

TEACHERS' GUIDE TO FISH PACKS

SPONSORED BY

**BUREAU OF FISHERIES MANAGEMENT AND HABITAT PROTECTION
OF THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES
AND THE WISCONSIN COASTAL MANAGEMENT PROGRAM**

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Wisconsin Coastal Management Program
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WRITTEN AND DESIGNED BY BETH MITTERMAIER

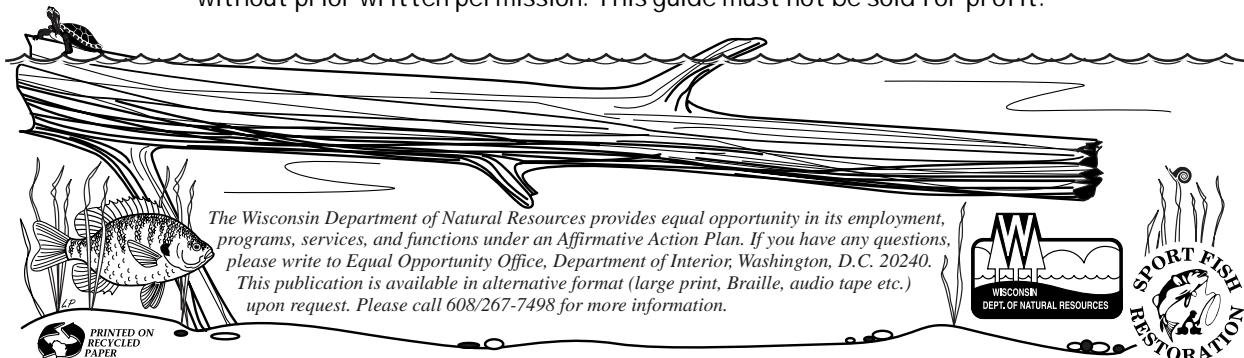
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TEACHERS' GUIDE TO FISH PACKS

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WISCONSIN ENVIRONMENTAL EDUCATION BOARD

WELCOME TO FISH PACKS

Fish Packs are a great way to explore our state hatcheries, parks, and forests. You and your students will discover the underwater life of the lakes, hear some amazing fish stories, ponder some fishy problems, and find out about your role in taking care of this great resource. Be prepared to get wet and have fun!

WHO ARE THEY FOR?

Fish Packs are for middle school kids in families, youth groups, or school classes who want to learn more about fisheries and aquatic habitats.

WHERE CAN YOU USE THEM?

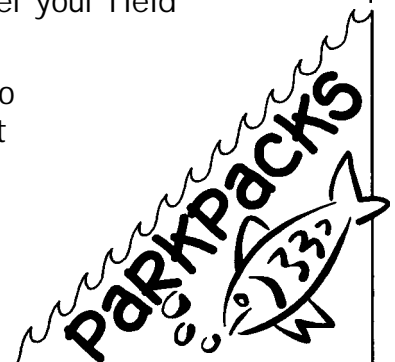
Fish Packs are designed to be used at most any lake! There are two different versions. Where you borrow the pack from determines which version you use. Locations along the Great Lakes are equipped with **Great Lakes Fish Packs** featuring Great Lakes plants and animals. Other locations around the state have **Inland Lakes Fish Packs** featuring plants and animals common to most Wisconsin lakes.

WHAT'S DIFFERENT ABOUT A TEACHERS' PACK?

A single family can borrow a blue Fish Pack from several locations around the state. However, teachers will want to borrow a teachers' version of the Fish Pack. Teachers' Packs have three components:

1. A **blue backpack**, which contains single copies of activity cards, game cards, and exploring tools.
2. A **black duffel bag**, which contains multiple sets of exploring tools and field guides.
3. And this **binder**, which contains copies of all the activity cards, masters for all worksheets and game cards, hints on how to use the activities with your group, and suggestions on which activities to use before and after your field experience.

These three components contain all the materials you need to conduct these activities, except for paper, copies of student worksheets, and clipboards.



ARE THEY JUST FOR TEACHERS?

No, Teacher Fish Packs can be used by youth leaders, scout leaders, day care providers, and other organized group leaders. Homeschoolers are encouraged to check out the regular Fish Packs designed for family use. A list of parks with Fish Packs is available from the Angler Education Office.

WHERE CAN I FIND THEM?

Teachers' Fish Packs are available at several state parks, DNR offices, and state fish hatcheries. A list of locations is available on the DNR website or by contacting the Angler Education Office. Be sure to reserve the packs before making field trip arrangements to the lake of your choice.

BUT WAIT . . . THERE'S MORE!

Fish Packs are just one of many angler education resources available to you. You can also borrow rods, reels, casting plugs, bobbers, hooks, line, and sinkers. In addition, you can borrow Angler Education Kits containing fish flash cards, fish printing materials, knot-tying practice equipment, Backyard Bass (a casting game), and ice fishing equipment. See *Angler Education Program* in the Appendix or call for more information.

NEED MORE INFORMATION?

Angler Education Office
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707
(608) 266-2272 or (608) 261-6431
www.dnr.state.wi.us/org/water/fhp/fish/equip.htm

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WHAT'S IN a TEACHERS' FISH PACK?

Teachers' Fish Packs contain the books and tools you need to do the activities. You will need to provide paper, copies of student worksheets, clipboards, and a few items as noted in the planning guide and on the activity cards.

IN THIS BINDER

- ♦ helpful hints on how to use all 11 Fish Pack activities
- ♦ black and white copies of all the activity cards
- ♦ masters for all student worksheets
- ♦ correlations to Wisconsin's Model Academic Standards
- ♦ correlations to Scout badge requirements
- ♦ bibliography of children's books and reference books

IN THE BLUE BACKPACK

Blue expanding wallet containing:

- Activity cards (11) & intro card (1)
- Investigation cards (4 - Rival for Survival gameboard, I imagine - No Lakes!, Soda Can Casters, Operation Population)
- Brochures (3) and map (1)

Drawstring pouches (7)

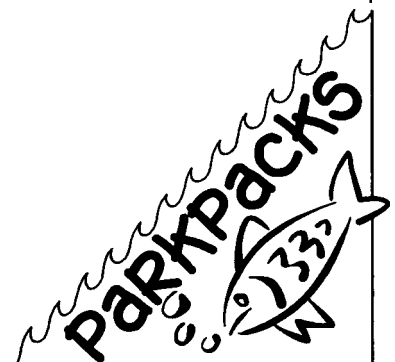
- "X-lenses" - magnifying lenses (2)
- "Lake Life" - plant and animal cards (48)
- "Match Your Catch" - fish cards (37) on a ring
- "Something's Fishy" - cards (7) on a ring
- "Yearbook" - plant and animal cards - Great Lakes (39) **OR** Wisconsin Lakes (52)
- "Rival for Survival" - question cards (30) and die
- "Sticky Situation" - cards (6)
- Clipboard with transparency pen**
- White container**
- Binoculars**
- Trout life cycle plastimount**
- Rope**
- Telescope** - Great Lakes locations only
- ParkPack journal**

Children's Books

- Shingebiss: An Ojibwe Legend*
- William the Curious: Knight of the Water Lilies*

Field Guides

- Pond Life*
- Fishes*
- Shorebirds*



IN THE BLACK DUFFEL BAG

Black drawstring bags containing:

- magnifying lenses ("X-lenses") (10)
- white bowls (10)
- rope circles (10)

Plastic containers with:

- binoculars (2)
- Match Your Catch Wild Cards* (10 sets)
- telescopes (2) - Great Lakes locations only

Additional field guides

- Pond Life* (4)
- Fishes* (4)
- Shorebirds* (4)

Wisconsin Maps (2)

Zebra mussel identification cards (10)

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Lake Life

Play a game of “Go Fish” to learn about food chains in the Great Lakes ecosystem. Later, at the lake, students will search for signs of life.

OBJECTIVES

Recognize the diversity of life in the Great Lakes and other Wisconsin lakes.
Understand that microscopic plankton is the basis for lake food chains.
Use the information given on the cards to build lake food chains and webs.
Realize many lake species are non-native and some are invasive.

WISCONSIN'S MODEL ACADEMIC STANDARDS

Environmental Education

B.8.3 Explain the importance of biodiversity

B.8.8 Explain interactions among organisms or populations of organisms

MATERIALS

Lake Life cards. The laminated set in the blue backpack can be used with small groups of students or at a learning center. The masters for making multiple sets are on pages 61 - 66 of this guide.

PREPARATION TIME

Allow time to copy and cut apart multiple sets of the playing cards.

ACTIVITY TIME

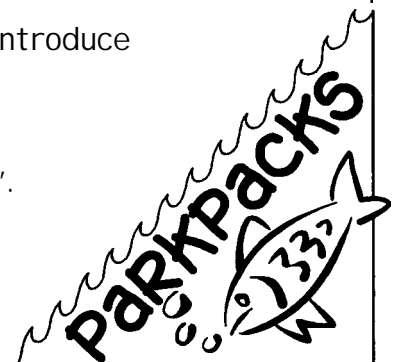
One 50-minute period

SETTING

Indoors or outdoors on a calm day

INSTRUCTIONAL STRATEGIES

1. Ask students to brainstorm a list of plants and animals that live in the Great Lakes. Note: While this activity is written for the Great Lakes, most of these plants and animals are also found in inland lakes.
2. Using the information on the front of the card (page 11), introduce the chief producers found in lake ecosystems.
3. With the students' help, build a simple food chain.
4. Review the directions for playing the card game “Go Fish”.
5. Divide students into groups of 3 - 6 to play the game. After the game, encourage students to identify all of the non-native and invasive species in their food chains.



ASSESSMENT

Ask students to construct a Great Lakes food web using words or pictures. Using the information on the cards, they should indicate which plants and animals are not native to the Great Lakes.

The cards only feature some of the plants and animals found in the Great Lakes. Ask students to create new cards for the game by researching, writing, and illustrating cards featuring other Great Lakes plants and animals.

ADDITIONAL RESOURCES AND IDEAS

Use stereomicroscopes and pond water (or prepared specimen slides) to observe some of the microscopic pond plants and animals before your field trip.

CURRICULUM GUIDE

The Great Lakes in My World: An Activities Workbook for Grades K - 8

produced by the Lake Michigan Federation and the Great Lakes Commission © 1989.

The activity "Food Chain, Then and Now" takes a closer look at how food chains in the Great Lakes have changed since European settlement.

CHILDREN'S BOOKS

Lakes by Randy Frahm © 1997. Defines lakes and tells how they are formed. Briefly discusses lake food chains, temperature variations, the aging of lakes, and how humans affect lakes. Beautiful book with full-page photos.

Lake by Brian Knapp © 1992. *Landshapes* series. Describes patterns produced where water collects in hollows, behind natural dams, and in deep valleys over the Earth's land surface.

One Small Square: Pond by Donald Silver © 1994. *Scientific American Books for Young Readers* series. Invites kids to adopt a 2-foot cube of a pond and observe all the creatures that live there. Gives activities to aid exploration.

One Small Square: Seashore by Donald Silver © 1993. *Scientific American Books for Young Readers* series. Examines small portions of a sandy East Coast beach and a rocky West Coast shore and describes the life they support.

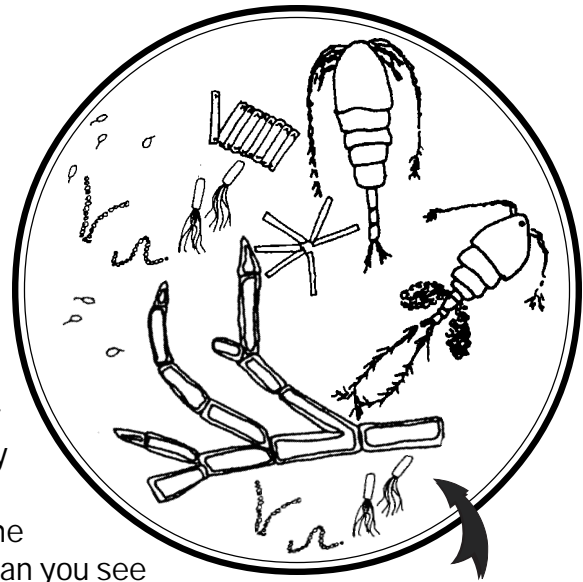
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Lake Life

Lakes as huge as these can be misleading. You walk along the shore and you can't see much life. A dead fish here. An empty zebra mussel shell there. A gull flying overhead. How much life could there really be among all these waves, rocks, and sands?

Scoop up a handful of water. If you had microscope eyes, you could see hundreds, thousands, maybe millions of creatures in your hand. These microscopic organisms are the key to life in the lake. Use the **magnifying lens**, **white bowl**, and **Pond Life field guide** from the **PARKPACK**. Put some lake water in the bowl. Can you see anything? Threads of life? Moving dots? I imagine what it would look like under a microscope!

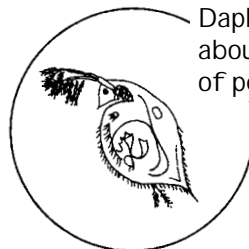
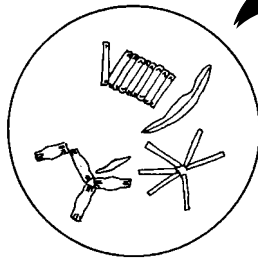


**MICROSCOPIC
Lake Life**

INVISIBLE KEY TO LIFE

In most natural communities, large plants such as trees, shrubs, or grasses are the basis for food chains. Not in the lakes! The basis for life in the lakes is invisible-to-the-naked-eye phytoplankton. Here's how it works:

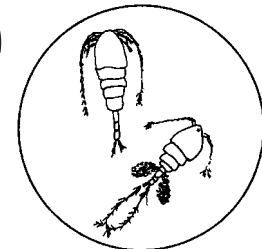
**MICROSCOPIC algae,
Like DIATOMS, CONVERT
SUNLIGHT INTO FOOD.**



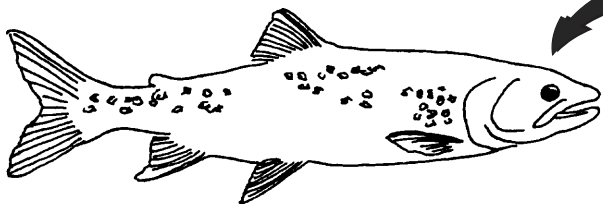
Daphnia are
about the size
of periods.

