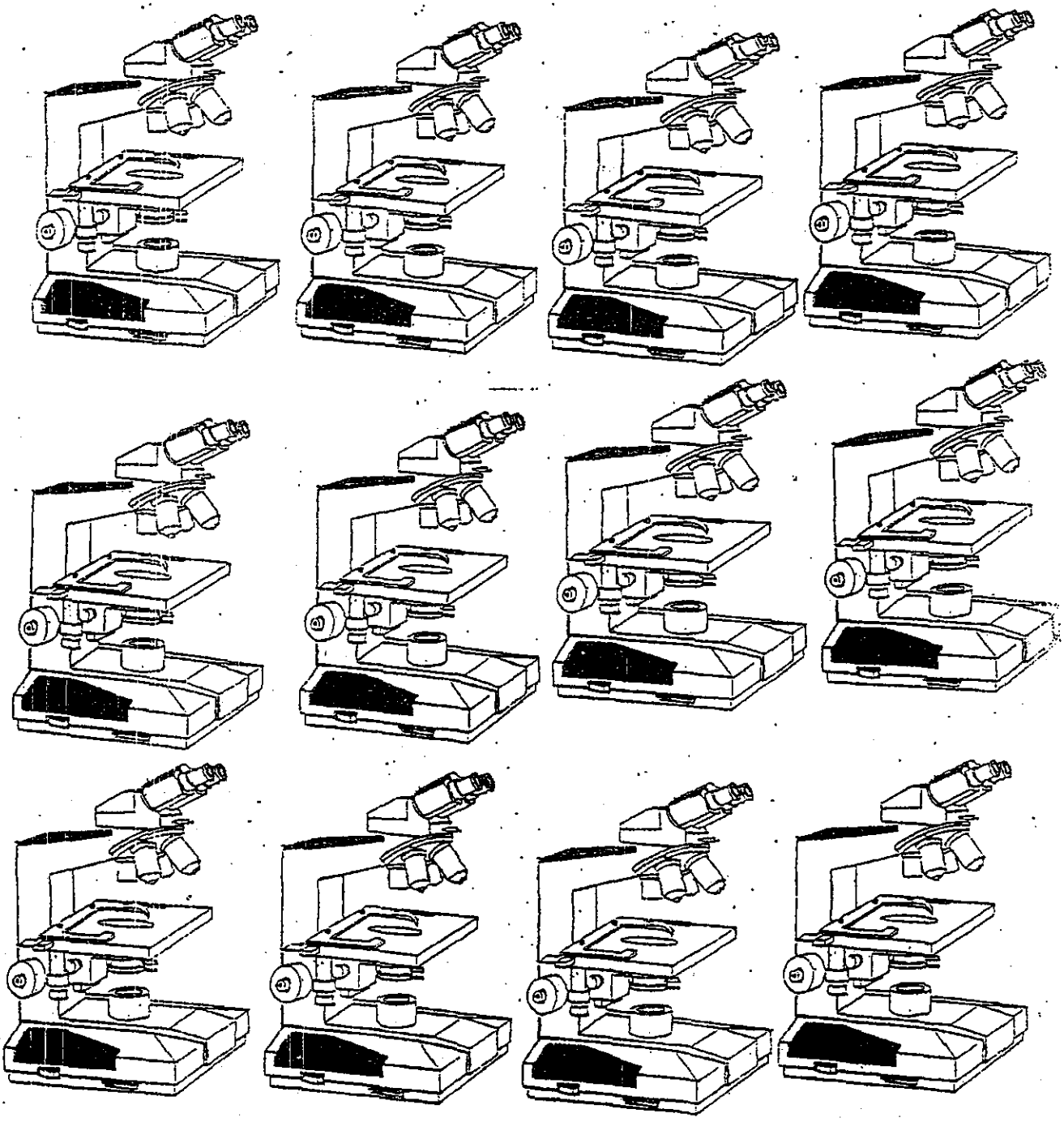
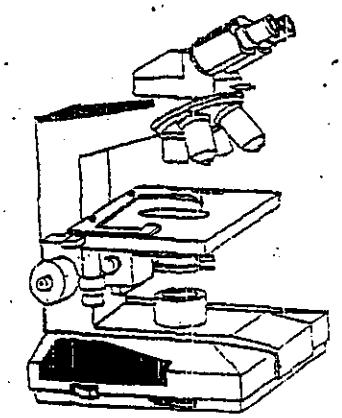
Microscope Flashcards.....



