</b>	<b>15 points</b>	<b>5 points</b>	<b>0 points</b>
<b>Class participation</b>	enthusiastically Participates in ALL aspects of Discussions	participates in half of discussions	participates in less than half of discussions	no participation
<b>Note taking</b>	<b>10 points</b>	<b>5 points</b>	<b>1 point</b>	<b>0 points</b>
	Complete and Comprehensive Notes	completed but not comprehensive notes	not complete or comprehensive	no notes
	<b>10 points</b>	<b>5 points</b>	<b>1 point</b>	<b>0 points</b>
<b>Depth of Reflection</b>	best effort Given	moderate effort given	little effort given	no effort given

## **Definition/Explanation of Concepts**

There are 2 types of wetlands: coastal and inland. Examples of some of these wetlands are marshes, boggs, and swamps. Some wetlands are seasonal, meaning they only hold water during certain seasons of the year, usually winter and spring. There are more freshwater wetlands than saltwater.

The function of wetlands include being coastal barriers to the mainland, protection of humans from major flooding, protection from mosquito infestation, to promote wildlife diversity, improving ground and stream water quality by filtrating runoff, and recharging groundwater.

Shallow wetlands control mosquito populations by harboring amphibians and predatory insects which feed on mosquito larvae. These organisms include frogs, salamanders, dragonflies, damselflies, beetles, water striders, and backswimmers to name a few.

The United States is losing wetlands at an alarming rate mostly due to urban sprawl. We are making more conveniences for the human population at the expense of destroying the Earth and it's magnificent environments. Even though the loss of

wetlands is mainly due to humans, we are also the main factor in restoring them. Our future actions will decide the fate of our landscape. Since the government is not creating or regulating enough laws to make sure the wetlands are protected, most of the responsibility must be voluntary. To prevent future problems and correct present ones, we, as individuals, must be responsible, environmentally aware individuals. Along with this comes the power of also voting for environmentally friendly officials into the local and national level.

## References

Meinhart, K., Watersheds.tv. Greentreks Network, inc.  
<http://www.greentreks.org/watershedstv/intheflow/archives.asp>. Accessed on July 1, 2006.

## Lesson Context

### I. What are wetlands?

- a. Informal discussion on what a wetland is.
- b. E-field trip to a wildlife refuge. (if available)

### II. How important are wetlands to me? What can I do about the loss of wetlands in the US?

- a. Reading/Analyzing/Reflection of articles relating to wetlands (Lesson described above)
- b. Observing a wetland and collecting macroinvertebrate samples. Use key in field. (<http://www.iowater.net/datashts/Level1BenthicKey05.pdf>)
- c. Observing collected specimens under microscope and keying out using internet. (<http://www.people.virginia.edu/~sos-iwla/Stream-Study/Key/MacroKeyIntro.HTML>)
- d. Performing chemical analysis on wetland and discussing findings.

### III. What does it all mean to me?

- a. Give handout “Characteristics that Determine Water Quality” and determine the wetlands water quality using previous data.
- b. Discuss findings. Answer question, “Should wetlands have good water quality?”
- c. Guest speaker from US Department of Wildlife. Incorporate future job opportunities.

### IV. Assessment

- a. Portfolio Writing: Using information on macro invertebrates and wetlands, construct one of the following: (Use student worksheet)
  - i. Personal Ad
  - ii. Wanted Poster
  - iii. Help Wanted Ad
  - iv. Job Application

## Sources

Lessons were adapted from the sources listed.

Iowater: Volunteer Water Quality Monitoring. Benthic Key. March 2005.

<http://www.siue.edu/OSME/river/water&kicknets/Benthic%20Personal/Teacher%20Information.doc> accessed on July 1, 2006.

Meinhart, K., Watersheds.tv. Greentreks Network, inc.

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Moody, D., The American Biology Teacher, Volume 47, # 6, Sept 1985. Pp360.

<http://www.siue.edu/OSME/river/water&kicknets/inexpideaforrivstudy.htm>. Accessed on July 1, 2006.