**ZOOPLANKTON,
Like DAPHNIA,
eat the ALGAE.**

**LARGER
ZOOPLANKTON,
Like COPEPODS,
eat the LITTLE
ZOOPLANKTON.**



**SMALL FISH, Like
PERCH, FEED ON
ZOOPLANKTON.**



**LARGE FISH, Like LAKE TROUT, are
at the TOP OF THE FOOD CHAIN.
THEY eat SMALLER FISH.**



GO FISH

Ever played *Go Fish*? The object of the game is to collect "books," which are sets of four cards of the same rank, by asking other players for cards you think they may have. Whoever collects the most books wins.

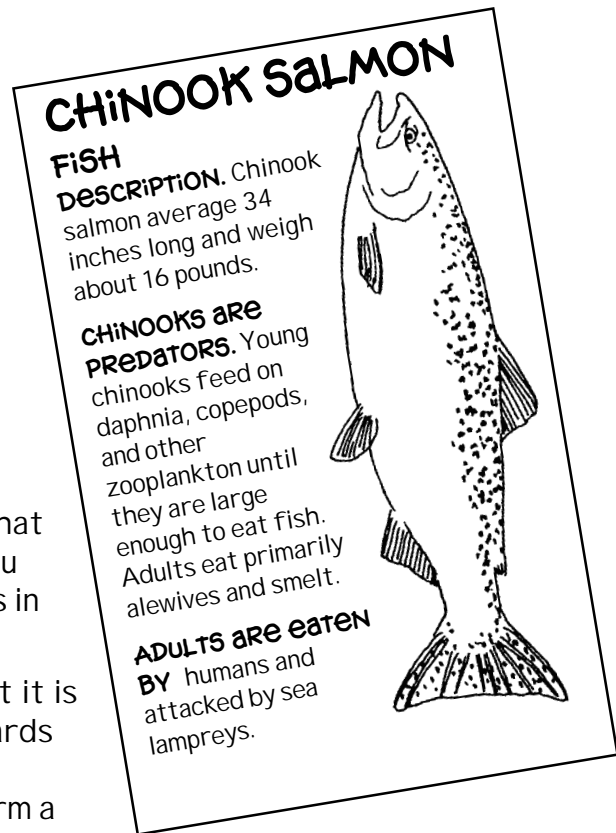
In this version of the game, you will collect "chains" instead of "books." Great Lakes food chains, that is! Find the **Lake Life cards** in the **ParkPack**. Each card represents one plant or animal found in the lakes. It has a short description, a list of what the animal eats, and a list of who eats it. You will use this information to build food chains in the game.

The game works best with 3 - 6 players, but it is possible for 2 to play. The dealer deals 5 cards to each player (7 each for 2 players). The remaining cards are placed face down to form a stock.

The player to the dealer's left starts. A turn consists of asking a specific player for a specific card. For example, if it is my turn I might say: 'Adam, do you have any lake sturgeon?' I must already hold at least 1 card that can connect with a lake sturgeon in a food chain. If Adam has a lake sturgeon, he must give it to me. I get another turn and may ask any player for any card that can be connected to a card already held in my hand.

If Adam doesn't have the card, he says 'Go fish!'. I must then draw the top card of the undealt stock. In the unlikely event that I draw the card asked for, I show the card and get another turn. If the drawn card is not the card asked for, I keep it, but the turn now passes to the player who said 'Go fish!'.

As soon as a player collects a chain of at least 4 cards, the cards are shown and the connections are explained. For example, "Diatoms are eaten by Slippershell Mussels are eaten by Lake Sturgeons are eaten by Humans." The cards are left face up. The game continues until either someone has no cards left in their hand or the stock runs out. The winner is the player who has the most chains.



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RIVAL FOR SURVIVAL

Play a board game to help understand how invasive species impact an aquatic ecosystem and what students can do to help keep aquatic habitats healthy.

OBJECTIVES

Define native, non-native, invasive, and introduced.

Identify some of the characteristics of aquatic invasive species.

Recognize the role of individuals in managing invasive species.

WISCONSIN'S MODEL ACADEMIC STANDARDS

Environmental Education

B.8.5 Give examples of human impact on various ecosystems

B.8.8 Explain interactions among organisms or populations of organisms

Science

F.8.9 Explain how some of the changes on the earth are contributing to changes in the balance of life and affecting the survival or population growth of certain species

Social Studies

D.8.11 Describe how personal decisions can have a global impact on issues such as trade agreements, recycling, and conserving the environment

MATERIALS

Rival for Survival gameboard. The laminated board in the blue backpack can be used with small groups of students or at a learning center. The master for making multiple boards is on page 67 of this guide.

Rival for Survival game cards. The laminated set in the blue backpack can be used with small groups of students or at a learning center. The masters for making multiple sets are on pages 69 - 74 of this guide.

Die. Use die from other board games.

Markers. Felt marker caps, pebbles, or zebra mussel shells make great game markers.

PREPARATION TIME

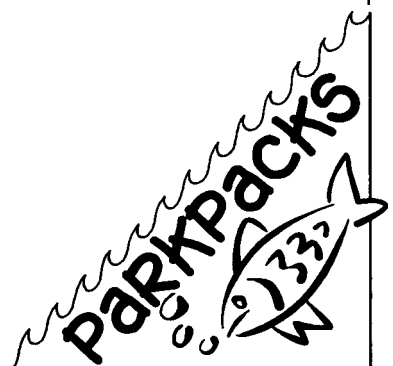
Allow time to copy and cut apart multiple sets of game boards and cards.

ACTIVITY TIME

One or two 50-minute periods

SETTING

Indoors or outdoors on a calm day



INSTRUCTIONAL STRATEGIES

1. Use the information on the card (page 15) to introduce how non-native species influence native species.
2. Divide the students into groups of 3 - 6 and go over the rules for the game.

ASSESSMENT

Invasive species are everywhere. Ask students to identify invasive species in their own community and find out how they are affecting local native species. If possible, join the efforts to control the growth and spread of local invasive plants.

Using some of the scenarios presented on the game cards, ask students to determine the environmental consequences of the various options. For example, what could happen if you flushed your aquarium contents down the drain or dumped the contents in a local pond?

ADDITIONAL RESOURCES AND IDEAS

For information on non-native species that might be in your community, visit the invasive species page of the Wisconsin Department of Natural Resources website. <www.dnr.state.wi.us/org/land/er/invasive/>

CHILDREN'S BOOKS

Exotic Invaders: Killer Bees, Fire Ants and Other Alien Species Are Infesting America by Jeanne M. Lesinski © 1996. Describes five species that are not native to North America – the sea lamprey, fire ants, zebra mussels, European starlings, and African honeybees – and efforts to handle the problems their introductions have caused.

CURRICULUM GUIDE

Biodiversity, Wetlands, and Biological Control: Information and Activities for Young Scientists - Purple Loosestrife: A Case Study by Michael Jeffords and Susan Post © 1999. Introductory activities about biodiversity and wetlands lead to lessons concerning the biological control of purple loosestrife in wetland areas. Based in Illinois, but very adaptable.

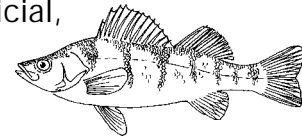
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RIVAL FOR SURVIVAL

Suppose some people came to your home uninvited. They move into your room, sleep in your bed, and eat the food in your fridge. You don't have many options. You could try to live with these unwelcome guests, find a new home, or die. That is what is happening in most of Wisconsin's lakes and rivers. Plants and animals from other parts of the world are invading our waters. These invasions can be harmful, beneficial, or hardly noticed at all. Here are some of the competitors trying to survive in Wisconsin's lakes and rivers:

The **NATIVE SPECIES** are the plants and animals that have lived for many centuries in Wisconsin. Scientists also call them indigenous. They are specially adapted to live here. Lake sturgeon, yellow perch, and slippershell mussels are native to Wisconsin waters.



YELLOW PERCH

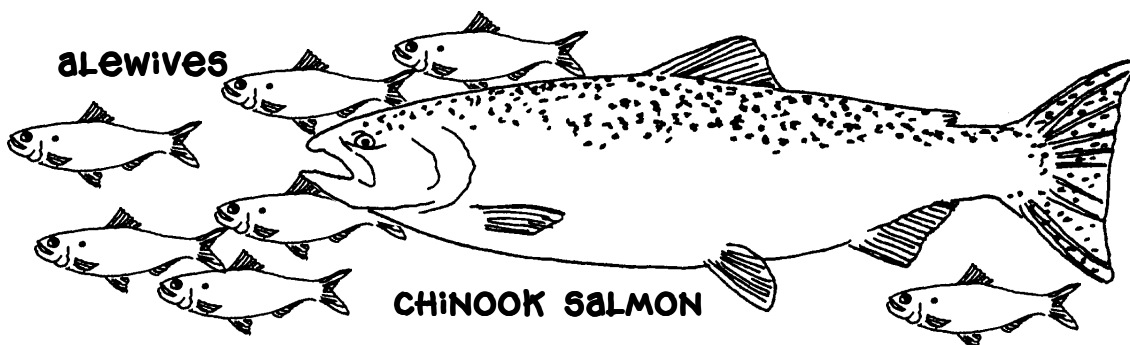
NON-NATIVE SPECIES are plants or animals from another part of the country or world. Just to make things interesting, scientists also call them introduced, nonindigenous, and exotic! Species can arrive here by accident or on purpose.

A non-native species that invades a habitat and takes resources from native plants or animals is called an **invasive** species. For example, spiny water fleas eat the same foods as native plankton and small fish. Because their long spines prevent small fish from swallowing them, they don't have many natural predators. That means their population can grow and grow!



SPINY WATER FLEA

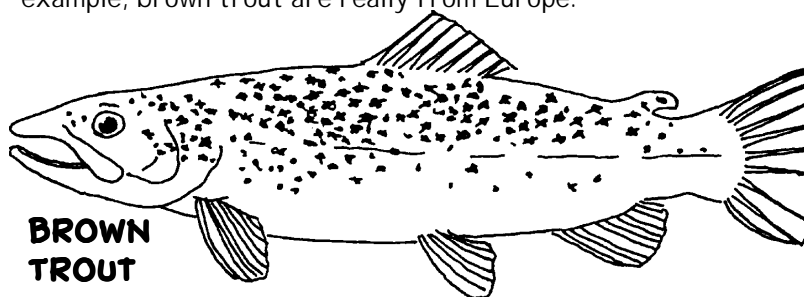
Sometimes a non-native species is **INTRODUCED** on purpose. In the 1960s, fish biologists began stocking coho salmon in Lake Michigan. They hoped the salmon would eat the invasive alewives that were out of control, and they did!



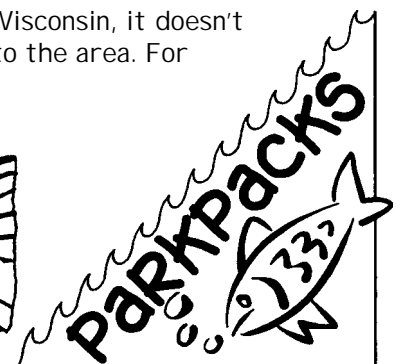
alewives

CHINOOK SALMON

Occasionally, when a **NON-NATIVE** species is introduced into Wisconsin, it doesn't cause any real problems. We even forget that it is not native to the area. For example, brown trout are really from Europe.



BROWN TROUT



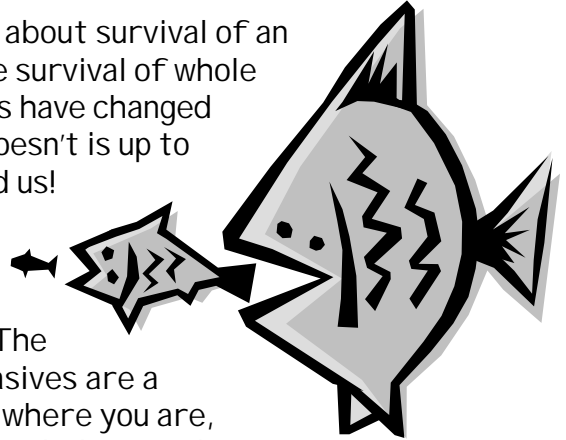
LIFE IS NOT a Game . . .

Survival was never easy in Wisconsin waters. It's a fish-eat-fish world out there! Tiny plankton being eaten by larger zooplankton being eaten by little fish being eaten by bigger fish! Of the thousands of eggs animals lay, only a few grow up to become adults.

But now the stakes are higher! We're not talking about survival of an individual plant or animal. We're talking about the survival of whole populations of plants and animals. Invasive species have changed aquatic ecology forever. Who survives and who doesn't is up to the ways of nature, the dynamics of habitats, and us!

. . . BUT THIS IS!

By playing *Rival for Survival*, you will learn more about the changes caused by non-native species. The game was designed for the Great Lakes, but invasives are a problem in most of Wisconsin's lakes. No matter where you are, playing the game will help you discover ways you can help save the natives. Find the ***Rival for Survival* game board, question cards, and die** in the **PARKPACK**. Use **pebbles** or **zebra mussel shells** for playing pieces. You'll also need a **piece of paper** and **pencil** for keeping score.



HOW TO PLAY

The object of the game is to have the most points when all the players reach the finish. Each player rolls the die, and the player with the highest number goes first.

1. Player 1 rolls the die and moves the playing piece the number of spaces shown.
2. Player 1 chooses a question card and hands it to Player 2 on the left. Player 2 reads the question aloud. Player 1 chooses an answer.
3. Based on Player 1's answer, the scorekeeper records Player 1's points.
4. Play continues in a clockwise direction until all players reach the finish. The player with the **most points** is the winner—not the player who reaches the Great Lakes first. Finishing first may not necessarily be a good thing in this game!

Notes:

When landing on a space that requires the player to move ahead or backward, the player moves the playing piece before picking a question card.