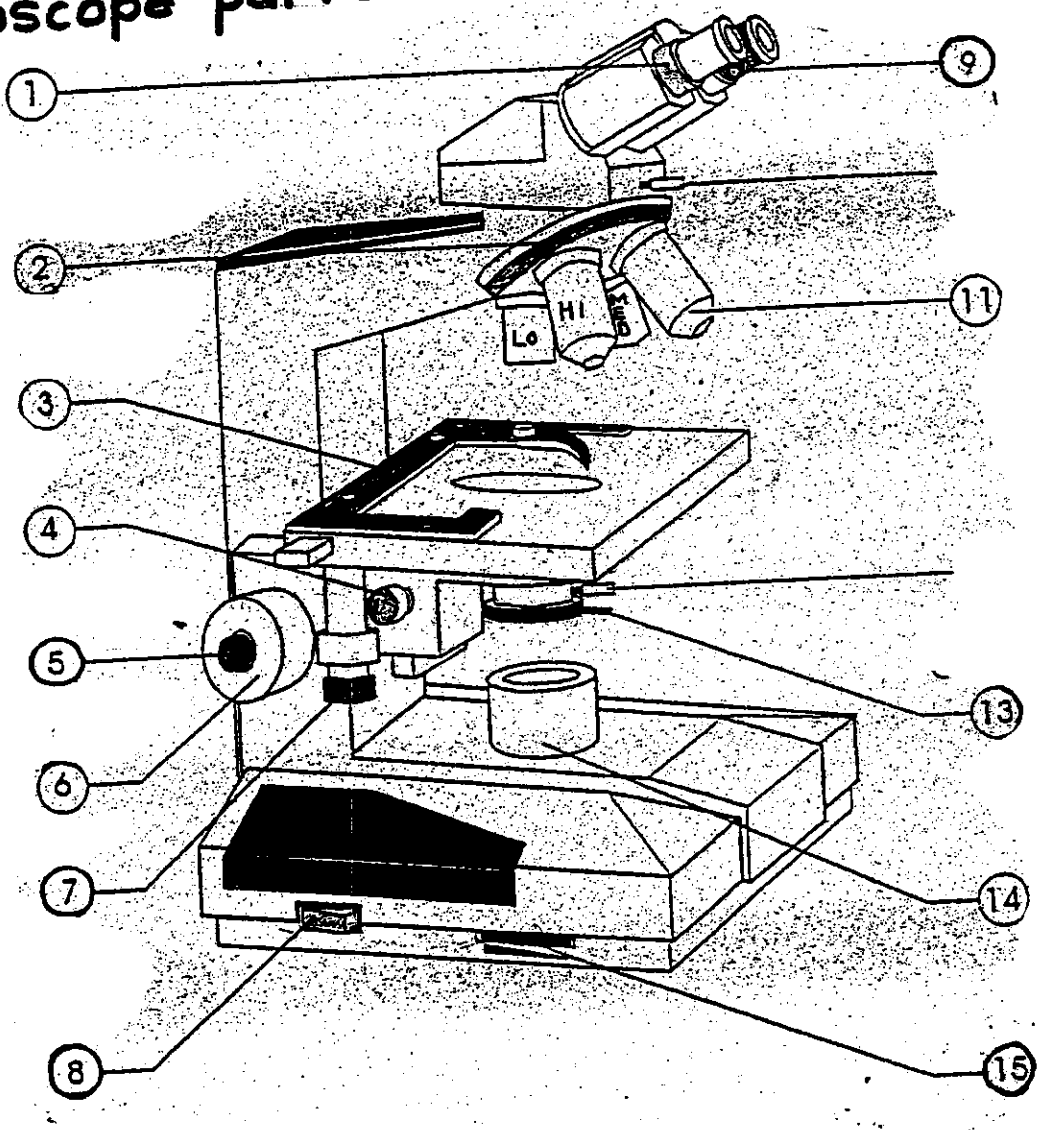


Directions: Cut out the picture of the microscope and glue onto an index card. Label and highlight each of the microscope parts below. On the opposite side of the card, explain the function of the microscope part.

Ocular lens (10x)	Stag clips
Revolving nosepiece	Rheostat illumination control
Fine focus knob	Coarse focus knob
Mechanical stage control	halogen illuminator
Diopter adjustment	condenser lift knob
On/off switch	Objective lens

• Microscope Core:

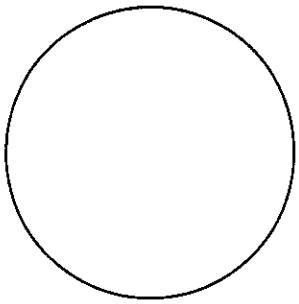
• Microscope parts:



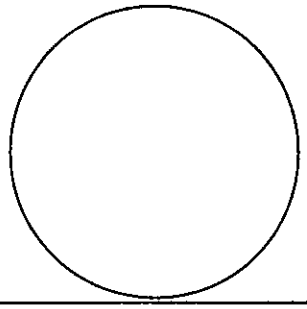
• Microscope use:

Microscope Lab

1. The Letter "E"
    a. Obtain a prepared slide with the letter "e".
    b. Observe the specimen under low and medium power objective lenses. Draw what you see in color and add all details you see.

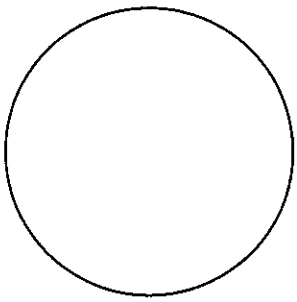


Low Power Objective
Magnification: _____X

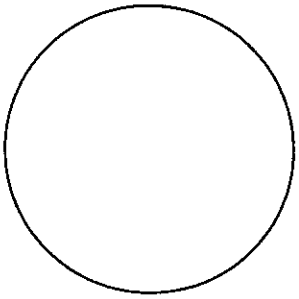


Med Power Objective
Magnification: _____X

2. Graph Paper
    a. Obtain a prepared slide with the micrograph paper.
    b. Observe the specimen under medium and high power objective lenses. Draw what you see in color and add all details you see.



Med Power Objective
Magnification: _____X

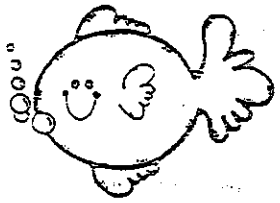


Hi Power Objective
Magnification: _____X

Analysis Questions

1. How does the letter "e" appear when viewed through your microscope (direction, etc.)?
2. When a microscope slide is moved to the right, in which direction does the viewed image appear to move?
3. When a microscope slide is moved up, in which direction does the viewed image appear to move?

