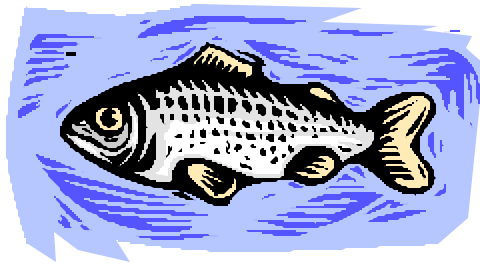
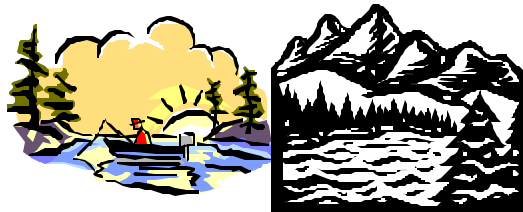


Your Handbook and
Journal of

Lake Water Quality



Name _____

Lake name _____

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Dear Kids,

This booklet is packed with facts, activities, and stuff for you to learn about lakes and reservoirs (those are lakes made when we build dams on rivers). There is a glossary in the back of the book with some words you may not know yet, but will find in the booklet.

This book will teach you why you should care about lakes, how to know if a lake is healthy, and what you can do to help keep the lake clean and the fish alive.

Have fun!!

Why should everyone care about water quality?

Everyone (including you) should care about water quality. You use our water for fishing, boating, swimming, and drinking. When water quality is bad, you are affected. Can you think of other ways that bad water quality can affect you?

Lakes (and reservoirs) throughout the seasons

If you have ever visited a lake during the winter, you know that the surface of a frozen lake can look very different from a summer lake. You may not know, however, how much the lake itself changes throughout the seasons. These changes are important to the fish and other living things in the lake.

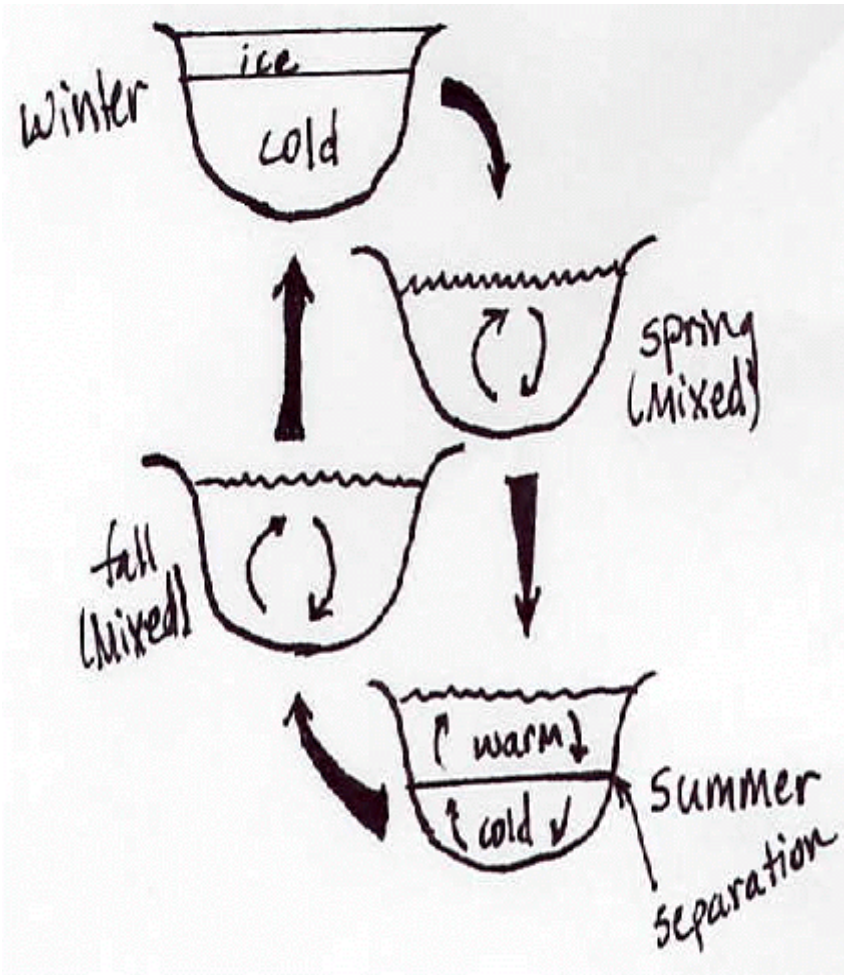
Spring: After the ice melts off a lake in the early spring, the water in the lake is usually the same temperature from top to the bottom. This means that the water in the lake is mixed and all the oxygen and **nutrients** (plant food) are mixed as well. During this time of the year, the lake may turn greenish with tiny plants living on the nutrients.