Some answers will cause a player to lose points. If the player has no points, he or she cannot go below zero, even if told to subtract a point.

Thanks to the Illinois-Indiana Sea Grant College Program for allowing the use of this activity. It is from "ESCAPE: Exotic Species Compendium of Activities to Protect the Ecosystem" © 2001 produced in partnership with these Sea Grant College Programs in the Great Lakes Network: Michigan, Minnesota, New York, and Ohio.

PARKPACKS

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FISH STORIES

Listen to short stories about the history of fishing in Wisconsin and decide if the stories could be true.

OBJECTIVES

Evaluate and analyze stories based on common knowledge and/or research. Consider the history of fishing and fish resources in context with other events in Wisconsin history.

WISCONSIN'S MODEL ACADEMIC STANDARDS

Science

- E.8.6 Describe through investigations the use of the earth's resources by humans in both past and current cultures, particularly how changes in the resources used for the past 100 years are the basis for efforts to conserve and recycle renewable and nonrenewable resources
- G.8.3 Illustrate the impact that science and technology have had, both good and bad, on careers, systems, society, environment, and quality of life

Social Studies

- B.8.12 Describe how history can be organized and analyzed using various criteria to group people and events chronologically, geographically, thematically, topically, and by ideas

MATERIALS

Shingebiss: An Ojibwe Legend. Found in the blue backpack.

PREPARATION TIME

Minimal

ACTIVITY TIME

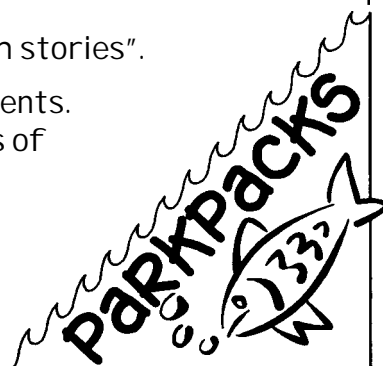
One or two 50-minute periods

SETTING

Indoors

INSTRUCTIONAL STRATEGIES

1. Allow some time for students to share some of their "fish stories".
2. Read the story *Shingebiss: An Ojibwe Legend* to the students. Discuss the importance of fish to the earliest inhabitants of this land.
3. Read through the fish stories on the card (pages 19 - 20) and discuss them in class or copy the stories and assign them to groups of students to read and research.



ASSESSMENT

Assign each student to a time period of Wisconsin history. Ask them to find out all they can about fishing during that time through interviews with older relatives and neighbors, Internet research, and other methods. Compile the stories, photos, and newspaper articles that students collect into a *History of Wisconsin Fishing* timeline. Ask students to include major historical events affecting Wisconsin, the United States, and the world. Challenge the students to write their true stories in the hard-to-believe style used in *Fish Stories*.

ADDITIONAL RESOURCES AND IDEAS

CHILDREN'S BOOKS

The Great Fish by Peter Parnall © 1973. An Indian boy's grandfather tells him of the time when the mothers' tears for their hungry children brought the salmon to now polluted and lifeless waters.

Shingebiss: A Ojibwe Legend retold by Nancy Van Laan © 1997. Shingebiss, the merganser duck, bravely challenges the Winter Maker and manages to find enough food to survive a long, harsh winter by ice fishing in the Great Lakes.

Traders in Time: A Dream-Quest Adventure by Janie Lynn Panagopoulos © 1993. Eight-year-old Nick and his older brother, Chris, travel back in time to the late 1700s. Chris's escape from a dishonest fur trader sets the stage for a vivid portrayal of the sights, smells, and drama taking place along the shores of Lake Michigan and at Fort Mackinac.

REFERENCE BOOKS

Great Lakes Country by Russell McKee © 1966. Very interesting information on early inhabitants and explorers. Some historic drawings, maps, and photos.

Land of the Inland Seas by William Donohue Ellis © 1974. Information on the Great Lakes, plants and animals, early Europeans, struggles and early government, harvesting and shipping, and conditions as of mid-1970s. Includes historic documents and maps.

A Pictorial History of the Great Lakes by Harlan Hatcher and Erich A. Walter ©1963. Geology, early history, some old maps, drawings of ships, cities along the shores, locks, lighthouses. Includes many historical photos and drawings.

TEACHERS' GUIDE TO FISH PACKS

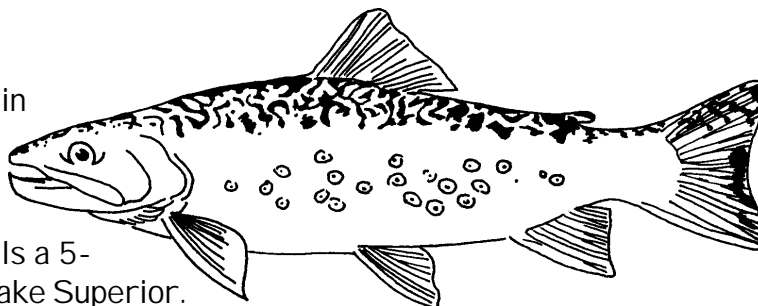
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FISH STORIES

Maybe you've heard an angler stretch the truth and tell about a huge catch that got away or an unbelievable fish that was hauled in. Well, sit back and listen to these fish stories! Some are mysteries to be solved. Could they be true? Talk about them with your friends or family. Which ones do you think are believable?

FISH STORY #1

The year is 1890. A lumberjack in northern Wisconsin saws through a 4-foot diameter white pine tree. When the tree hits the forest floor, it kills a 5-pound brook trout swimming in Lake Superior.

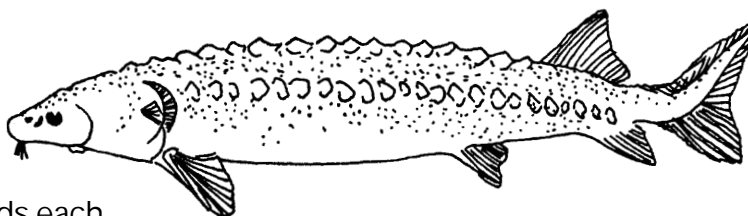


OK, it's not the whole truth, but it's not that far off! A lot of things changed when Europeans began arriving on the Wisconsin frontier. At first, there was plenty of game, wood, fish, and space for everyone. The problems started when resources were harvested and shipped out – furs for beaver hats in Europe, wood for building big cities, and fish to feed people in other territories. There just seemed to be so much here. How could it ever be used up?

By 1900, almost all of northern Wisconsin had been logged and nearly half of the land had been burned. The streams where the fish had once spawned were exposed to full sunlight, eroded by flash floods, and scoured by logjams. Sawdust and rotting lumber lay at the mouths of once pristine rivers, polluting fish habitats. Previously fertile wetlands were drained for the construction of cities and towns. So you see, the cutting of that tree may very well have killed that fish!

FISH STORY #2

In 1875, a commercial angler on the Great Lakes named Edward Muller hauled in 30 to 40 lake sturgeon weighing about 200 pounds each.

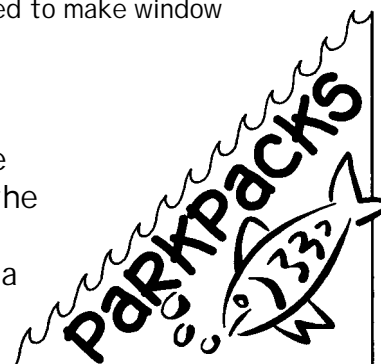


On shore, he poured kerosene over their bodies and burned them. The next day, he gave his sturgeon catch to a friend to be used as fuel in the boiler of his steamship.

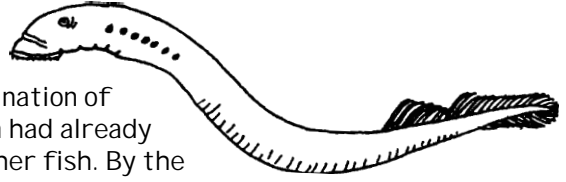
Although names have been changed to protect the guilty, this one is true! Early Great Lakes anglers despised sturgeon because they damaged their nets. In fact, they routinely killed the sturgeon and tossed them back in the lake. It wasn't until later that sturgeon were sought after for their eggs (caviar), oil, and a high-quality gelatin once used to make window glass.

FISH STORY #3

It is 1934. A commercial angler fishing for whitefish on Lake Michigan is shocked when he pulls in his catch of the day. In the net is a deepwater cisco. He should be thrilled because he hasn't caught one in weeks. Instead, he watches in horror as a foot-long, snake-like, fishy-looking thing sucks blood out of the cisco.

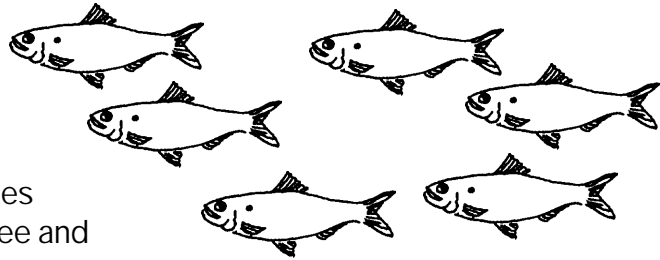


Sad, but true. The fishy thing was a sea lamprey. They began invading the upper Great Lakes when the Welland Canal was remodeled in the 1920s. The combination of overfishing, a growing human population, and pollution had already reduced the populations of deepwater ciscoes and other fish. By the late 1950s, lampreys had contributed to the extermination of several fish species in the Great Lakes. Barriers were used to keep lampreys out of the lakes. A chemical that kills young lampreys (ammocoetes), but does not harm other aquatic life, was put into the water. By the mid-1960s, the number of lampreys in the Great Lakes had rapidly decreased.



FISH STORY #4

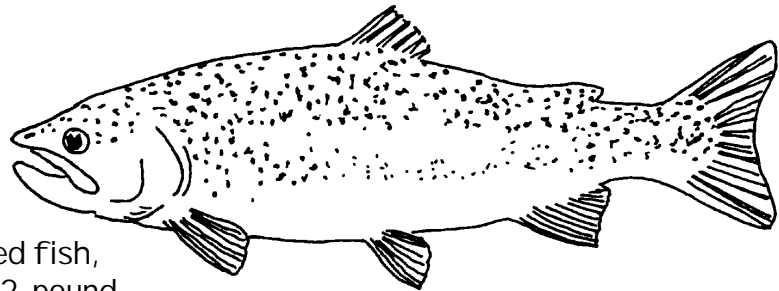
In 1967, a Milwaukee family packs a picnic lunch and heads for the beach. Their plans to spend the day sunbathing and building sand castles are changed when they arrive. They see and smell thousands of rotting fish carcasses.



True again. This mass die-off of alewives apparently occurred because of starvation due to overpopulation and unusually cold weather. Alewives are invaders from the ocean that have displaced many of the smaller fish in the lakes. After smelling the rotting fish, few people had hope for the Great Lakes fisheries.

FISH STORY #5

Last year, Gerri Lebeck chartered a fishing boat to take her best friends sport fishing. After a few hours of catching and releasing undersized fish, one friend landed a keeper – a 22-pound rainbow trout.



It's hard to believe that a fishery that was once in terrible decline could produce such a trophy, but it is true. And Gerri's friend isn't alone! Every year, Great Lakes anglers haul in salmon and trout that have been stocked to support sport fishing. The Great Lakes fishery will never return to its presettlement condition, but with careful management, it can continue to be an important part of Wisconsin's recreation and tourism industries.

FISH STORY #6

Read the book *Shingebiss: An Ojibwe Legend*. You can find it in the **PARKPACK**. Shingebiss, the duck, is somehow managing to survive a cold Lake Superior winter, and Winter Maker doesn't know how. The answer to the mystery is fish! Five hundred years ago, fish meant survival. What other secrets for life are Native Americans passing on when they tell this story?

PARKPACKS

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FIELD TRIP ACTIVITIES

The following activities are well-suited for use at state hatcheries, parks, or forests. You can also do these activities at many city parks, county parks, and school forests with water resources.

PREPARING FOR YOUR FIELD TRIP

1. Reserve the **Teachers' Fish Pack** through your local Tackle Loaner Site or DNR facility.
2. Call the hatchery, park, or forest you plan to visit.
 - Do you need to make reservations?
 - Are there shelters available for rain or heat?
 - Where are the restrooms?
 - Can staff recommend locations for the various Fish Pack activities?
3. Arrange for transportation to the site.
4. Visit the area ahead of time. Plan your hike route and decide where the various activities will take place.
5. Based on what you have learned:
 - Decide which activities you will do and plan your schedule.
 - Contact staff or parents who will help you.
 - Divide the students into groups.

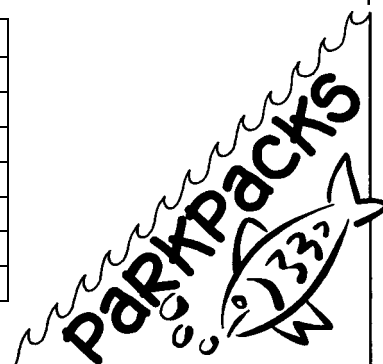
SCHEDULING SUGGESTIONS

Setting up several stations will give you quite a bit of flexibility during your field trip. You can vary the number of stations based on the activities you want to do, the number of teachers/leaders, the number of students, the amount of time you have for the trip, and the resources at the field trip site.

There is enough equipment in the Teachers' Fish Pack to accommodate 30 students, but see the table on page 22 to help you plan your trip.