Analyzing Watersheds



Watershed

- Watershed:
  - Runoff carries sediments, and other suspended and dissolved materials
  - type and amount of these materials are dictated by the uses of the land within each area of the watershed
- Watersheds can be large:
- Watersheds can be small:

Energy and Food Webs

- Energy, materials and organisms pass into, through, and out of an ecosystem.
  - Aquatic macroinvertebrates consume the algae and diatoms that grow in streams.
  - Energy can leave the aquatic system through various routes

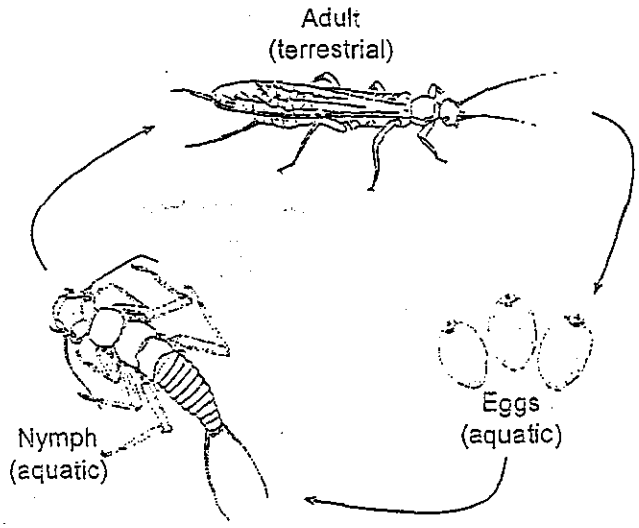
Aquatic Macroinvertebrates

- *Daphnia*
  - common to the Sacramento area
  - it is adapted to still or slow moving water
- Most stream species are bottom-dwelling (benthic) and crawl or attach to the river bottom.
  - some will eventually develop wings, fly away to mate and return to the water to lay their eggs.

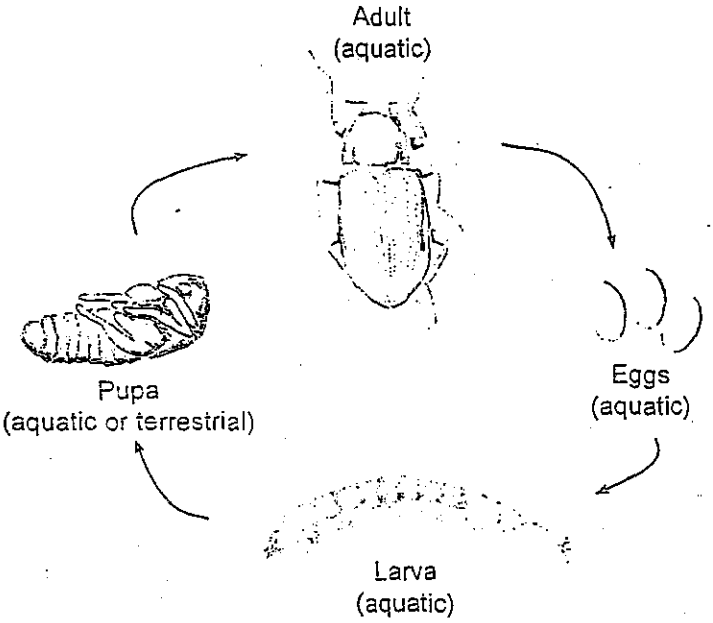
Benthic Macroinvertebrates = BMIs

- Most BMIs spend the majority of their life cycle in water
  - Metamorphosis =

Life History



Incomplete Metamorphosis



Complete Metamorphosis

Macroinvertebrates as Water Quality Indicators

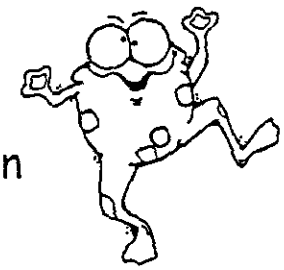
- Ecologists can determine the quality of a stream by sampling BMIs from stream bottoms.

  Example:

- By knowing the water quality and habitat needs of different groups and species of macroinvertebrates, people can use BMI samples to determine if a stream has been recently impacted by pollution of habitat disturbance.

  -Bioassessment:

Up close and personal Macroinvertebrates



1. Obtain Daphnia from the instructor, put them on a slide with a well. (NO COVER SLIP!)
2. Add a drop of "Detain" which will slow down the organisms.
3. Using the microscope, observe the live specimen Daphnia.
4. Draw a Daphnia with detail and color.

Title:_____(X)

5. Put the Daphnia in the bucket and clean your slide.
6. Put away your microscope.
7. Look at a preserved specimen under the dissecting microscope.
8. Draw one of them in detail.

Title:_____(X)

Cartoon Creation

Directions: Design a cartoon with at least five frames that illustrates each of the following components of a stream.

- A life cycle (egg, larvae, pupa, adult, death & decomposition) of an aquatic macroinvertebrate.
- A food web (energy moving through a system). Label the producer, 1st order consumer, 2nd order consumer, etc.
- Biodiversity of a poor quality stream (high tolerance)
- Color