Ramu, C., Rivers Project, SIUE. February 2006.

<http://www.siue.edu/OSME/river/water&kicknets/Benthic%20Personal/Teacher%20Information.doc> accessed on July 1, 2006.

Simon, S., Hawkins, T., & Davis, M., Rivers Project, SIUE.

<http://www.siue.edu/OSME/river/13things/13things.htm> accessed on July 1, 2006.

## Note taking Guide

*Individual work section*

**Use the following space to jot down the main ideas.**

*Group work section*

**1. Condense the above to 3 or less main points.**

**1.**

**2.**

**3**

**2. How do these relate to each other?**

**3. How do they impact society?**

*Individual work section*

**How do they impact you?**

## 13 Things You Can Do for a Healthier River

We all enjoy the river and sometimes get impatient with polluters, the Army Corps of Engineers and others who we think are harming the Mississippi in some way. Meanwhile, while we're waiting for others to clean up their acts, there are things each of us can do to improve the river in some way. Here are a few ideas.

### **1. Get the Lead Out**

It's against the law to use lead shot for hunting waterfowl in the Mississippi River Valley, because ducks geese and swans sometimes scoop up lead pellets from the backwater bottoms. Eagles and other predators sometimes eat lead-poisoned waterfowl and get poisoned themselves. In fact, eagles are often poisoned by eating dead deer and carcasses of other game legally shot with lead slugs or bullets beyond the river valley. Many anglers still have lead sinkers and split shot in their tackle boxes, despite the wide availability of lead-free products. Clean out that tackle box this spring and bring the old lead sinkers to a household hazardous waste site.

### **2. Double your Cycles**

In the last couple of years many four-cycle outboard motors, with power, response, and torque comparable to two-cycle, have hit the market. They're quieter, get much better mileage and run much cleaner than two-cycle engines, because they are designed for complete fuel combustion. They are so quiet that you can actually hear someone talk over the noise of the motor. The downside is the price; a four-cycle will cost quite a bit more than a two-cycle of the same horsepower. Of course, over the life of the motor, you'll probably more than make up the cost difference in what you save on gas. For example, Evinrude reports that it's latest 70 hp, four-cycle engine will go 31 percent farther on a gallon of gas than a comparable 70hp, two-cycle.

As much as 30 percent of the fuel-oil mix that powers two-cycle engines goes directly into the water unburned, yet 75 percent of motorized boats and personal watercraft run on two-cycles. Most two-cycle engines also emit nearly 40 times the toxic hydrocarbons coming from new, four-cycle engines. To counter noise and pollution complaints, manufactures are starting to offer jet-skis with four-cycle engines as well. They run quieter and don't leave a smelly haze in their wake.

### **3. Ease Off on the Lawn**

Now that most cities have pretty good sewage treatment, the main source of pollution in the River is fertilizer. Much of the fertilizers and herbicides used in the U.S. are applied to lawns, and some of these herbicides are far more potent and dangerous than those allowed on food crops. A lot of the herbicides and fertilizers applied to crops and lawns are quickly washed into lakes and rivers.

Many Americans want their lawns to look like carpets. If you feel compelled to do this, try to accomplish it with lighter or fewer applications. You'll save money and make a safer environment for neighborhood kids and pets, while you clean up the rivers and lakes.

Go one step further and use fertilizer without phosphorus, which is worse for the river than the nitrogen, (though nitrogen is the main culprit in the Dead Zone at the mouth of the Mississippi). If you really want to make a difference, go cold turkey. Plant clover in your lawn to get your nitrogen for free. Get used to a few dandelions and plantains. Pull a few if they get too thick. Or, start a prairie in your yard. Many prairie plants bloom and attract butterflies. Once established it needs little work. Sell your lawn mower, spend more time fishing.

#### **4. Help at a River Cleanup**

Nearly every river community holds an annual river cleanup. Besides being good for the river, cleanups are fun social events, often with free food and live music. You'll meet other river lovers, introduce kids to river stewardship and spend a day on the river. Bring gloves, drinking water, and sunblock. Watch out for poison ivy.