Here is one possible schedule for a 2 1/2 hour field trip for 30 - 40 students and 3 leaders. Each of the four activities is 30 minutes long including time for changing stations and reorganizing

Time	Group 1	Group 2	Group 3	Group 4
9:00	Arrive at field trip site and get organized			
9:10	Lake Life		Read a Fish	Life of Crime
9:40	Read a Fish	Life of Crime	Lake Life	
10:10	Break			
10:20	Unfair Advantage		Life of Crime	Read a Fish
10:50	Life of Crime	Read a Fish	Unfair Advantage	
11:20	Pack up and head for school			



FIELD TRIP ACTIVITY	Time (in minutes) to allow for activity.	Number of students able to do activity at one time.	Number of students able to do activity at one time if equipment is shared.	Resources required/ helpful at the field trip site.	Information or skills needed by a leader or helpful for a leader to possess.	Additional equipment or supplies needed. These are not in the Teachers' Pack!
Lake Life	20 - 60	10	20	pier or dock helpful	ID of pond critters helpful	nets, waders, dishpans, and other pond equipment helpful
Read a Fish	20 - 30	10	20	fish in a tank for observation helpful	knowledge of fish adaptations helpful	art materials optional
Something's Fishy	20 - 30	5	10	dead fish required ☺	fish ID, basic biology, and fish dissection experience helpful	
Gone Fishin'	20 - 60	limited by materials available from Tackle Loaner Site	limited by materials available from Tackle Loaner Site	extensive shoreline or pier very useful	fishing experience very helpful	There is no fishing equipment in the pack.
Unfair Advantage!	20 - 30	10	20	zebra mussels required	math and graphing skills needed	clipboards and pencils
A Life of Crime	20 - 30	5	10	active gulls or other shorebirds required	bird watching experience helpful	notebooks and pencils

TEACHERS' GUIDE TO FISH PACKS

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IMAGINE - NO LAKES!

Use a checklist to locate ways that we depend on water for farming, power generation, industry, recreation, shipping, and inspiration.

OBJECTIVES

List specific ways that humans depend on water.

Realize that life might be very different in a location without abundant water.

WISCONSIN'S MODEL ACADEMIC STANDARDS

Environmental Education

B.8.5 Give examples of human impact on various ecosystems

Social Studies

D.8.7 I identify the location of concentrations of selected natural resources and describe how their acquisition and distribution generates trade and shapes economic patterns

MATERIALS

Imagine - No Lakes! checklist. The laminated checklist in the blue backpack can be used with small groups of students. The masters for making copies are on pages 75 - 76 in this guide.

Wisconsin state maps. You will find one in the blue backpack and two in the black duffel bag. Additional maps are available from the Department of Tourism.

Telescopes. Great Lakes Teachers' Packs have 3 telescopes for checking out the ships on the lakes. You will find one telescope in the blue backpack and two in the black duffel bag.

PREPARATION TIME

Allow time to copy checklists.

ACTIVITY TIME

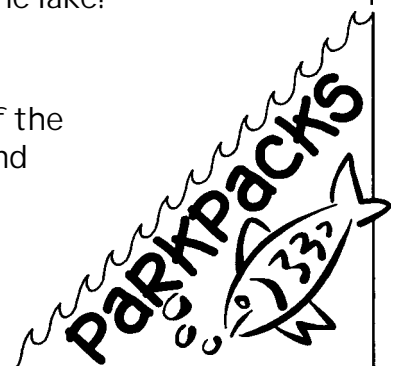
Varies

SETTING

This is a great activity for the bus or car ride to and from the lake!

INSTRUCTIONAL STRATEGIES

1. Before leaving on the field trip, lead a brief discussion of the importance of the Great Lakes and inland lakes to local and regional economies. Share some of the statistics from the card (page 24).
2. In transit, encourage students to look for things on the checklist.



3. Back in the classroom, discuss the importance of water to the region.

ASSESSMENT

Ask students to consider what their community might look like without abundant water resources. Invite them to present their findings to the class in the form of essay, poetry, artwork, or other visual or performing arts.

ADDITIONAL RESOURCES AND IDEAS

Find out about places in the world that do not have abundant water resources. How do people find water to meet their basic needs? How do they conserve water? Can we learn any lessons from their practices?

BOOKS ABOUT LIFE AROUND THE GREAT LAKES

Paddle-to-the-Sea by Holling Clancy Holling © 1941. In the Nipigon country north of the Great Lakes, a young boy carves a wooden canoe carrying an Indian. He christens his artwork *Paddle-to-the-Sea* and sets it on a journey through the Great Lakes. As the Lakes and people help him on his way, Paddle learns about life on the Lakes, including the wildlife, weather, shipping, and industry, and how the Lakes flow to the sea.

Lake Michigan: Great Lakes of North America by Harry Beckett ©1999. Discusses Lake Michigan's geography, history, early inhabitants, important events, economy, and more.

Lake Superior: Great Lakes of North America by Harry Beckett ©1999. Discusses Lake Superior's geography, history, early inhabitants, important events, economy, and more.

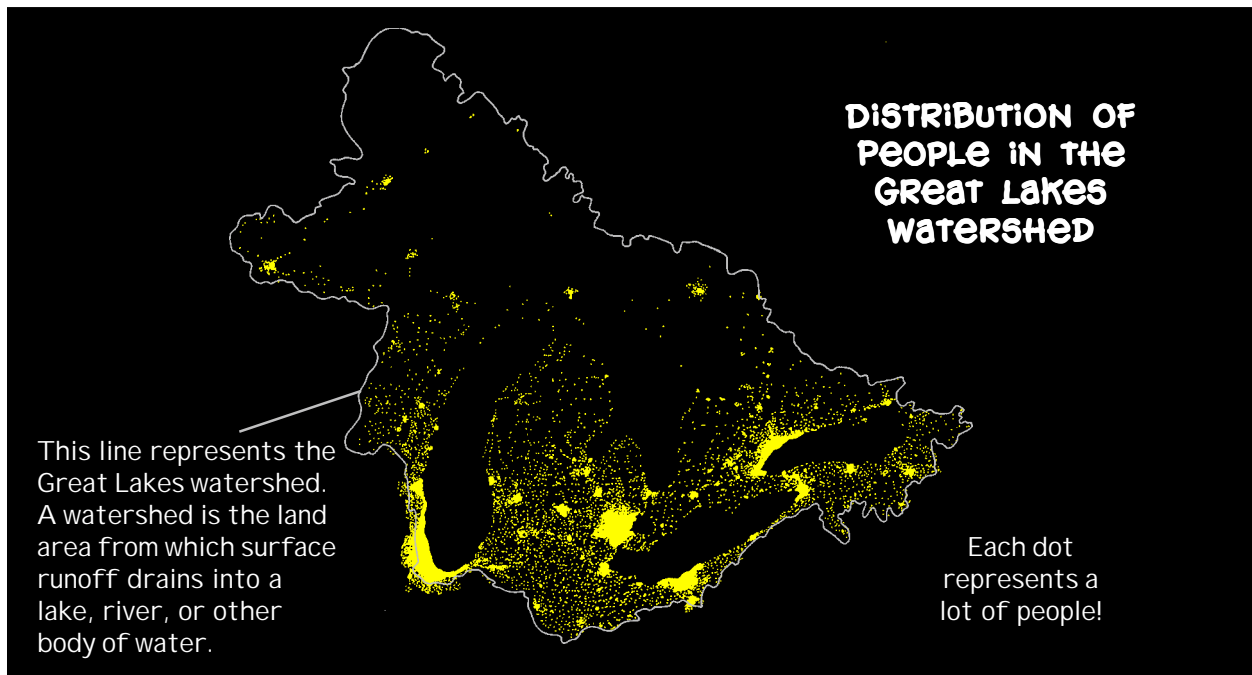
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IMAGINE - NO LAKES!



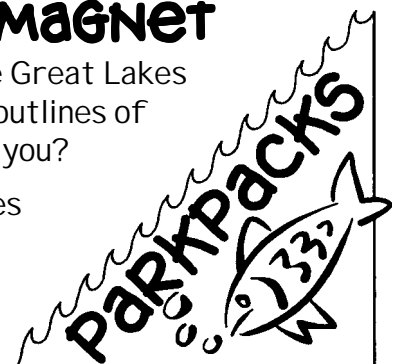
The Great Lakes are huge. If you stood on the moon, you could still see them! You could recognize the wolf-head shape of Lake Superior and the 'mitten' formed by lakes Michigan, Huron, and Erie. The lakes themselves cover more than 94,000 square miles. The Great Lakes watershed is over three times that size. The lakes hold an estimated six quadrillion gallons of water. That's about 20% of the world's fresh surface water supply and 90% of the U.S. supply. Spread evenly across the continental 48 states, the lakes' water would be about 9.5 feet deep!



WATER - THE GREAT PEOPLE MAGNET

Imagine you're in outer space. It's night. Can you picture the Great Lakes watershed? With the lights burning, you can almost see the outlines of the lakes! How many major cities can you locate? Where are you?

More than 30% of the U.S. population lives in the eight states bordering the Great Lakes. We've settled not only on the Great Lakes, but on thousands of inland lakes and miles of rivers. Water provides us with transportation, recreation, agriculture, industry, and, well, water!



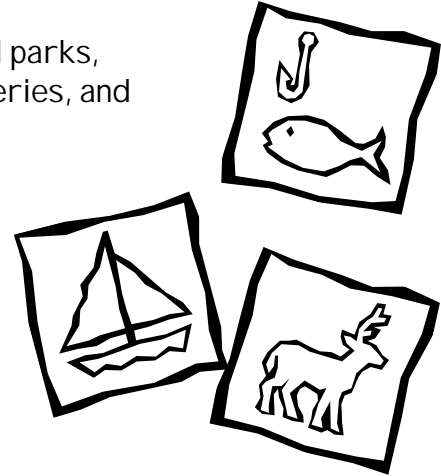
wees-konsan

What would Wisconsin be without all of its lakes? For starters, it might not have the same name. Wees-konsan means "gathering of waters" in Ojibwa. Did you know that 22% of Wisconsin is underwater? Get the **map** out of the **ParkPack** and check out the communities that are located near lakes. How many are named for water? You might have to brush up on your French and several Native American languages to find them all!

Now look on the map for ways we use lakes. Can you find parks, ferries, scenic tours, harbors, power plants, fish hatcheries, and railroads?

CHECK IT OUT!

Head down to the water. Take the *Imagine - No Lakes!* checklist, clipboard, and pen from the **ParkPack**. Look up and down the shore and out over a lake. Check out maps and talk to staff about how water is used in this area. Pay attention when you are driving around with your family. How many things on the list can you find evidence of?



WHAT WOULD WE DO WITHOUT THEM?

How would our lives be different without our lakes? Would your parents have the same jobs? Would you have come on vacation to this place? Would you even live in the same place? It's hard to imagine what life would be like without Lake Michigan, Lake Superior, and the 15,000 or so lakes within our borders. It's also easy to take them for granted!

ParkPacks

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Lake Life

Before the trip, students played “Go Fish” to learn about food chains. Now, they can search for the plants and animals that inhabit a lake ecosystem.

OBJECTIVES

Recognize the diversity of life in the Great Lakes and Wisconsin’s inland lakes.
List plants and animals that live in a local lake.

WISCONSIN’S MODEL ACADEMIC STANDARDS

Environmental Education

B.8.8 Explain interactions among organisms or populations of organisms

Science

F.8.2 Show how organisms have adapted structures to match their functions, providing means of encouraging individual and group survival within specific environments.

MATERIALS

Magnifying lenses (10). Found in the black duffel bag.

White bowls (10). Found in the black duffel bag.

Pond Life field guides (5). Four field guides are in the black duffel bag and one is in the blue backpack.

PREPARATION TIME

Minimal

ACTIVITY TIME

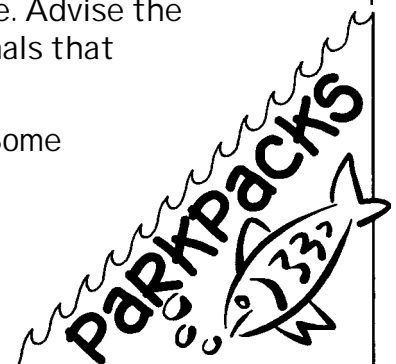
20 - 60 minutes

SETTING

At a lake. A pier or dock will increase the students’ chances of finding plants and animals without getting wet!

INSTRUCTIONAL STRATEGIES

1. Review the plants and animals from the *Go Fish* card game. Advise the students that these are only a few of the plants and animals that they can expect to find living in the lake.
2. Set boundaries and rules for the students’ exploration. Some rules might be: stay dry; show respect for all living creatures - even the microscopic ones; return all water, plants, and animals to the lake; don’t allow aquatic animals to dry out or sit in direct sunlight. Also see *Best Practices* in the Appendix (page 119 - 120).



3. Help the students find plants and animals in the lake. Encourage them to observe and make notes. Use the field guides to identify plants and animals.

ASSESSMENT

Ask students to choose one plant or animal that they found in the lake. Based on their observations and research, ask them to show how it is specifically adapted to live in a watery world.

ADDITIONAL RESOURCES AND IDEAS

Locate additional equipment for exploring the life in the lake. Waders, seine nets, pole nets, plankton samplers, field microscopes, eye droppers, large white dishpans, and other sampling equipment will certainly enhance your students' ability to find and capture animals.

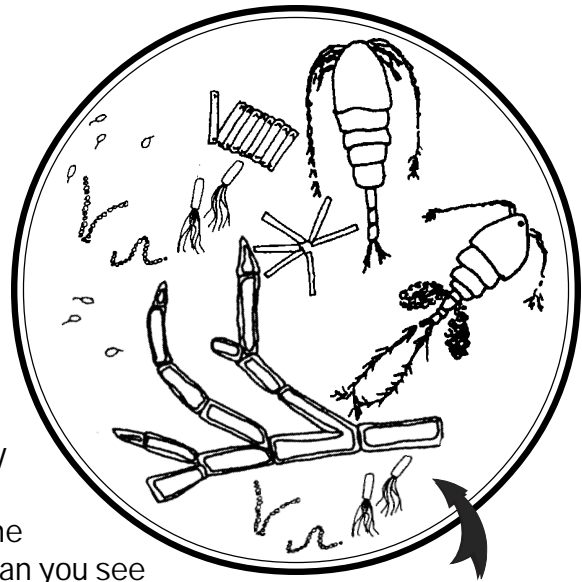
TEACHERS' GUIDE TO FISH PACKS

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Lake Life

Lakes as huge as these can be misleading. You walk along the shore and you can't see much life. A dead fish here. An empty zebra mussel shell there. A gull flying overhead. How much life could there really be among all these waves, rocks, and sands?