Cartoon Rubric

Components	3	2	1	0
Life Cycle	Life cycle includes egg, larvae, pupa, adult, death and decomposition of an aquatic macroinvertebrate. All stages are labeled.	Some aspects of the life cycle are incomplete. All stages are labeled.	Some aspects of the life cycle are incomplete. All stages are not labeled.	Life cycle is incomplete and not labeled.
Food web	• Food web begins with a producer. Consumers are appropriately labeled. • Sun is depicted in the poster to show radiant energy. • Decomposition is show.	One of the following is incomplete: • Food web begins with a producer. Consumers are appropriately labeled. • Sun is depicted in the poster to show radiant energy. • Decomposition is show.	Two of the following are incomplete: • Food web begins with a producer. Consumers are appropriately labeled. • Sun is depicted in the poster to show radiant energy. • Decomposition is show.	Missing: • Food web begins with a producer. Consumers are appropriately labeled. • Sun is depicted in the poster to show radiant energy. • Decompositio n is show.
Biodiversity	• Shows 6 or more macroinvertebr ates • Organisms are labeled	• Shows 5 - 4 macroinvertebra tes • Organisms are labeled	• Shows less than 3 macroinvertebr ates • Organisms are not labeled	• Showsless than 2 macroinvert ebrates • Organisms are not labeled
Color, Legibility, Rubric is attached	• Very Colorful • Poster is legible • Rubric is attached	• Colorful • Poster is legible	• Semi-colorful • Poster is somewhat legible	• Lacking color • Poster is illegible • Rubric is not attached
Title	• Title depicts the quality of water (high tolerance) and scenario	• Title either does not depict the quality of water or the scenario	• Title does not depict the quality of water and nor the scenario	• Lacking title

Names of Group Members: _____

Total: _____ /15 x 2 = _____

Reading: The Watershed

1. Read the article "The watershed", pages 1-4
2. Glossary Terms - fill in the context clues and what you think the definition of the word might be. The true definitions will not be looked up until we have gone over the warm-up.

Word	Context Clues	What I think the definition is	True Definition
Tributary			
Watershed			
Food web			
Aquatic macroinverte-brates			

3. How many square miles of land contributes to the Sacramento watershed?

4. Which creek are nearest to?

5. What two factors determine how well the biotic organisms of a stream live?

6. How does energy and materials get passed from one living thing to another in an underwater community?

What is a watershed? Describe in *your own* words and draw a diagram.

Name four tributaries to the Sacramento River. What would occur if a dam was build on one of those tributaries?

Using words (or drawings) and arrows, construct a flow chart showing how energy passes from the sun to a human through a stream's food web.

bH

Glossary Word	Context Clues	What I think it means	True Definition
Pollutant			
First flush			
Point sources			
Sanitary			
Protozoa			

Questions from Reading:

1. Where does sediment come from and what consequences does it have on aquatic macroinvertebrates?

2. What nutrients are found in fertilizers? What are the consequences of these nutrients in streams?

3. How is the oxygen getting used up when algal blooms decompose?

4. Pretend you are a drop of water. Explain the path you would take after being dumped down the sink, and through the wastewater treatment plant.

5. How are anaerobic bacteria used in wastewater treatment.

1. What is a bioassay?

2. What are the variables in your bioassay?

3. Explain what the control was in your bioassay, and why it is necessary?

4. How do our actions on the land can affect aquatic life in streams.

5. How are runoff and wastewater different?

6. Why is the first big autumn storm more dangerous to fish than a big storm in the middle of winter?

Lesson III
Pages 11-16

	Context Clues	Definition	True Definition
Pathogen			
Impervious Surface			

Respond:

1. Describe Sacramento's water situation in the 1800's.
2. Thoroughly explain the Clean Water Act.
3. How does an impervious surface influence a watershed?

Reading: Alaska's Oil War

1. Read the article "Alaska's Oil War"
2. Glossary Terms - fill in the context clues and what you think the definition of the word might be. The true definitions will not be looked up until we have gone over the warm-up.

Word	Context Clues	What I think the Definition is	True Definition
Refuge			
Migratory			
Environment			
Contaminated			
Pristine			

3. What are the arguments for drilling in the Refuge?

4. What are the arguments for not drilling in the Refuge?

5. What is your opinion? (Support your opinion with facts fron the article)

Nonpoint source pollution: Finding the source of pollution

Background

Ecologists are often asked to analyze water for pollutants and then find the source of the pollutants. A **watershed** is a land area that drains into a stream, lake or pond. Water picks up pollutants and carries it into a water source. Runoff that carries natural and human-made pollutants into lakes, rivers, streams, wetlands, estuaries, and underground water is known as **nonpoint source pollution**. Some potential pollutants are heat (waste heat from power generation), heavy metals, organic pollutants, pesticides, erosion (farming, road building, forestry, urban construction) and acid rain. These pollutants can drastically alter the state of the ecosystems. If we can determine the type of pollutants, then we can not only classify the source of the pollutant, but also take preventative measures to alleviate any further contamination.

Purpose: To describe and identify the activity within a watershed that causes polluted water

Materials

1. Data table
2. Bag of pollutants (each bag represents pollutants from a watershed)
3. Graph paper

Hypothesis: If I analyze the pollutants in the watershed, then _____ (land use) will be the source of pollutants.