#### **5. Keep a Trash Bag in Your Tackle Box**

The good shore fishing spots are marked with empty Styrofoam worm cups, beer cans, and small plastic bags. Bring a garbage bag in the boat when you picnic on an island. Leave every spot you visit a little cleaner.

#### **6. Volunteer**

Every conservation and environmental group depends on volunteers. Give something back to the river by joining with like-minded volunteers who are working to improve the river.

#### **7. Act Locally**

Is your city putting off improving its sewer system? Is it filling in wetlands to build an industrial park? Does a local business have a lot of hazardous waste accidents and spills? In many communities just a couple of persistent citizens can motivate local officials to do a better job.

#### **8. Slow Down**

River islands and shorelines are fragile, and over a summer boating season they take a beating. Do we really want riprap to take the place of all the sandy beaches and willowy shores? According to a Minnesota Department of Natural Resources (DNR), a wake 25 inches or higher slamming into shore is 30 times more destructive than a five-inch wake. So when you are out in your cruiser or houseboat, take it easy, slow down and enjoy the beauty of natural shorelines.

#### **9. Watch the Mercury**

Mercury poisoning of fish and birds is an increasing problem on the river. Mercury contaminated fish are unsafe for human consumption, so check DNR fish consumption advisories for the pool where you are fishing before you oil up the frying pan. To reduce mercury releases into the environment, call your power company and ask them to install mercury removal systems at their coal-fired power plants. Power plant emissions are the largest source of mercury. Better yet, ask them when they plan to switch to cleaner burning or renewable fuel sources.

Do your part at home by taking used watch or calculator batteries and fluorescent light bulbs to appropriate recycling or hazardous waste sites. They contain mercury that can be released into the environment when trash is incinerated.

#### **10. Throw'em Back**

People enjoy ice fishing or summer fishing for panfish, especially kids. But panfish (sunnies, crappies, bluegills and perch) numbers are declining on the river due to poor over-wintering habitat in the sloughs and overfishing.

Minnesota and Wisconsin may soon limit the number of panfish that can be taken from the Mississippi. Currently there is no limit. Future generations of kids will continue to enjoy the thrill of catching their first sunfish if you throw some of them back, and take only what you will eat.

#### **11. To Get To the Other Side**

River turtles can find themselves dangerously mobility-challenged when they try to cross busy roads to lay their eggs in June. Don't risk your own safety, but give turtles a brake or a hand when you can.

Pull off safely to the shoulder, and if traffic is clear, carry the turtle across the road in the direction she was heading.

Handle them carefully, especially snapping turtles (some turtles may not let you move them). Check out their markings and you can learn more about the turtles of the region, like the rare Blanding's turtle. Remember to wash your hands at the next opportunity after handling a turtle.

### **12. Wise Land Use**

Erosion is perhaps the river's biggest enemy. Silt is filling in backwaters needed by fish and birds, and contributes to the hypoxia problem in the Gulf of Mexico. If you are reading this, your home or property probably lies somewhere in the Mississippi water shed, which includes 31 states. Whether you are a suburban or rural landowner, a farmer or a city dweller, there are things you can do to reduce erosion.

Look for ways to maintain more vegetative cover of your property, especially if a stream runs through it. Create buffer strips of native grasses and trees along stream banks. Plant large gardens or farm fields to cover crops in fall to decrease erosion and improve the soil. Fence livestock from stream banks. Plant trees and native grasses on your rural hunting property, and learn about sustainable forestry.

As a city dweller, be aware when your town considers filling in a wetland to build a new retail or commercial development (a common event in river towns).

The rivers lose in two ways: because pavement and large roofs increase the amount of runoff; and because there is less wetland to slow and filter the runoff water before it enters the river.

### **13. Enjoy It**

Get out there. Swim in it. Identify a new bird or plant. Visit a new place. Sit on the shore and watch all that water go by. Soak in the beauty of a marvelous river.