Scoop up a handful of water. If you had microscope eyes, you could see hundreds, thousands, maybe millions of creatures in your hand. These microscopic organisms are the key to life in the lake. Use the **magnifying lens**, **white bowl**, and **Pond Life field guide** from the **PARKPACK**. Put some lake water in the bowl. Can you see anything? Threads of life? Moving dots? I imagine what it would look like under a microscope!

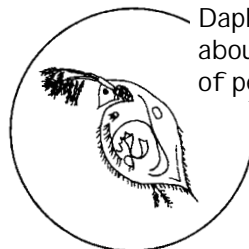
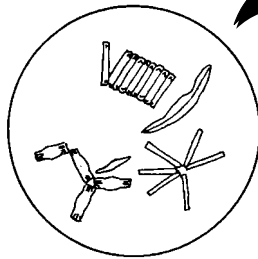


**MICROSCOPIC
Lake Life**

INVISIBLE KEY TO LIFE

In most natural communities, large plants such as trees, shrubs, or grasses are the basis for food chains. Not in the lakes! The basis for life in the lakes is invisible-to-the-naked-eye phytoplankton. Here's how it works:

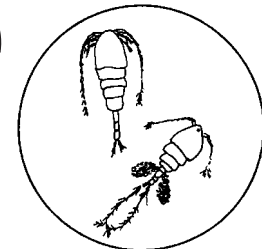
**MICROSCOPIC algae,
Like DIATOMS, CONVERT
SUNLIGHT INTO FOOD.**



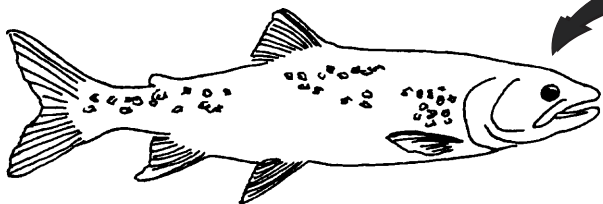
Daphnia are
about the size
of periods.

**ZOOPLANKTON,
Like DAPHNIA,
eat the ALGAE.**

**LARGER
ZOOPLANKTON,
Like COPEPODS,
eat the LITTLE
ZOOPLANKTON.**



**SMALL FISH, Like
PERCH, FEED ON
ZOOPLANKTON.**



**LARGE FISH, Like LAKE TROUT, ARE
AT THE TOP OF THE FOOD CHAIN.
THEY EAT SMALLER FISH.**



GO FISH

Ever played *Go Fish*? The object of the game is to collect "books," which are sets of four cards of the same rank, by asking other players for cards you think they may have. Whoever collects the most books wins.

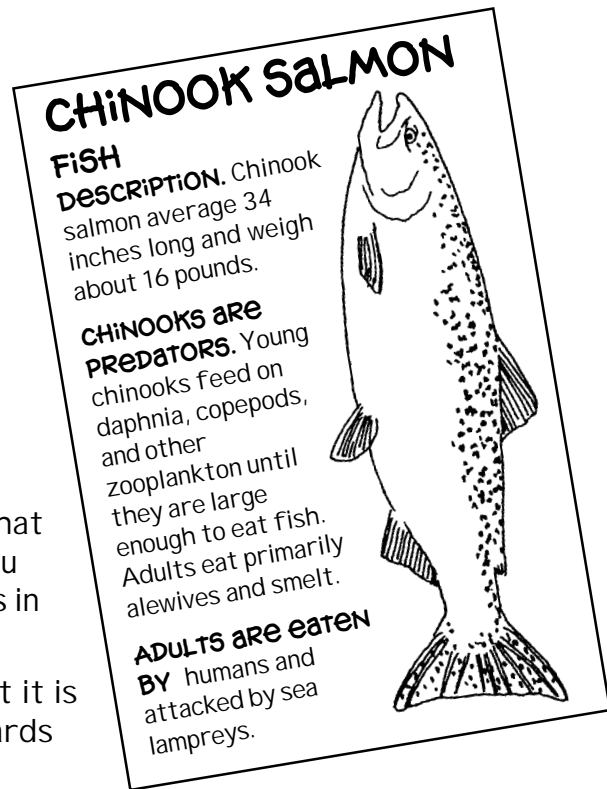
In this version of the game, you will collect "chains" instead of "books." Great Lakes food chains, that is! Find the **Lake Life cards** in the **ParkPack**. Each card represents one plant or animal found in the lakes. It has a short description, a list of what the animal eats, and a list of who eats it. You will use this information to build food chains in the game.

The game works best with 3 - 6 players, but it is possible for 2 to play. The dealer deals 5 cards to each player (7 each for 2 players). The remaining cards are placed face down to form a stock.

The player to the dealer's left starts. A turn consists of asking a specific player for a specific card. For example, if it is my turn I might say: 'Adam, do you have any lake sturgeon?' I must already hold at least 1 card that can connect with a lake sturgeon in a food chain. If Adam has a lake sturgeon, he must give it to me. I get another turn and may ask any player for any card that can be connected to a card already held in my hand.

If Adam doesn't have the card, he says 'Go fish!'. I must then draw the top card of the undealt stock. In the unlikely event that I draw the card asked for, I show the card and get another turn. If the drawn card is not the card asked for, I keep it, but the turn now passes to the player who said 'Go fish!'.

As soon as a player collects a chain of at least 4 cards, the cards are shown and the connections are explained. For example, "Diatoms are eaten by Slippershell Mussels are eaten by Lake Sturgeons are eaten by Humans." The cards are left face up. The game continues until either someone has no cards left in their hand or the stock runs out. The winner is the player who has the most chains.



PARKPACKS

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Read a Fish

Practice “reading” fish adaptations by observing living fish and analyzing their special structures and behaviors.

OBJECTIVES

Observe coloration, mouth adaptations, fins, other body structures, and behaviors of living fish.

Predict where the fish lives and how it survives based on its adaptations.

WISCONSIN'S MODEL ACADEMIC STANDARDS

Science

F.8.2 Show how organisms have adapted structures to match their functions, providing means of encouraging individual and group survival within specific environments

MATERIALS

Fishes field guides (5). Four field guides are in the black duffel bag and one is in the blue backpack.

Match Your Catch wildcards (10). Found in the black duffel bag.

Aquarium, tank, or child's wading pool. Observation of fish will be greatly enhanced if fish are confined to a smaller area.

Natural materials and/or art supplies for designing fish.

PREPARATION TIME

Minimal

ACTIVITY TIME

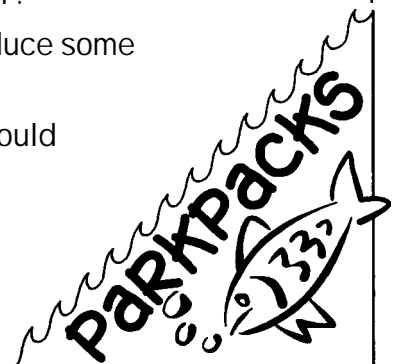
20 - 30 minutes plus additional time if art project is included during field trip.

SETTING

At a lake. Students could also design fish during art classes back at school.

INSTRUCTIONAL STRATEGIES

1. Ask the students how fish are adapted to survive in water.
2. Use the information on the card (pages 33 - 34) to introduce some of the other unique adaptations of fish.
3. Observe a variety of live fish with the students. These could be fish the students can see from piers, fish they have caught, hatchery fish, or aquarium fish.
4. Using natural materials that are available at the lake and/or art materials back at school, design a fish. See the directions on page 33.



ASSESSMENT

Ask students to describe the fish that they designed. Evaluate their art projects on the basis of creativity. Consider how well students applied their knowledge about fish adaptations to the designing of their unique fish.

Complete the *What If?* activity on page 34. Ask students to include how they would have to be transformed to become fish. What adaptations would they need to survive in the water?

ADDITIONAL RESOURCES AND IDEAS

See *Best Practices* and *School Aquariums* in the Appendix (pages 118 - 119) for information on keeping fish in the classroom.

CHILDREN'S BOOKS ABOUT FISH ADAPTATIONS

Fish by Steve Parker © 1990. *Eyewitness Book* series. A photo essay about the natural world of fish and their importance in human life.

Fish Do the Strangest Things by Leonora and Arthur Hornblow © 1990. *Step-up Nature Books* series. Describes 17 fishes that have peculiar characteristics and habits, including fish that spit, fly, climb trees, blow up like balloons, and sleep out of water.

Fish, Fish, Fish by Georgie Adams © 1993. Colorful collage illustrations introduce various sizes and shapes of fish.

Funny Fishes by Sara Swan Miller © 2001. Discusses several species of fishes that have unusual appearances, habitats, or behaviors.

OTHER FIELD GUIDES

Fishes by Michael Filisky © 1989. *Peterson First Guide* series. A simplified field guide to the fishes of North America.

Fishes by C. Lavett Smith © 2000. *National Audubon Society First Field Guide* series. Explores the world of fishes, discussing their classification, anatomy, behavior, and habitat, and providing photographs and detailed descriptions of individual taxonomic families.

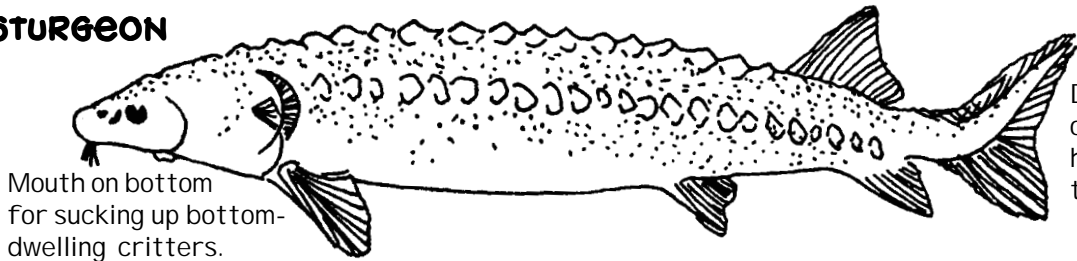
TEACHERS' GUIDE TO FISH PACKS

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Read a Fish

Fish come in so many different shapes, sizes, and patterns that it's almost impossible to know them all. But even if you don't know the name of a fish, you can figure out a lot by just 'reading' it. Look at all the things you can learn by taking a close look at these fish, then check out the back of the card for some more cool adaptations.

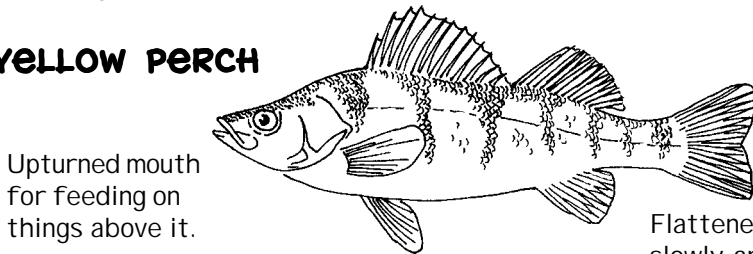
STURGEON



Mouth on bottom for sucking up bottom-dwelling critters.

Dark color on top for hiding along the bottom.

YELLOW PERCH

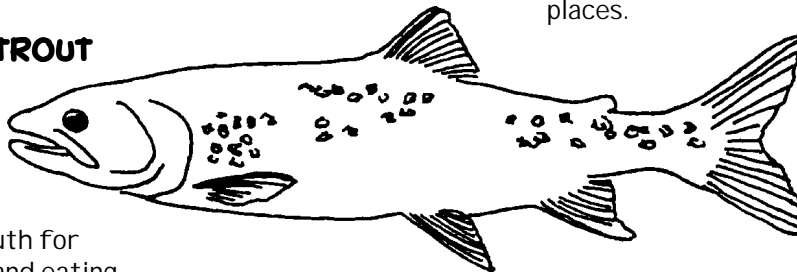


Upturned mouth for feeding on things above it.

Stripes for hiding in vegetation.

Flattened body for swimming slowly and fitting in small places.

LAKE TROUT



Large mouth for catching and eating prey fish.

Torpedo-shaped body for fast movement. All fish are streamlined for slipping smoothly through the water.

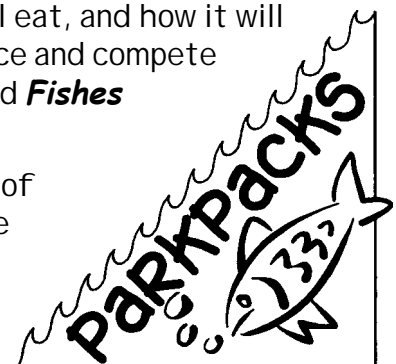
Light belly and dark back for camouflaging when seen from below or above. This common color pattern is called countershading.

DESIGN A FISH

Using the information on this card and what you know about fish adaptations, try to design your own fish. Decide where it will live, what it will eat, and how it will avoid predators. You can also think about how it will reproduce and compete with invasive fish species. The **Match Your Catch! cards** and **Fishes field guide** in the **PARKPACK** might give you some ideas!

Draw your new fish on paper or in the sand. Or create it out of driftwood, sand, rocks, shells, and feathers! Please use loose items, and don't use plants!

After you show your fish to your family and friends, return all the items to their original locations!



COOL ADAPTATIONS

A fish is amazing. Basically, a fish is a cold-blooded vertebrate that lives in water, breathes with gills, and has fins rather than legs. Check out some of the special features that allow it to survive in a watery world.

Eyes located on the side of the head let a fish see in almost a complete circle. Some predator fish have eyes a little more toward the front, allowing better depth perception. Fish eyes move independently; one can look up while the other looks down.

Fish have different **teeth** depending on their diet.

Fish have **nostrils** that help them smell odors. Many fish have an incredible sense of smell. Fish species with a poor sense of smell usually hunt by sight in the daytime.

Fish have internal and external **taste buds**. External taste buds are on the lips, snout, or feelers.

Overlapping **scales** protect the fish's skin. A slimy scale coating helps some fish swim faster and slip out of a predator's grasp. Special chemicals in the slimy coating help a fish fight germs. Some fish, like sea lamprey, do not have scales.

A fish's **gills** take oxygen from the water like our lungs extract oxygen from the air.