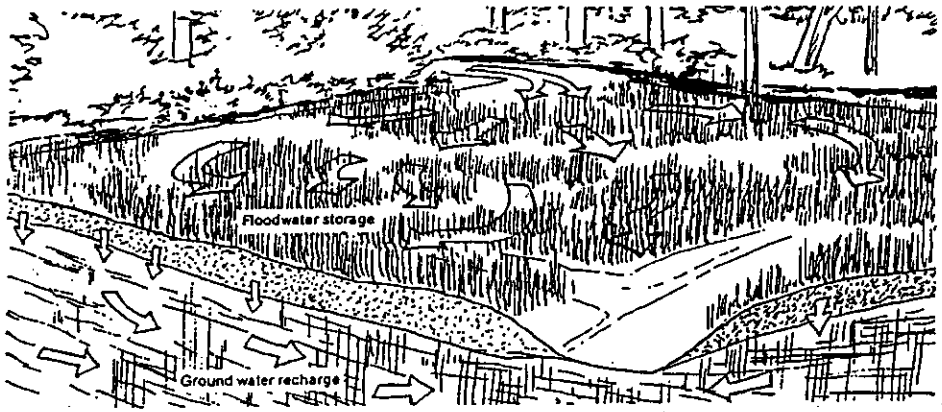
Instructions: See overhead transparency

Land Use	Activities	Pollution Problems
Agriculture	tilage, cultivation, pest control, fertilization, animal waste management	sediment, nitrate, ammonia, phosphate, pesticides, bacteria
Construction	land clearing and grading	sediment
Forestry	timber harvesting, road construction, fire control, weed control	sediment, pesticides
Wastewater Disposal	septic systems	bacteria, nitrate, phosphate
Surface Mining	soil, gravel, mineral excavation	sediment, heavy metals, acid drainage, nutrients
Urban Storm Runoff	automobile maintenance, lawn and garden care, painting	oil, gas, antifreeze, nutrients, pesticides, paint

Watershed water quality analysis table

Color of M & M	Contaminant
Red	sediment
Orange	Pesticides
Yellow	Nitrates, Phosphates
Green	Oil/Gas, antifreeze, paint
Dark Brown	Nutrients
Blue	Heavy metals, acid drainage

Wetlands Conservation and Use



Water purification

"A dawn wind stirs on the great marsh. With almost imperceptible slowness it rolls a bank of fog across the wide morass. Like the white ghost of a glacier the mists advance, riding over phalanxes of tamarack, sliding across bog meadows heavy with dew. A single silence hangs from horizon to horizon."

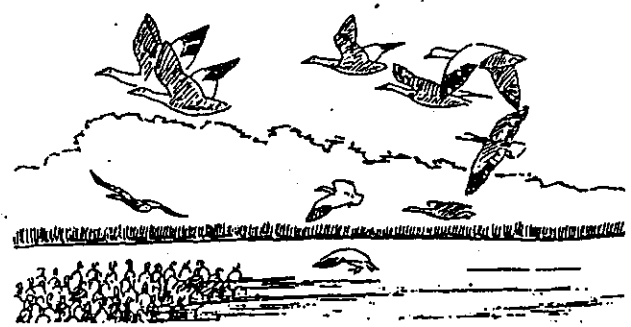
—Aldo Leopold
A Sand County Almanac

This peaceful beauty is only one of many wetland values.

Wetland Characteristics

Wetlands are places of interface between land and water. Though they may be flooded only occasionally during spring thaw or daily by the cycle of tides, water is the key feature controlling the life of the wetland ecosystem. Unique hydric soils and plants adapted to living in water-saturated conditions characterize wetland areas. Common names for different types of wetlands are swamps, bogs, freshwater or salt marshes, potholes, and sloughs.

These wetland systems have inherent natural values. They provide nursery and breeding grounds for fish, shellfish, waterfowl, and other wildlife. The highly productive wetland plants are the primary food source for these animals. Wetlands perform important hydrologic functions including water purification, groundwater recharge, and flood and erosion control. Unfortunately, these values went unnoticed for a long time while "worthless" wetlands were destroyed in efforts to "improve" them. The following table summarizes the benefits of natural wetlands to wildlife and people and the uses of developed wetlands.



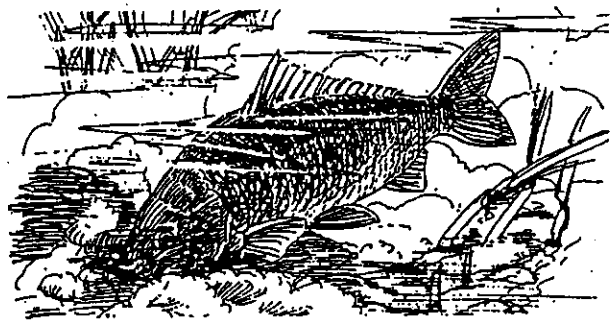
Functions/Uses	Natural Wetlands	Developed/Drained Wetlands
Wildlife Habitat	• Provide essential nesting, feeding, and wintering sites for waterfowl. • Provide food, water, and cover for many species of game and fur-bearing animals. • Provide breeding or nursery grounds for many species of fish and shellfish (including 2/3 of the commercial species).	• May support a different type of flora and fauna, but not generally wetland species. The problems of wetland destruction first became noticed due to a dramatic decline in populations of ducks and geese.
Water Resource Values	• Provide water purification because wetland plants and soil organisms absorb or break down many pollutants. Researchers are examining wetland use for wastewater treatment. • Recharge groundwater. Water held in wetlands may seep down to replenish the water table. • Provide flood and erosion control by temporarily storing excess water.	• Cause loss of water resource values after which deterioration of water quality or increased flooding may result. • Often requires construction of alternative solutions such as levees, dams, and treatment plants to replace formerly "free services."
Food Crops/ Productivity	• Provide food for people and other animals such as fish, shellfish, and waterfowl. Many wetlands are highly productive, with more plant growth per hectare than farmland. • Furnish areas for commercial crops such as cranberries, wild rice, and marsh hay.	• Usually easier to farm through small potholes than go around them. • Often result in soil destruction and loss of soil fertility; however, wheat, soybeans, and other crops may grow well in drained wetlands.

Indirect Human Impacts

In addition to the direct impacts of filling and draining, people have indirect impacts on wetlands. Industrial cooling water discharged into wetlands raises water temperature (heat pollution), sometimes killing animals or changing their life cycles. Wetlands are polluted by spills, discharges, or runoff of oil or chemicals.