**BY: Sol Simon, Mississippi River Revival; Tex Hawkins, U.S. Fish and Wildlife Service; and Mike Davis, Minnesota Department of Natural Resources**

# Discovering Benthic Macroinvertebrates: A Language Arts and Biology Activity

## **Purpose**

To organize information about benthic macroinvertebrates in three distinct formats.

## **Background**

As you've learned, the ability to identify macroinvertebrates will help you assess the health of your stream. These exercises will help you learn the characteristics of macroinvertebrates.

Using the information you've been given about macroinvertebrates plus information you gather through research, you will use one of the following formats to describe a particular species. Your work will be displayed along with your classmates'. This will enable you to more easily identify each species while you're at the river.

Format options include a personal ad and a wanted poster and a help wanted ad and a job application.

## **Procedure for PERSONAL AD**

1. Choose your favorite macroinvertebrate.
2. Research! Find its class, order, family, and full name. Describe its appearance and acquire some good illustrations. List many of its characteristics and habits (eating, mating, life span, etc.)
3. Fill out the questionnaire.
4. Look at various personal columns in newspapers and on the Internet to discover possible formats. Read the sample also.
5. Write a rough draft of your personal ad.
6. Edit and proofread your draft.
7. Combine your writing with the illustrations you've found to produce an attractive lay-out.
8. Gather some feedback from your classmates about the accuracy and appearance of your personals ad.
9. Add any finishing touches to polish your ad. [Note: You must include at least two illustrations.]
10. Attach a "Works Consulted" page.

## **Procedure for WANTED POSTER**

1. *Choose a suspicious-looking benthic macroinvertebrate.*
2. Find the following information:
  - a. Photograph or sketch from the Internet or textbook or other sources
  - b. A detailed description of the chosen macroinvertebrate
  - c. Your macroinvertebrate's "M.O."
  - d. Its most common victim [what it eats]
  - e. Favorite hideouts [place its most likely found]

- f. Tolerance level
  - g. Eating habits [predator, omnivore, scavenger, etc.]
  - h. Distinguishing characteristics [marks, tattoos, etc.]
  - i. Alias
  - j. Any other pertinent information
3. Look at the sample poster provided.
  4. Design your wanted poster. It should contain text and illustration. Use 8 ½ X 11 paper, unlined.
  5. Edit and proofread your draft.
  6. Gather some feedback from your classmates about the accuracy and appearance of your poster.
  7. Add any finishing touches to polish your wanted poster.
  8. Include a “Works Consulted” page.

### **Procedure for HELP WANTED AD**

1. Collect detailed information on the position you want a macroinvertebrate to fill. Use material from the Internet, your textbook, and your instructor. Details should include a description of the “job” to be performed, the requirements for that job, its location, and expected tenure.
2. Read the sample ad; peruse ads online or in a newspaper.
3. Write a first draft, then edit/proofread it.
4. Ask a classmate to check your work, and then make any corrections.
5. Include a “Works Consulted” page.

### **Procedure for JOB APPLICATION**

1. Collect information on the position you desire. Use material from the Internet, your textbook, and your instructor. Details should include your experience, training, and any special qualifications for the “job”.
2. Read the sample.
3. Write a first draft, then edit/proofread it.
4. Ask a classmate to check your work, and then make any corrections.
5. Include a “Works Consulted” page.

### **NOTES regarding Help Wanted Ad and Job Application**

These may be done as a set while working with a partner. One person designs the ad; the other person composes the application.

Challenge: The ad designer does not reveal the identity of the macroinvertebrate desired. Rather, the applicant must research to discover the species needed, then create the application.

### **Observations**

Read your classmates’ work to learn the characteristics of macroinvertebrate species.

### **Analyses and Conclusions**

What information do you need to identify macroinvertebrates?

**Critical Thinking Questions**

How did this (these) exercise(s) help you learn about macroinvertebrates?

What other formats could be used to help students identify macroinvertebrates?