Summer: As the sun warms up the surface water, however, a funny thing happens. Warm water is not as heavy as cool water, so the warm water stays at the top. This can cause problems for fish. The upper water has lots of oxygen from the air, but gets too warm for fish to live. The colder deep part of the lake where fish like to live, however, has almost no oxygen. These two layers may not mix at all during most of the summer. It's as if a warm lake is floating on top of a cold lake. You've probably experienced this if you've ever jumped into a warm lake and suddenly touched the much colder, deeper water.

Autumn: As the air cools, so does the lake's warm surface water, until it eventually is as cool as the deeper part of the lake. The water in the lake once again mixes from top to bottom, mixing all the oxygen and nutrients (plant food)..

Winter: Although warm water floats above colder water, ice is very light compared to liquid water, and therefore always floats (think about the ice in a glass of lemonade). Because of this, the very heaviest water actually is a little warmer than freezing. If a lake gets cold enough, an ice layer will form at the surface of the lake, but most of the lake will not freeze (although it will be very, very cold). When there is ice, the rest of the lake is sealed off from the air and no new oxygen comes in.

A picture of lakes through the seasons



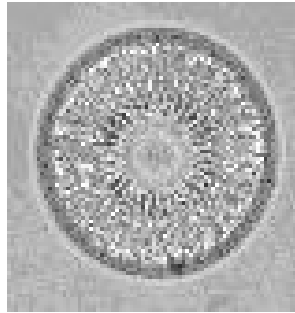
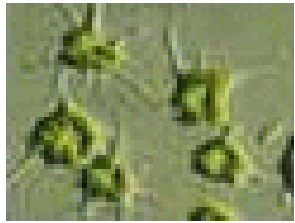
Healthy lakes:

Lakes contain a whole community of plants and animals. The seasonal story of a lake is important to these living organisms in the lake. You may only care about the fish in this lake. However, the fish feed on tiny crustaceans called **zooplankton**, and these microscopic animals eat tiny, floating plants called **algae**. The fish and zooplankton need oxygen to breathe which the plants produce. The plants need **nutrients** (phosphorus and nitrogen) to grow. The nutrients in a lake usually are mixed up from the lake bottom, or come into the lake with the water that enters the lake.

In the spring, nutrients and oxygen are plentiful throughout the lake. In a healthy lake, the algae will grow rapidly in the spring, the zooplankton will have enough food, and the fish will be well fed. In the summer, nutrients usually become scarcer in the upper, warmer part of the lake, so less algae grow. The zooplankton are such good "grazers" that they may eat most of the algae, resulting in clear water. Often the fish will move to the cooler, deeper, darker waters. In the fall, as the lake mixes, nutrients are returned to the surface waters, and the algae may grow rapidly again until winter temperatures become too cold.

What can go wrong?

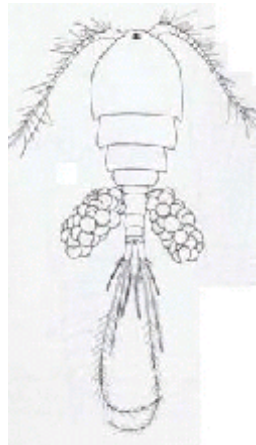
When too many nutrients get into a lake, it can cause so much algae growth that the zooplankton can't keep up. The algae cause the water to get greener and may even form a scum at the surface. This can look really bad but the real problem is hard to see. Because the algae don't get eaten, they eventually die and sink to the bottom of the lake, where they die and decompose. This action uses up oxygen, and can actually use up all of the oxygen in the lower, cooler part of the lake. Suddenly, the fish in the lake have a problem. There's not enough oxygen in the deeper part of the lake so they can't breathe, but many fish can't live in the warm surface waters of many summer lakes.



Algae!

Pictures courtesy of the Great Lakes Diatom Home Page.

Zooplankton!



Pictures courtesy of Pennak

About transparency...

Transparency is a measure of how clear water is. Because the lake water gets cloudier as more algae grow in a lake, the transparency in a lake is a good way to tell how healthy it is. The transparency of a lake can be easily measured with a black and white disk, called a Secchi (pronounced sec-ee) disk. The Secchi disk is lowered into the water until it is no longer visible from the surface. If this "secchi depth" gets shorter from year to year, it tells scientists that a lake may be getting too many nutrients and the fish may be in trouble.

Make an observation about what the water transparency looks like near you.

Note: Scientists usually also measure nutrients and the amount of plants in a lake.

What to do when you go out to take a Secchi measurement

- 1) Don't forget the disk!
- 2) Bring also a hat, sunscreen, a pen or pencil, and this book.
- 3) Don't forget to bring an adult as well!
- 4) Ask a park ranger if they take Secchi measurements, and ask if you can help.
- 5) Take the measurement.
- 6) Record observations on the observation page.