The introduction of nonnative species, which have few natural enemies, also affects wetlands. For example, carp, a native fish of Asia, has thrived in many U.S. freshwaters. This fish "roots" in the bottom for food, raising clouds of sediment that can cause a variety of problems. For instance, this disturbance clouds the water, thus reducing light penetration. This in turn may cause a decrease in photosynthesis, which eventually reduces the amount of oxygen available to plants and animals.

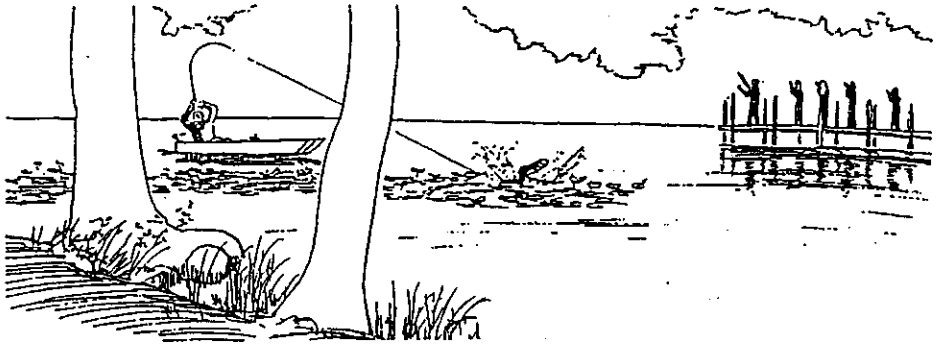
A second example of problems with introduced species is the purple loosestrife plant. It was brought into the United States in the early 1800's by a garden club and is taking over habitat once occupied by cattails. While some people consider purple loosestrife attractive, it is less nutritious than cattails. Ultimately, this affects food relationships in those wetlands dominated by purple loosestrife.



Choosing Priorities

Development of wetlands often impairs or destroys their natural functions. Before people became aware of these functions, filling, draining, or dumping on wetlands seemed the only way to make them useful. Now comes a need for careful balance. Does developing a wetland have more value than leaving it alone? The answer is not always simple.

Certainly different sites can be found for garbage dumps. But wetlands destruction is also spurred by the demand for jobs, food, and homes. Wetlands are drained for agriculture or filled for cheap, flat residential land or prime waterfront property. How are these values to be balanced?



Wetland Protection and Planning

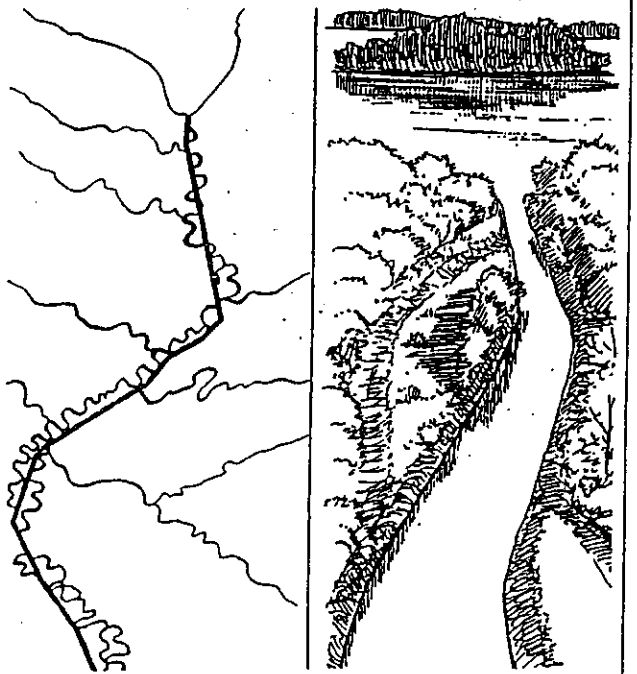
The first wetland protection programs were aimed at preserving wetlands important to wildlife, particularly to migrating birds. Federal and State agencies purchased wetlands or **easements** on them through the Waterbank or Migratory Bird Conservation Programs. Private agencies (such as The Nature Conservancy, Ducks Unlimited, and others) added to the conservation effort.

Increasing public realization of wetland values has led to broader programs for planning and preservation. The Clean Water Act requires permits for some wetland dredging or filling projects. The permit evaluation process ensures that public losses as well as benefits from proposed projects are considered. The Coastal Zone Management Act encourages States to consider development trade-offs in coastal wetlands. Many States have laws or public land management policies affecting wetlands; some offer tax relief programs for owners of wetlands.

Learning to Plan

Planning for wetland use and conservation requires knowledge of how wetland systems function. Research is now providing some needed information. Unfortunately, some lessons have been learned through hard experience. For example, some soils drained for agriculture were too acid or too salty for crops. Draining of prairie potholes has decreased waterfowl populations. Building sites located on former wetlands are often subject to recurring floods or storm damage.

A case in point is the channelization of the Kissimmee River, which flows into Lake Okeechobee in southern Florida. In the mid-1960's, this 100-mile-long meandering river was straightened into a 50-mile canal to drain and control floods on surrounding land. Soon water quality in Lake Okeechobee, the drinking water reservoir for the southern part of the State, began to deteriorate. What happened? Prior to channelization, the flowing water was slowed and filtered in the winding river and the adjacent wetlands. After channelization, runoff from adjacent farms and grazing land flowed quickly and directly into Lake Okeechobee without benefit of the natural pollution removal. The river and marsh may now have to be restored to accomplish this important function.