**Keeping Your Journal**

List as many species and their characteristics as you can recall from your classmates' work.

## ***Student Worksheet***

### Background

Full name - Call name  
                  - Scientific name

Order

Family

Gender

Age

### Physical Description

Eyes

Antennae

Mouthparts

Color

Body type

Tolerance level

Special attributes

Birthrate and/or Astrological sign

## Personal Information

Turn ons

Turn offs

Interests

Favorite foods

Preferred locale/habitat

What my friends say

Description of your perfect day/evening

Qualities desired in mate

## Characteristics that determine water quality

Characteristic	Heavily Polluted	Moderately Polluted	Slightly Polluted	CLEAN WATER
Water Condition	Brown, possibly with scum and frothy	Brownish. Film or scum possible	May be nearly clear or slightly muddied	Fairly clear
Mud Condition	Black, sewage, oily or chemical odor	Black, fairly strong odor	Dark brown, may have a slight odor	Should not have a foul odor
Diptera Larva	Mosquito ( <i>Culex</i> ), rat-tailed maggot ( <i>Eristalis</i> )	Mosquito, Midge ( <i>Chironomidae</i> & <i>Dixidae</i> ), black flies ( <i>Simulidae</i> , <i>Eristalis</i> , dance fly ( <i>Empididae</i> )	A few chironomids, dixids, & simulids, mosquito, horsefly, dance fly, <i>Eristalis</i>	Possibly mosquito, chironomids, or crane flies
Worms	Sludge or tubifex worms ( <i>Oligochaeta</i> )	Tubifex and other oligochaetes, leeches, possibly roundworms.	Leeches, oligochaetes, flatworms	Possibly none or may be oligochaetes
Crustaceans/ Mollusks	None living, may find empty shells	Pea shell clams, left handed snails, some copepods particularly Cyclops, some Branchiopoda particularly Daphnia, fresh water limpets	Daphnia, aquatic snails, crayfish, many copepods, many ostracods, some amphipods, freshwater mussels, limpets	Crayfish, good copepod variety, freshwater mussels, aquatic snails, limpets.
Other Insect Larva	None	Probably none	Dragonflies, riffle beetles, caddisflies, damselflies, water striders, water scorpion, whirligig beetles dobsonflies,	Stoneflies, water pennies, mayflies, dragonflies, riffle beetles, water scorpions, water striders, whirligig beetles, damselflies, predaceous diving beetles, caddisflies, dobsonflies,
Protozoans/Rotifers	Euglena, <i>Amoeba</i> , & some rotifers	<i>Amoeba</i> <i>Paramecium</i> , <i>Euglena</i> , and rotifers	<i>Stentor</i> , <i>Paramecium</i> , <i>Euglena</i> , & rotifers	A few <i>Euglena</i> , <i>Dinobryon</i> , <i>Diffugia</i> , <i>Chlamydomonas</i> , <i>Gonyaulax</i> but not many ciliates
Fish	none	May see carp, minnows	Carp, catfish,	Carp, catfish,

		( <i>Cyprinidae</i> ), buffalo fish and possibly catfish	minnows, buffalo fish, gars, stickleback & suckers	minnows, buffalo fish, stickleback, gars, suckers, blue gill, darters and game fish
Algae	Possibly <i>Melosira</i> and <i>Oscillatoria</i>	<i>Oscillatoria</i> & <i>Spirogyra</i>	<b>Pandorina</b>	<i>Oedogonium</i> and <i>Navicula</i>
Diversity Index	0-2	1-3	2-5	4-10
Misc.	Great numbers of Bacteria ( <i>Sphaerotilus</i> ) or may be entirely lacking life.	Possibly algae floating on the surface, bacteria ( <i>Beggiatoa</i> )	Rooted plants may be present	Good variety of rooted plants

The numbers for the diversity index and the organisms present are approximates based on a slow moving river. Fast moving and cold rivers impact diversity.

#### Bibliography

Dwight Moody, The American Biology Teacher, Volume 47, # 6, Sept 1985. Pp360