How to take a Secchi Measurement!

1) **Safety first!** Bring an adult, wear a life jacket, only go out in good weather conditions, and take the measurement off the dock!

2) Take the disk and begin to lower it into the water in a shady place. If there is no shade, use the shade of the boat or your head.



3) Keep lowering the disk.



4) When the disk looks like it is starting to disappear, lower it about 2 feet deeper until it is gone.



5) Then, slowly raise the disk until you can just start to see it again. Last, either look at the tape measure to see the depth or, pull the rope out, marking it at the water surface and measure it with a tape measure.



Data Sheet

Day_____

Time_____

Weather_____

How does the water look?

- 1) clear
- 2) green
- 3) blue/green
- 4) brown
- 5) other (describe it!)

Comments_____

What does the land look like around the water?

- 1) Nice with lots of plants.
- 2) OK, with a some plants.
- 3) OK, with few plants.
- 4) Bad with little to no plants.

Comments_____

Secchi Depth_____

Remember a short Secchi distance can mean there are too many plants.

Secchi distances.

If the distance is over 12 feet, then the lake you are testing probably has very high water quality. In other words, it is very healthy.

If the distance is between 6 and 12 feet, then the lake you are testing probably has OK water quality. This means that the lake is OK now, but if too many more nutrients enter the lake, the fish could have problems and the health could get worse.

If the distance is less than 6 feet, then the lake probably has poor water quality. This means that the health is bad and the fish are probably already having problems.

Remember that particles other than algae (such as suspended sediment) may cause low transparency.

How can I help?

- ! You can start by not polluting or littering around a lake or reservoir.
 - ★ Use fish washing stations.
 - ★ Camp only in camping areas.
 - ★ Use restrooms instead of the bushes!

- ! If you do all this, then you can start at home by not using the storm drains for dumping. Remember, the storm drains usually take water directly to your local river or reservoir.
 - ✓ Don't dump household cleaners or oil down the drain or into ditches.
 - ✓ Let your parents know to use the correct amount of fertilizer or pesticide on your lawn- more will not make it work better!
 - ✓ Clean up pet waste and dispose of it properly.
 - ✓ Make sure your sprinklers water the lawn, not the driveway or sidewalks.
 - ✓ Don't wash grass clippings and other green waste into ditches or drains.
 - ✓ Don't use a hose to wash off your driveway or wash your car in the driveways.

You have learned about lake water quality, so now what?

- ★ Tell someone!
- ★ Do a science fair project on water quality.
- ★ Ask your teacher for more information.
- ★ Pay attention to what things look like outside. Most of science is observation!
- ★ Check out the web! Here are some suggested sites.

- ★ The USU Water Quality Extension page:
www.extension.usu.edu/coop/natres/wq
- ★ The Department of Natural Resources kids page:
www.metrokc.gov/DNR/kidsweb/index.htm
- ★ The US Geologic Society kids page:
<http://ga.water.usgs.gov/edu/index.html>
- ★ The Environmental Protection Agency kids page:
www.epa.gov/water/kids/waterforkids.html
- ★ The National Wildlife Foundation kids page: www.nwf.org/kids
- ★ The Great American Secchi Dip-In:
<http://dipin.kent.edu>

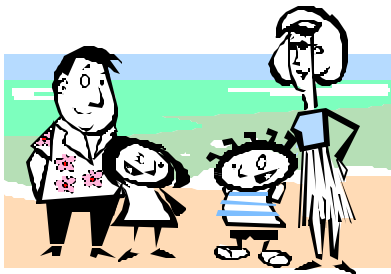
Make a list of all the water you see used in one day

How much water do you use in one day?

My plan for keeping the water around me clean...

List three things you can do to keep your water clean!

List three people I can teach about how to keep our water clean!



Question section

1)What happens to a lake in the summer?_____

2)What is algae and what is it's food?

3)What are zooplankton?

4) Which is correct?

A) algae eats fish

B) fish eat zooplankton

C) there is no such thing as zooplankton

5) True or False. It is OK to put old oil in storm drains. _____

6)True or False. Algae make a lake look green in the summer.

More Questions!



7) What is transparency?

8) How do you measure transparency in lakes?

9) Name one thing you can do to help keep water quality good.

10) Why should you (and everyone else) care about water quality?

Answers

- 1) In summer, warm water stays on top of colder water and is almost like a warm lake on top of a cold one.
- 2) Algae are small plants and they make their own food from nutrients in the water.
- 3) Zooplankton are tiny animals that eat algae and are in turn eaten by fish.
- 4) Answer B is correct. Fish eat zooplankton.
- 5) False! Never dump anything down the storm drains. This water usually drains directly into a local river or reservoir, without being treated. You don't want to swim in that!
- 6) True! Algae make water look green in the summer. When there are lots of algae in the water, it looks even more green.