Channelization of the Kissimmee River

Habitat Management

Planning for wetland uses is often an either/or trade-off decision because wetlands cannot be managed both for development and for natural values.

Preservation of wetlands is important to maintaining its wildlife values and, in most cases, proper management can enhance wetland habitat. **Moist soil management** can be used to control marsh plant populations wherever water levels can be manipulated. For example, water levels may be "drawn down" in spring, allowing plants to grow in areas that were formerly flooded. Reflooding these areas in the fall makes the food available to migrating waterfowl. Plantings and nesting boxes may be located where food or nest sites are insufficient.

Plans for development should not assume that wetland areas are useless. Wetlands are proving more and more to be invaluable resources. Their further loss would be both costly and sad, as so eloquently described by Aldo Leopold:

"Some day my marsh, dyked and pumped, will lie forgotten under the wheat, just as today and yesterday will lie forgotten under the years. Before the last mud-minnow makes his last wiggle in the last pool, the terns will scream goodbye...the swans will circle skyward in snowy dignity, and the cranes will blow their trumpets in farewell."

Our increased knowledge and appreciation of the wetlands' natural "work and worth" can help ensure their presence for future generations to enjoy.

Glossary

channelization—A process by which people modify the shape and course of a streambed to provide a more direct waterflow.
easement—Legal rights (for a nonowner) written into a real estate deed for a specific purpose—such as wetlands protection activities.
groundwater recharge—Replenishment of the underground water supply.
hectare—Measurement of area in the metric system; 1 hectare (10,000 sq m) = 2.47 acres.
hydric—A term used to describe particular types of soils formed under wet conditions.
hydrologic—A term pertaining to water—its properties, distribution, or circulation.
moist soil management—The process of controlling water levels in a marsh so that natural wild foods are abundantly produced for wildlife.
pothole—A shallow, water-filled depression of glacial origin found primarily in the northern Great Plains. Potholes characteristically have cattails, grasses, and abundant aquatic life.

Department of the Interior/U.S. Fish and Wildlife Service, 1982

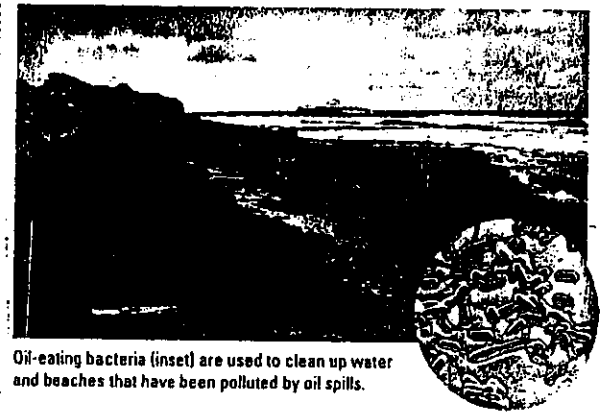
Frontier

Using Microbes to Remove Pollutants

Oil spill. The words evoke images of a spreading iridescent layer on the surface of the ocean or globs of tarry stuff stuck to rocks, sand, and birds along the shoreline. Cleaning up an oil spill is a difficult task. In the past, efforts to clean up oil spills have included vacuuming the oil off the surface of the water and burning it off. Now scientists are using a new technique. They are using bacteria to digest the oil.

The process of using microorganisms to break down pollutants is called bioremediation. Recall that decomposer organisms are nature's recyclers, breaking down complex molecules into simpler substances. Some bacteria are able to do this with large hydrocarbons. When these bacteria are introduced into the spilled oil, they reproduce rapidly, consuming the oil. Sometimes the bacteria are already present, and all it takes is the addition of some nutrients, such as amino acids and vitamins, to stimulate the population growth.

Bioremediation has several advantages. The cost is about half the cost of traditional methods of dealing with spilled oil. With a variety of mixtures of bacteria, nutrients, and enzymes, the material can be custom blended for each situation. The bacteria seem to have no side effects. Where bioremediation was used on a large oil spill in Japan, no harmful effects could be seen in local marine life.



Oil-eating bacteria (inset) are used to clean up water and beaches that have been polluted by oil spills.

Although bioremediation has been used most successfully on oil spills, it can also be used to break down other substances. Ethylene glycol, an ingredient in anitfreeze, is used at airports to deice planes. When this substance runs off the pavement into the ground, it can contaminate nearby bodies of water. Bacteria can be used to break down this chemical.

Not all substances can be cleaned up by bacteria. Heavy metals and radioactive substances do not break down due to bacterial action. However, scientists are looking for bacteria that may concentrate these pollutants, making disposal of them simpler.

Checkpoint

1. What items are included in the bioremediation mixture added to an oil spill?
2. Bacteria are better at breaking down oil that is on water or in an aquifer than oil that has washed up on a beach. Suggest a reason for this.

LIH

Wetlands Conservation and Use

Glossary Word	Context Clues	What I think it means	True Definition
hydrologic			
Ground-water recharge			
easements			
channelizat-ion			
potholes			

- List 3-5 natural values of a wetland system
- Why are wetlands important to humans or society?

- How have humans influenced wetlands?
- What is an introduced species? Give an example of an introduced species. What are some problems with introduced species?

Marsh Metaphors Worksheet

Directions: If you were trying to each someone else about wetlands and how they work, you might find it helpful to compare wetlands to ordinary objects. How would you compare a wetland to each of the following objects?

1. A sponge -

2. Coffee filter -

3. A House -

4. A nursery -

5. A strainer -

Groundwater Word Search: Print and complete!