The **dorsal fin** provides stability and keeps the fish upright.

The **lateral line** senses vibrations that tell the fish when the water around it is being disturbed. It aids in navigation and helps detect food and predators.

The **caudal fin** provides power for forward motion.

Pelvic and anal fins work with the dorsal fin to provide stability and to keep the fish upright.

Pectoral fins provide steering.

Internal **ears** collect sounds from all over the fish's body.

A **swim bladder** is an internal float that helps the fish rise, sink, or stay in place. The swim bladder works like a hot air balloon. Fish without swim bladders must move constantly or they will sink. Some fish that live on the bottom don't need swim bladders.

WHAT IF?

What if you could be a fish for a day? What kind of a fish would you want to be? Would you live in the open water, on the murky bottom, or among vegetation? Would you eat plankton or other fish? How would you avoid being eaten by bigger fish? What would an underwater life be like?

PARKPACKS

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SOMETHING'S FISHY

Investigate the death of a fish to guess its identity, age, general condition, and clues from its past.

OBJECTIVES

Identify a fish based on visible characteristics.
Examine a dead fish for clues to its life and death.

WISCONSIN'S MODEL ACADEMIC STANDARDS

Environmental Education

B.8.8 Explain interactions among organisms or populations of organisms

Science

C.8.1 Identify questions they can investigate using resources and equipment they have available

MATERIALS

At least one dead fish!

Something's Fishycards - The laminated set of *Something's Fishycards* can be used by a small group of students. For multiple groups, make copies of the cards found on pages 77 - 86 of this guide. Be sure you copy the cards appropriate to your location. For Great Lakes: 77, 79, 81, 83, 84, 85, and 86. For inland lakes: 78, 79, 82, 83, 84, 85, and 86.

Fishes field guide (5). Four field guides are in the black duffel bag and one is in the blue backpack.

Match Your Catch cards (10). Found in the black duffel bag.

Trout life cycle plastimount. Found in the blue backpack.

PREPARATION TIME

Allow time to copy *Something's Fishycards*.

ACTIVITY TIME

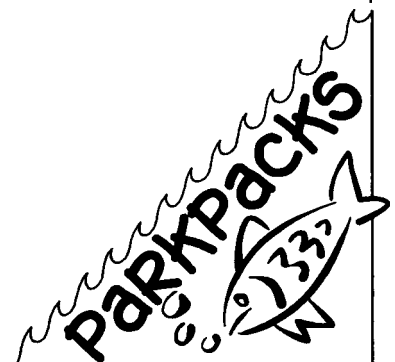
20 - 30 minutes

SETTING

At a lake

INSTRUCTIONAL STRATEGIES

1. Using the information on the card (page 37), discuss the reasons why fish die.
2. Locate one or more dead fish for students to examine. Caution: Don't touch a dead fish.



3. If possible, dissect a fresh catch so that students can examine the internal organs.

ASSESSMENT

Using the clues collected on the field trip, ask students to reconstruct the last few days or hours of the dead fish's life. Encourage them to write a story, illustrate a storyboard, or act out the demise of the fish for the class.

ADDITIONAL RESOURCES AND IDEAS

Check out more information on fish tagging by visiting the Wisconsin Department of Natural Resources website.

<www.dnr.state.wi.us/org/water/fhp/fish/faq/tag.htm>

CHILDREN'S BOOKS ABOUT THE LIFE HISTORY OF FISH

Swimmer by Shelley Gill © 1995. The story of the Chinook salmon—Swimmer's journey over 10,000 miles illustrates the cycles of life for the salmon and the girl Katya, who is coming of age.

Fish by Edward R. Ricciuti © 1993. *Our Living World* series. Examines the physical structure, metabolism, and life cycle of fishes and discusses how they fit into the food chain.

A Fish Hatches by Joanna Cole and Jerome Wexler © 1978. Describes the life cycle of a trout from the laying of eggs in a hatchery to maturity.

Salmon Stream by Carol Reed-Jones © 2000. *Sharing Nature with Children* series. The life cycle of salmon and its place in ecology is lavishly illustrated and explained to the reader.

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SOMETHING'S FISHY

Fishy smelling, that is! Few things smell worse than a dead fish! If you spend much time along the shores of the Great Lakes, you're bound to meet a dead or dying fish. And if you are the kind of person who can't walk past a good mystery, you might find yourself asking, "Why do fish die anyway?"







Fish die for many of the same reasons most other animals die. They can be eaten by predators, of course. Or they can die from old age, injury, or sickness. They can also die of malnutrition if they don't eat enough of the right kinds of food. Fish can even suffocate if there isn't enough oxygen in the water. So . . . go find a dead fish and see if you can figure out why it died!

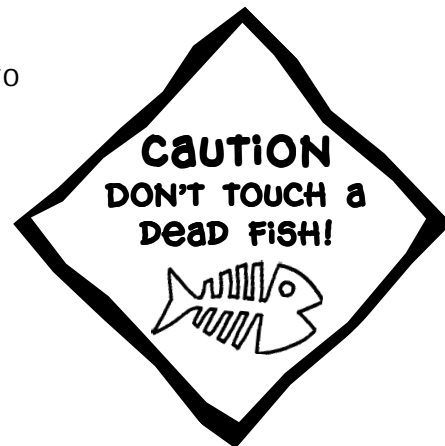
OK—THIS IS GROSS, BUT IS IT SAFE?

It's fairly safe. Fish are fish. You're a mammal. There are very few fish diseases or parasites that can infect people. You could get bacterial infections from a dead fish, so be careful. Don't touch it. You can use a stick to turn it over!

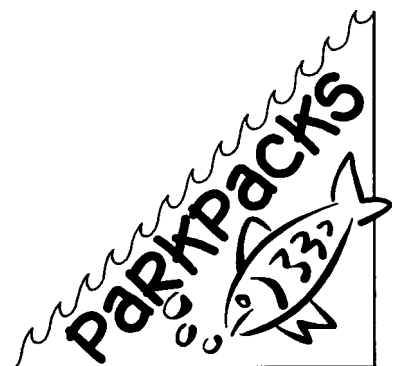
CRACKING THE MYSTERY

To find out how the fish died, you are going to have to answer some basic questions:

-  What kind of fish is it?
-  What stage of life is it in?
-  How old was it when it died?
-  What kind of shape is it in?
-  Did your fish die alone?
-  Was the fish tagged?



Use the **Something's Fishy cards** in the **PARKPACK** to find out all you can about your dead fish. When you think you have it figured out, share your theory with someone else. Maybe you can make up a story about the fish's life and how it died.



PARKPACKS

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GONE FISHIN'

Experiment with some primitive fishing equipment and think about how fishing has changed over the years.

OBJECTIVES

Realize that changes in technology and society have changed the ways we fish and the ways we think about fishing.

Practice a simple way of fishing.

WISCONSIN'S MODEL ACADEMIC STANDARDS

Environmental Education

B.8.9 Explain how the environment is perceived differently by various cultures

Science

E.8.6 Describe through investigations the use of the earth's resources by humans in both past and current cultures, particularly how changes in the resources used for the past 100 years are the basis for efforts to conserve and recycle renewable and nonrenewable resources

G.8.3 Illustrate the impact that science and technology have had, both good and bad, on careers, systems, society, environment, and quality of life

MATERIALS

Soda Can Casters instruction card. The laminated card in the blue backpack can be used with small groups of students or at a learning center. The masters for making multiple cards are on pages 87-88 of this guide.

Soda cans

Hooks, line, sinkers, bobbers. Fishing equipment can be borrowed from Tackle Loaner Sites. See brochure or visit the website at <www.dnr.state.wi.us> and click on these pages: Outdoor Recreation; Fishing; and Kids, Parents, Educators.

PREPARATION TIME

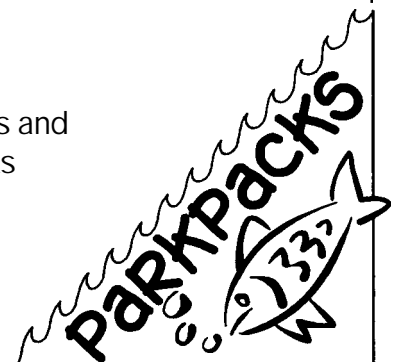
Allow time to copy directions and borrow equipment.

ACTIVITY TIME

20 - 60 minutes

SETTING

At a lake. Students could also construct the soda can casters and practice using them at school. For safety, practice with corks or casting plugs, instead of hooks, in a large open area.



INSTRUCTIONAL STRATEGIES

1. Read the opening paragraph from the card (page 41) and elicit responses from the students. Allow anglers to share their passion for the sport. Encourage all students to share their thoughts on fishing in Wisconsin and around the world. Discuss why people might choose to fish or not to fish.
2. Pass out the directions and supplies for constructing *Soda Can Casters*. Allow students to practice casting on land so they don't throw the soda cans in the lake!
3. Review safety procedures with students before allowing them to attach hooks and cast into the lake.

ASSESSMENT

Find out about an ancient or modern day culture that depends on fish for survival. What methods did/do the people use for catching the fish?

ADDITIONAL RESOURCES AND IDEAS

CHILDREN'S BOOKS ABOUT PEOPLE FISHING

Frozen Terror as told to Ben East © 1979. A man is stranded on an ice floe in Lake Michigan while ice fishing and endures perilous adventures attempting to get back to shore. Originally published in "Narrow Escapes" by *Outdoor Life*.

Minas and the Fish by Olga Pastuchiv © 1997. A young boy wishes to learn to swim so he can go fishing with his older brothers, but when a magic fish teaches him, his brothers no longer recognize him.

CHILDREN'S BOOKS THAT TEACH HOW TO FISH

Freshwater Fishing: A Step-by-Step Guide by Richard Smithsen © 1990. *Be the Best* series. Discusses how and where to fish, what kind of equipment to use, and what species of freshwater fishes can be caught.

Let's Go Fishing: A Book for Beginners by Gerald Schmidt © 1990. Focusing on freshwater fishing in North America, this book takes the mystery out of the most popular form of recreation in the U.S. and Canada.

Let's Go Fishing in Streams, Rivers, and Lakes by George Travis © 1998. Describes the equipment and techniques used in freshwater fishing.

Let's Go Fishing on the Ice by George Travis © 1998. Describes some of the techniques used to catch fish in frozen lakes.

The Young Fishing Enthusiast by John Bailey © 1999. An introduction to the basic techniques of fishing, including advice on tackle, bait, and clothing.

TEACHERS' GUIDE TO FISH PACKS

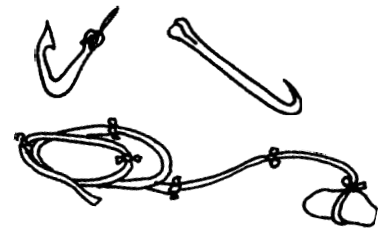
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GONE FISHIN'

Would you prefer to stand in the water waiting for a fish to swim by so you could grab it with your bare hands . . . or would you rather go out on the open water in a fishing boat and use a sonar fish finder and fiberglass pole equipped with a sophisticated lure and an automatic reel? However it's done, something about catching a fish has lured people to the water for thousands of years.

FIRST, IT WAS SURVIVAL

Fish are a great source of protein, and they are readily available year round. Many people have survived on a diet of fish. Almost half of the world's population relies on fish for their main source of protein.



EARLY FISHING GEAR

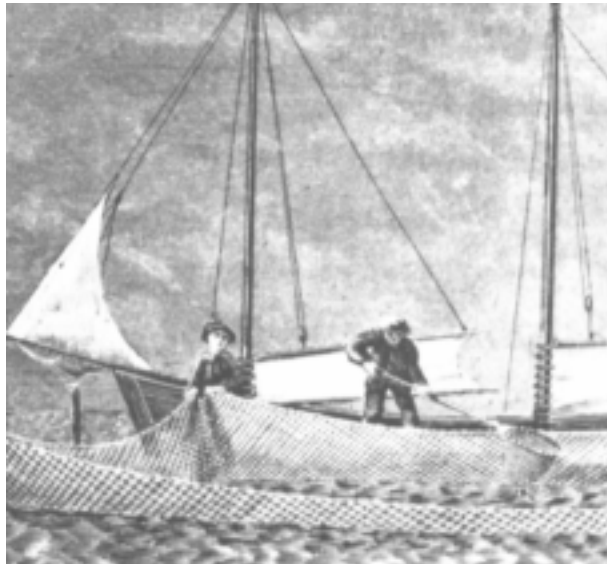


ILLUSTRATION FROM THE GREAT LAKES BASIN COMMISSION

NEXT CAME COMMERCIAL FISHING

Boats and nets meant being able to catch more fish than one family could eat. Commercial fishing crews catch, preserve, and ship fish for profit. Many towns along the shores of the Great Lakes owe their existence and character to the commercial fishing industry. Can you find out any information about nearby towns?



SPAWN SACK

NOW THERE'S SPORT FISHING

With increased income and leisure time, people began to try to hook larger and harder-to-catch fish. Many times, they caught them just for the challenge, only to release them! While this would have been unheard of 200 years ago, today it is a relaxing, yet challenging, pastime for many anglers.

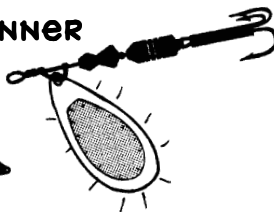


MINNOW

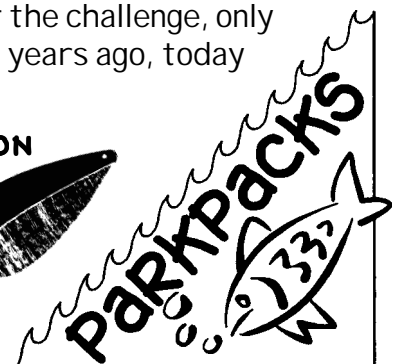


PLUG

SPINNER

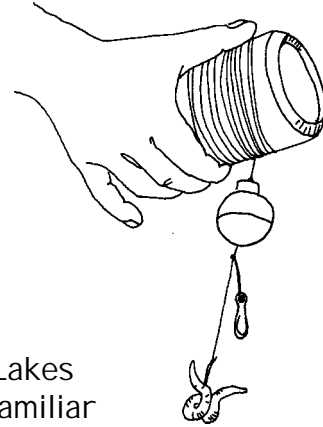


SPOON



JOIN THE FUN

You can try it! All you need is a pole, line, hook, and bait. You might be able to borrow these from a Tackle Loaner Site. Check out the brochure in the ParkPack or talk to the property staff. If you can't borrow the equipment, ask the staff for a hook, line, sinker, and bobber. Then, use the directions in the **PARKPACK** to make a **Soda Can Caster**.