More answers.

7) Transparency is a measure of how clear the water is. When there is a lot of algae in the water, it is not as transparent and your secchi depth will be shorter.

8) You measure transparency with a secchi disk.

9) Look at page 15 for a list of things you can do to help keep water clean.

10) There are lots of reasons! Look at page 3 for some reasons, and then think of a few on your own.



Glossary

1) Water Quality- a measurement of whether water is clean enough for the different ways we use it.

2) Ecology- The study of how living things interact with one another and their environment.

3) Habitat- the environment an organism lives in.

4) Secchi Disk- a black and white disk used to see how clear lake water is.

5) Organisms- living things.

6) Observations- what you see and can learn when you look for a while at something.

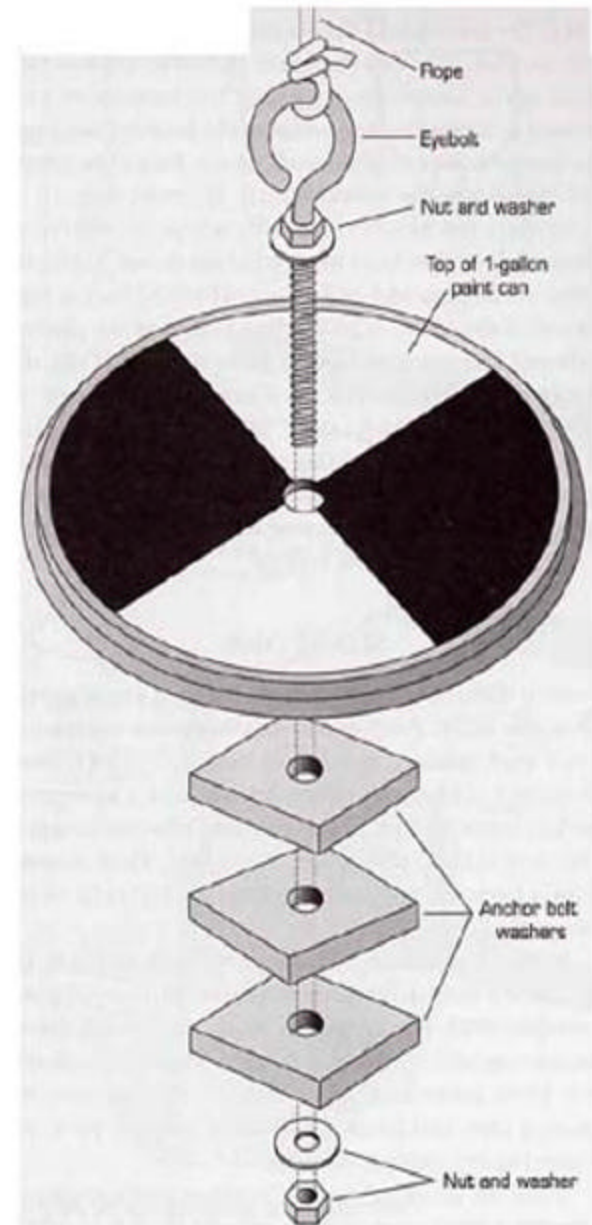
7) Decompose- when a thing rots (like when fruit gets squishy and brown).

8) Storm drain- a pipe that collects water off the street and also drains all the garbage dumped on the streets into streams, lakes, and treatment plants.

9) Environment- The surroundings an organism lives in and all that affect them.

Observations.

Make observations about habitats around you and what makes them unique.



How to make your own Secchi disk.

Notes

Materials list:

- 1) A clean one gallon paint lid
- 2) One 5/16 x 4 inch eyebolt
- 3) Two 5/16 inch nuts
- 4) Two 5/16 inch washers
- 5) Three 3x3 1/4 inch anchor bolt washers
- 6) A permanent marker
- 7) Masking tape
- 8) A tape measure
- 9) A 66 foot length of nylon rope
- 10) Small amounts of black and white paint
- 11) A hammer
- 12) A screwdriver
- 13) A ruler

How to make it:

First, use the marker and ruler to make the four sections on the paint can lid. Use the masking tape to cover two sections on opposite sides and then paint the uncovered sections black. When the black paint is dry, paint the other sections white. When the paint is dry, use the hammer and screwdriver to punch a small hole in the center of the lid. It should be large enough to put the eyebolt. Thread a washer and nut onto the eyebolt before putting the eyebolt through the lid, and then attach the washers in the order shown in the picture (see the opposite page). Last, tie on the rope and go take a Secchi reading!



Draw a picture of what the

lake looks like here!

Utah State University Water Quality
Extension Program

United States Forestry Service

Department of Water Quality

Department of Wildlife Resources