A	G	V	E	A	W	A	I	O	N	C	D	R	O	U	G	H	T	Q	R
G	F	S	D	R	J	H	B	K	E	S	R	U	C	Y	T	Z	M	A	L
P	R	E	C	I	P	I	T	A	T	I	O	N	V	D	Y	A	N	S	W
T	Z	O	N	S	I	B	M	L	U	A	P	O	N	A	R	Q	D	D	P
O	M	H	U	F	E	S	C	I	D	N	L	F	S	P	B	I	U	F	E
E	W	O	K	N	E	A	P	D	O	G	A	F	U	E	L	U	N	J	R
R	X	P	J	B	D	N	F	R	T	B	M	T	X	O	E	N	F	K	M
C	G	T	W	Y	U	W	B	S	I	E	C	J	M	I	B	G	R	N	E
A	U	I	E	E	N	K	A	L	C	N	O	I	I	E	W	Q	V	H	A
N	J	O	L	L	A	I	D	T	A	W	G	E	R	K	O	P	G	K	B
K	P	U	L	N	S	W	L	I	E	R	Y	D	R	O	T	E	H	L	L
I	O	N	Y	W	G	S	A	T	U	R	A	T	I	O	N	Z	O	N	E
E	L	T	Z	A	R	G	D	A	T	E	N	M	G	I	J	R	L	M	Y
V	L	C	B	L	S	L	I	B	B	A	S	H	A	A	R	G	C	S	B
E	U	D	R	E	C	H	A	R	G	E	I	S	T	Q	U	K	A	E	C
U	T	A	X	O	J	V	C	H	S	E	F	P	E	M	U	L	R	L	S
O	I	C	O	N	D	E	N	S	A	T	I	O	N	S	T	I	H	Y	Z
T	O	J	R	M	O	K	S	C	O	T	E	Q	F	R	C	H	F	U	J
S	N	P	I	E	V	A	P	O	R	A	T	I	O	N	J	U	Q	E	M
J	C	L	K	N	E	Q	U	F	M	W	O	M	A	E	L	T	B	S	R

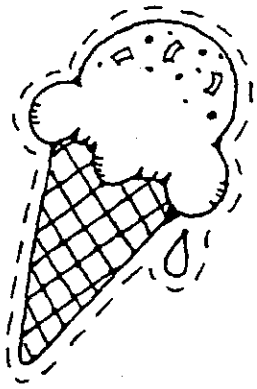
aquifer
condensation
drink
drought
evaporation
fuel
groundwater
irrigate
permeable
pollution
precipitation
recharge
runoff
saturation zone
spring
well

Edible Aquifers

Background: This activity will help you to understand the geology of an aquifer. You will build you own edible aquifer, learn about confining layers, contamination, recharge and water tables.

Before you begin, Define the following words:

1. Aquifer
2. Permeable
3. Contamination
4. Recharge
5. Water Table



Materials: Clear plastic cup, drinking straw, crushed ice, clear soda pop, variety of colored cake decoration sprinkles, vanilla ice cream, food coloring.

Protocol:

1. Fill a clear plastic cup 1/3 full with crushed ice (represents gravel and soil)
2. Add enough soda to just cover the ice.
3. Add a layer of ice cream to serve as a "confining layer" over the water-filled aquifer.
4. Then add more crushed ice on op of the confining layer.
5. Colored sprinkles represent soils and should be sprinkled over the top to create the porous top layer.
6. Now add the food coloring to the soda. The food coloring represents contamination. Watch what happens when it is poured on the top of the "aquifer". Keep in mind that the same thing happens when contaminants are spilled on the earth's surface.
7. Using your straw, drill a well into the center of your aquifer.
8. Slowly begin to pump the well by sucking on the straw. Watch the decline in the water table.
9. Notice how the contaminants get stuck into the well area and end up in the groundwater by leaking through the confining layer.
10. Now recharge your aquifer by adding more soda which represents a rain shower.

Data

Draw the aquifer you have created. Label the following parts of your aquifer: Gravel and soils, confining layer, aquifer, permeable soils (top layer), straw, and water table.

Draw the same aquifer after pumping from the well took place.

*Therefore you should have two experimental designs draw.

Analysis Questions

1. What occurred when you added contaminants (food coloring) to the aquifer?
2. When a well is drilled into an aquifer, what occurs to the water table when pumping starts to occur? Explain how contaminants can get into the well?
3. How did the aquifer change due to the rainfall?
4. What can you do to decrease the amount of contaminants that reach an aquifer?
5. How does this lab make you feel about your drinking water?

*Clean up your mess!!

Ecology Midsession Study Guide

Populations

- Define carrying capacity, predation, immigration, emig
- When might competition occur w/i a population?
- Contrast S- and J-shaped growth patterns
- List density-dependent and density-independent limiting factors
- Diagram 3 age structure graphs

Competition

- Define habitat and niche
- mutualism, parasitism, commensalism } give an + example

Succession

- Define pioneer species (1 examples), ecological succession
- Contrast primary and secondary succession
- Climax community (define or diagram)

Biomes

- Define biome
- Know all of the following biomes: tropical rain forest, desert, grassland, taiga (coniferous forest), tundra
- What is an estuary? What adaptations do estuarine animals have? and list their characteristics
- Describe wetlands & Contrast marshes and swamps.
- What is bioremediation?

Watersheds

- Describe or diagram a watershed
- What is a nonpoint source pollutant? Name a few
- Why are they difficult to eliminate?

Name an aquatic macroinvertebrate that you observed in the lab. _____

How are aquatic macroinvertebrates use to test water quality?

Groundwater

- Define aquifer and ground water
- How can land pollutants end up in your drinking water

Reminder the study guide is not limited to the topics listed on this study guide.
Good Luck