FISHING BY THE RULES

You don't need a license to fish in Wisconsin or on the Great Lakes until you are 16 years old. That's cool! But you do need to be familiar with and follow the fishing regulations that apply to the area where you are fishing! And . . . if adults help you . . . each of them needs a license! When you are older, you can buy one, too. By purchasing a license, you help fellow anglers support fish stocking, habitat restoration, education, and research programs.




A CAUTION FOR ALL FISH-EATERS

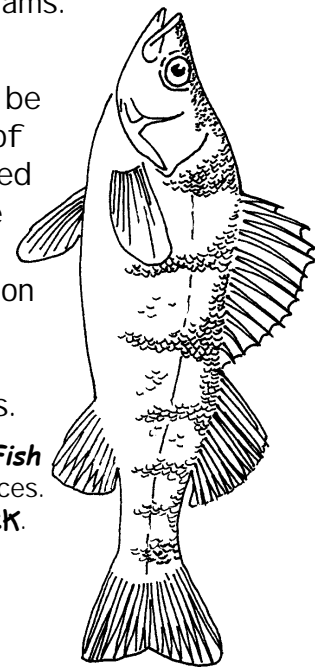
Fish are fun to catch and good for you to eat. But you do need to be careful! Fish from Wisconsin lakes may contain unhealthy levels of contaminants. Fish absorb chemicals, like PCBs, from contaminated sediments suspended in the water and from their food. PCBs are extremely persistent and are easily passed along the food chain. The amounts of these contaminants found in fish vary depending on the fish's species, age, size, fat content, location, and diet. Larger, older, or predatory fish that have eaten many smaller fish may accumulate higher levels of contaminants in their bodies.

* This information is from *Choose Wisely: A Health Guide for Eating Fish in Wisconsin* published by the Wisconsin Department of Natural Resources. If you want more detailed information, the brochure is in the **PARKPACK**.

REDUCE YOUR RISK

You can lower your exposure to contaminants by:

-  Choosing smaller, leaner, shorter-lived species such as bluegills, crappies, and yellow perch.
-  Removing the fat and skin from fish before cooking.
-  Broiling, grilling, or baking your fish so that the fat drips away. Throw away the drippings! If you boil fish, don't use the water.



**YELLOW
PERCH**

PARKPACKS

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UNFAIR ADVANTAGE!

Measure and graph the sizes of zebra mussels found on the shore to find out more about the local population.

OBJECTIVES

Collect, measure, and graph zebra mussel shells.
Interpret population graphs.

WISCONSIN'S MODEL ACADEMIC STANDARDS

Environmental Education

- A.8.4 Use critical-thinking strategies to interpret and analyze gathered information
- B.8.8 Explain interactions among organisms or populations of organisms

Math

- D.8.3 Determine measurement directly using standard units (metric and US Customary) with these suggested degrees of accuracy - lengths to the nearest mm
- E.8.1 Work with data in the context of real-world situations
- E.8.2 Organize and display data from statistical investigations using appropriate tables, graphs, and/or charts
- E.8.4 Use the results of data analysis to make predictions, develop convincing arguments, and draw conclusions

Science

- F.8.8 Show through investigations how organisms both depend on and contribute to the balance or imbalance of populations and/or ecosystems, which in turn contribute to the total system of life on the planet

MATERIALS

Operation Population worksheet. The laminated worksheet in the blue backpack can be used with small groups of students or at a learning center. The masters for making copies are on pages 89 - 90 of this guide.

Rope circles (10). Found in the black duffel bag.

Zebra mussel identification cards (10). Found in the black duffel bag.

You will need to provide clipboards, scrap paper, and pencils

PREPARATION TIME

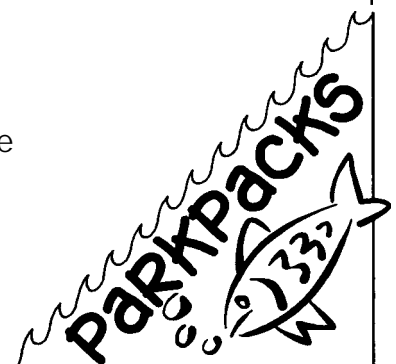
Allow time to copy directions.

ACTIVITY TIME

20 - 30 minutes plus additional time back at school to analyze the data

SETTING

At a lake with a zebra mussel population



INSTRUCTIONAL STRATEGIES

1. Introduce the life history of zebra mussels and the way they change the lake ecosystem by using the information on the card (pages 45 - 46).
2. Before conducting the investigation, instruct students to look around for signs of zebra mussels. Check the clarity of the water, and look for signs of encrustations of zebra mussels on piers and other submerged structures. Look for the other changes in the lake diagrammed on page 45.
3. Pass out *Operation Population* worksheets, ropes, clipboards, and pencils.
4. Review the directions with the students.
5. In the field or the classroom, discuss the results of the investigation.

ASSESSMENT

Note the accuracy of measurements and ability to compile data into a meaningful graph. Ask students to use their observations, measurements, and graphs to write a brief statement concerning the zebra mussel population of the lake.

ADDITIONAL RESOURCES AND IDEAS

Investigate how zebra mussels invaded Wisconsin. How did they get to the Great Lakes? How fast did they spread? Are there any lakes or waterways that do not have zebra mussels? How have these lakes remained free from the invasive mussel?

CHILDREN'S BOOK

Exotic Invaders: Killer Bees, Fire Ants and Other Alien Species Are Infesting America by Jeanne M. Lesinski © 1996. Describes five species that are not native to North America – the sea lamprey, fire ants, zebra mussels, European starlings, and African honeybees – and efforts to handle the problems their introduction has caused.

CURRICULUM GUIDE

Biodiversity, Wetlands, and Biological Control: Information and Activities for Young Scientists – Purple Loosestrife: A Case Study by Michael Jeffords and Susan Post © 1999. Introductory activities about biodiversity and wetlands lead to lessons concerning the biological control of purple loosestrife in wetland areas. Based in Illinois, but very adaptable.

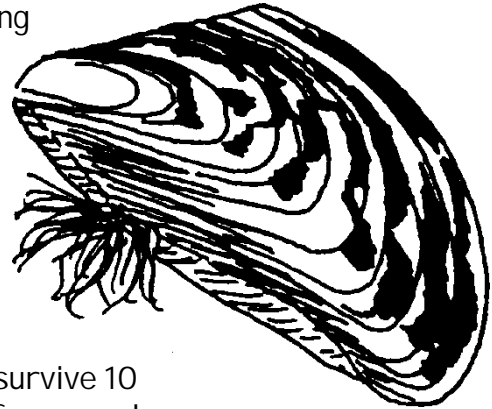
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UNFAIR ADVANTAGE!

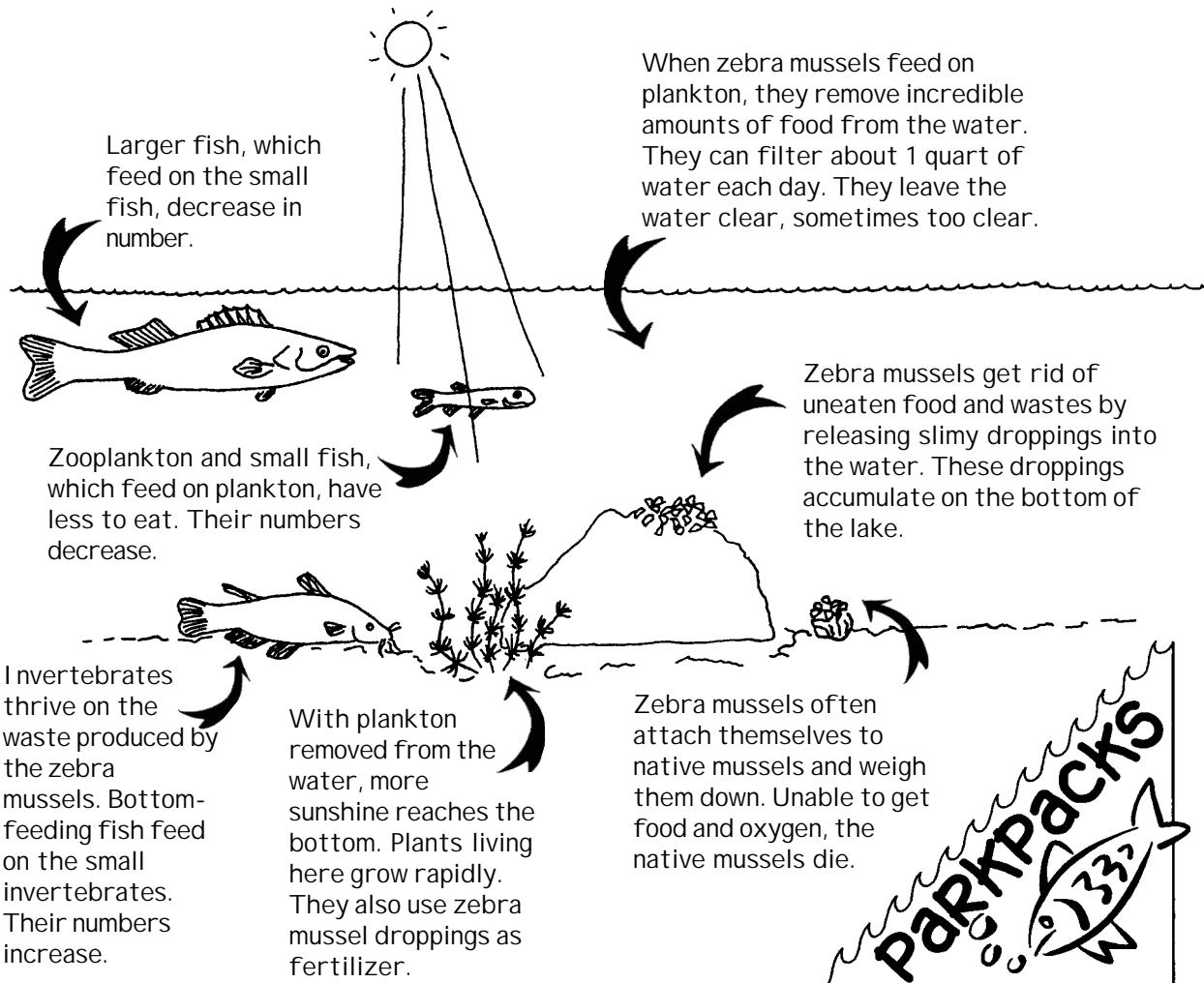
Does it bother you when someone excels in everything they do? They just roll over the competition. No one else even has a chance!

That's what zebra mussels do! They're little, but they're tough. Consider this . . . female zebras can produce 30,000 to 1,000,000 eggs in one year! The young, called veligers, can survive for a month in water with little or no food. Even though very few of the veligers survive to adulthood, so many do that populations can explode! And the adults can survive 10 days out of water. They can even live without food for a year!



AND THAT'S NOT ALL!

Take a look at how zebra mussels mess up the ecology of the lake.



CHECK IT OUT!

There's no question that zebra mussels are doing very well in Wisconsin's waters. They're not only surviving - they're thriving! You can find out more about the zebra mussel population by taking samples of the empty shells. Take the **rope**, **Operation Population chart**, **clipboard**, and **pen** from the **PARKPACK** and head down to the lake.

To choose a sample area, just toss the rope onto the rocks or sand. Arrange it into a circle. Now, collect all the zebra mussel shells from inside the circle.


Sort through the shells. Are they all the same size? Have they all been lying on the shore the same amount of time? After a big storm, you can usually find fresher shells that were just washed up on the shore. As time passes, the waves, wind, and people break the shells down. What other clues can you use to predict how long the zebra mussels have been dead? (See #1 below for answer.)

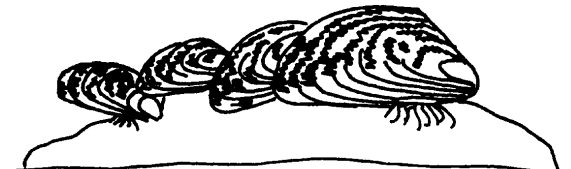
Follow the directions on the **Operation Population** chart to find out more about the zebra mussel population in this part of Wisconsin.

Life as a zebra

Zebra mussels start life as free-swimming young called veligers. When they are about 1 month old, they settle down and attach to a solid surface. During their first year of life, they grow from microscopic size to about 14 mm in length. At this time, they are adults and can begin to reproduce. For the next several years, they only grow about 4 mm every year. Why do you think their growth rate goes way down when they become adults? (See #2 below for answer.)


**FREE-
SWIMMING
VELIGERS**


**YOUNG ZEBRA
MUSSEL**


**ADULT ZEBRA
MUSSELS**

- Answers to Questions!
1. Shells from zebra mussels that died recently might have more distinct stripes, connect at the hinge, contain bits of tissue, and stink. Older zebra mussels' shells would be bleached out, broken, and partly dissolved.
 2. During the first year of life, a zebra mussel uses its energy to grow to adult size. After becoming an adult, it uses most of its energy to reproduce, and its growth rate slows way down.

PARKPACKS

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A Life of Crime

Use binoculars to observe shorebirds, then consider their role in the lake ecosystem.

OBJECTIVES

Demonstrate the ability to observe gull behavior with binoculars and the naked eye. Record observations and analyze the meaning of observed behaviors.

WISCONSIN'S MODEL ACADEMIC STANDARDS

Environmental Education

B.8.8 Explain interactions among organisms or populations of organisms

Science

F.8.2 Show how organisms have adapted structures to match their functions, providing means of encouraging individual and group survival within specific environments

F.8.9 Explain how some of the changes on the earth are contributing to changes in the balance of life and affecting the survival or population growth of certain species

MATERIALS

A *Life of Crime* activity card. The laminated card in the blue backpack can be used with small groups of students or at a learning center. The masters for making copies are on pages 49 - 50 of this guide.

Binoculars (3). Two binoculars are in the black duffel bag and one is in the blue backpack.

Shorebirds field guides (5). Four field guides are in the black duffel bag and one is in the blue backpack.

You will need to provide notebooks and pencils.

PREPARATION TIME

Allow time to copy the activity card.

ACTIVITY TIME

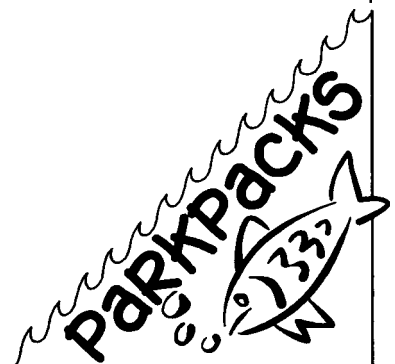
20 - 30 minutes

SETTING

Any place gulls gather!

INSTRUCTIONAL STRATEGIES

1. Ask students about their experiences with gulls. Discuss these questions: Are there any stereotypes or biases associated with gulls? What is their role in the lake ecosystem?



2. Allow small groups of students to use the equipment to observe gulls and record their observations.

ASSESSMENT

Ask students to make a journal entry documenting their observations of the gulls' physical and behavioral adaptations. Use sketches, notes, and/or artifacts.

ADDITIONAL RESOURCES AND IDEAS

Use the information on the back of the card (page 46) and from *Choose Wisely: A Health Guide for Eating Fish in Wisconsin* (in the blue backpack) to determine how many meals of a certain species of fish a person can safely eat.

Check out the mystery "The Case of the Lost Stamp" in *Two Minute Mysteries* by Donald Sobol © 1969. It will be a fun test of your students' observation skills.

CURRICULUM GUIDE

The Great Lakes in My World: An Activities Workbook for Grades K - 8 produced by the Lake Michigan Federation and the Great Lakes Commission © 1989. Activities are divided into 3 sections: People and the Great Lakes, The Great Lakes Today, and Natural Processes in the Great Lakes. Three activities are related to gulls: *Herring Gull Habitat Map*, *The Gull's Way Game*, and *Biomagnification* explain how PCB's enter aquatic ecosystems and their effects on gulls.

CHILDREN'S BOOKS ABOUT GULLS

Gull # 737 by Jean Craighead George © 1964. Luke and his family spend summers on a small island in the Atlantic Ocean studying gulls as part of his father's scientific research. When they are almost ready to call it quits, they are summoned to help solve an aviation crisis. The book is a little dated, but it is also filled with insights into gull behavior and the scientific process.

Gulls by George K. Peck © 1998. Describes the life cycle, behavior patterns, and habitat of various species of gulls, focusing on those found in North America.

The Gull's Way by Louis Darling © 1965. The author describes his observations of a gull-nesting area in spring. Some good descriptions of behavior and interactions.

Watching Water Birds by Jim Arnosky © 1997. Provides a personal look at various species of fresh- and saltwater birds, including loons and grebes, mergansers, mallards, wood duck, Canada geese, gulls, and herons.

Zoobooks: Seabirds by Beth Wagner Brust © 1990. A basic introduction to seabirds, of which there are more than 260 species distributed all over the world.

FIELD GUIDE

A Guide to Bird Behavior - Volume 1 by Donald Stokes © 1979.

Extensive information about the behavior and life history of herring gulls.

TEACHERS' GUIDE TO FISH PACKS

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A Life of Crime

When it comes to crime novels and murder mysteries, gulls could have written the book! They are master thieves, burglar alarms, and murderers of young gull chicks. To gulls, the best meals are free meals. They will even steal food from the beak of another gull!

But wait a minute! Those are our human thoughts and our human perceptions. Gulls play an important role in lake ecosystems. Without gulls on the sanitation crew, the shores and harbors would be littered with dead fish and garbage. They are just opportunistic feeders! They will eat almost everything that looks or smells like food. This is why gulls gather at lakes where people may be picnicking, in farmer's fields that are being plowed, and wherever anglers might be cleaning fish.

BACKGROUND CHECK

Gulls are amazingly adapted to their way of life. Get the **binoculars** out of the **ParkPack** and find some gulls to watch. How many of these physical and behavioral adaptations can you observe?

The color of the beak (yellow, red, or black) helps to sort out the different species of gulls. Are there dots or rings on the beak of the gull you are observing?

A gull preens its feathers 2 to 3 hours each day! During preening, the gull uses its bill to clean and straighten its feathers. It spreads a thin coating of oil over the feathers to waterproof them. The oil comes from a gland above the base of the tail.

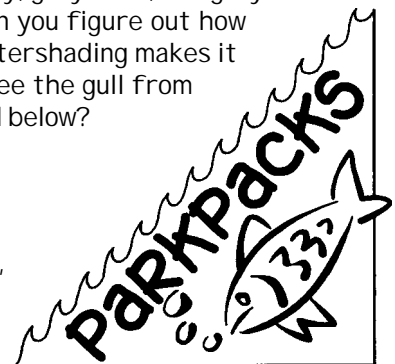
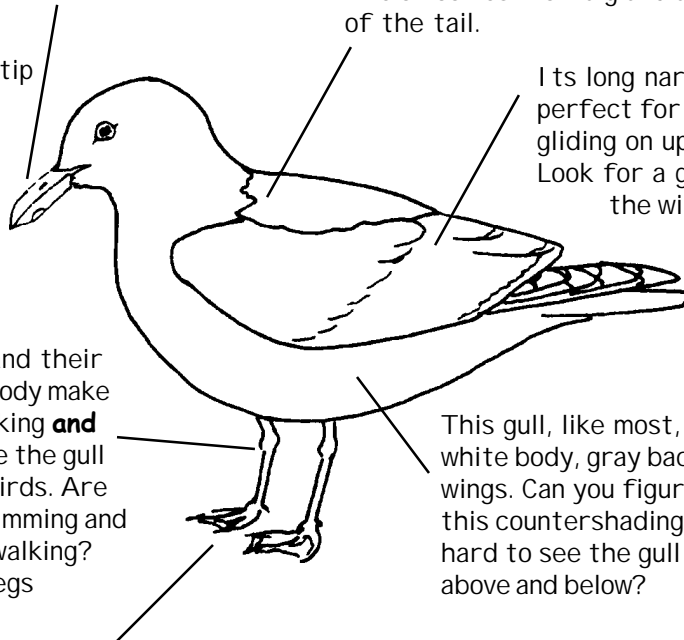
The strong beak is slightly hooked at the tip for tearing into food. Gulls aren't just junk food junkies! Gulls also eat seeds, insects, worms, fish, mice, grain, and dead animals.

Its long narrow wings are perfect for soaring and gliding on updrafts of air. Look for a gull facing into the wind and simply hovering as if by magic!

A gull's long legs and their placement on the body make them good for walking **and** swimming. Compare the gull with other waterbirds. Are some better at swimming and others better at walking? Where are their legs attached?

This gull, like most, has a white body, gray back, and gray wings. Can you figure out how this countershading makes it hard to see the gull from above and below?

Webbed feet help make the gull an excellent swimmer. Look for the print on the shore. You can use the color of the feet and legs (yellow, red, gray, pink, orange, or black) to help identify different species of gulls.

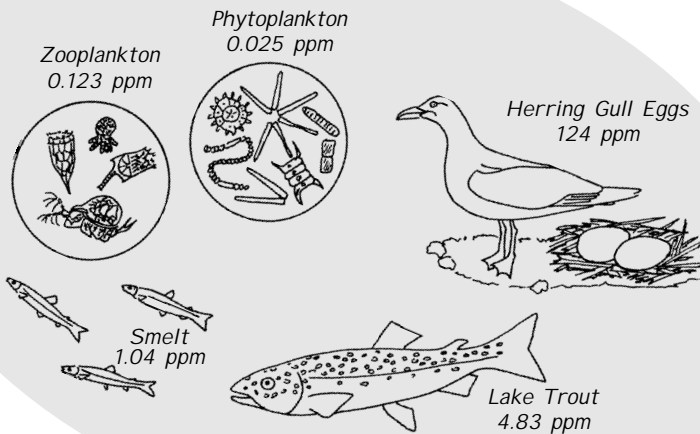


THE DOWNSIDE OF A LIFE OF "CRIME"

Gulls pay a price for their life of stealing and easy living. The dead fish and discarded fish parts that gulls regularly eat can be laced with toxic chemicals. Here's how it works.

2

Zooplankton eat the phytoplankton. The toxic chemicals accumulated in the phytoplankton are further concentrated in their bodies.



1

Phytoplankton absorb the nutrients they need directly from the water. They may also absorb toxic chemicals that are in the water.

5

The eggs of gulls and other fish-eating birds often have the highest concentrations, because the egg yolk is rich in fatty material.

3

Next on the food chain are small fish. They eat many zooplankton, and the levels of toxins increase even more.

4

The larger fish and fish-eating birds at the top of the food chain may accumulate concentrations of toxins that are high enough to cause serious deformities or death.

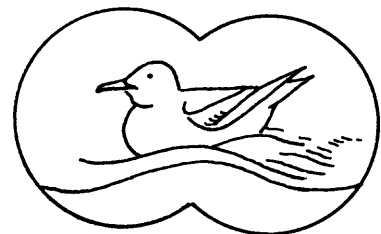
SPOTTING SHOREBIRDS

Use the **binoculars** and **Shorebirds field guide** in the **PARKPACK** to look for gulls and other birds at the lake. Observe a bird for several minutes before you try to find it in the field guide.

It's challenging to learn their names, but it's more interesting to watch how they interact with each other. Eating, stealing, courting, strutting, and calling. Draw pictures and write down everything you observe.



Spot the bird with your naked eyes.



Keep your eyes on it while you raise your binoculars.

PARKPACKS

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GREAT LAKES OR WISCONSIN LAKES YEARBOOK

Sort cards or cutout photos into groupings of ecological significance and groupings just for fun!

OBJECTIVES

Establish criteria for sorting lake plants and animals.

Create a "yearbook" that displays established categories of living things.

WISCONSIN'S MODEL ACADEMIC STANDARDS

English Language Arts

E.8.3 Create media products appropriate to audience and purpose

Environmental Education

B.8.8 Explain interactions among organisms or populations of organisms

MATERIALS

Yearbooks. Collect yearbooks from several sources.

Yearbook cards. Depending on your location use either the *Great Lakes Yearbook* cards or the *Wisconsin Lakes Yearbook* cards. The laminated set in the blue backpack can be used with small groups of students or at a learning center. The masters for making multiple sets are in this guide on pages 91 - 96 for use along the Great Lakes **or** pages 97 - 102 for use at inland lakes.

Art materials and references as needed by groups of students.

PREPARATION TIME

Allow time to copy and cut apart the *Yearbook* cards and to develop a rubric for the yearbook project.

ACTIVITY TIME

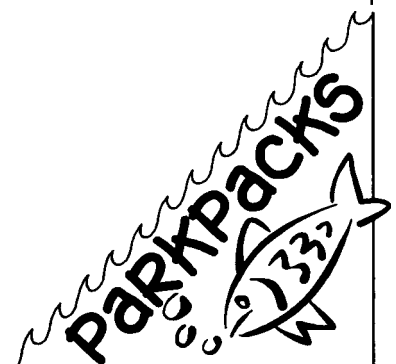
One 50-minute period to introduce and begin the project plus additional class time or homework time to complete the project.

SETTING

Classroom

INSTRUCTIONAL STRATEGIES

1. Look through several yearbooks to remind students of the different ways yearbooks can be organized.



2. Brainstorm ways that a Great Lakes or Wisconsin Lakes yearbook might be organized. Use information from the cards (pages 53 - 56).
3. Divide students into groups and let them get to work. This project can be very simple or quite elaborate. Define your expectations with a rubric.

ASSESSMENT

Assess student yearbooks on the basis of your rubric.

TEACHERS' GUIDE TO FISH PACKS

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GREAT LAKES YEARBOOK

Activities! Clubs! Sports! Class pictures! Yearbooks are great ways to remember the people you went to school with and what everyone did.

Could there be a Great Lakes Yearbook? What if you were in charge of getting all the plants and animals organized for the photo shoots? What if someone dropped the pictures and they got all mixed up? Would you know who belongs in each picture? Which animals would be in the Predator Club? Who's not on the Swim Team? Could you pick out the animals and plants that have moved here from other places?

Find the **Yearbook pictures** and **Pond Life field guide** in the **PARKPACK**. Using the clues on the pictures, the field guide, and any other info you can find, try to organize the pictures into these clubs, sports, and activities. Plants and animals can be in more than one group. The answers are on the back of this card, but don't peek. Good luck!

THE GREEN KEY SOCIETY

That's right, green plants are the key to life in the Great Lakes, so they deserve their own organization. Include all the producers.

CHLOROPHYLL CONSUMER CLIQUE

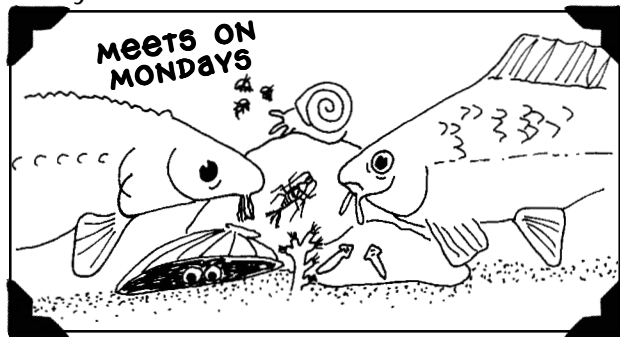
No meat eaters allowed! This group tries to keep to themselves, 'cause life isn't easy when you're an herbivore!

FEDERATION OF MEAT MUNCHERS

Animals eating other animals have a lot in common. Just be careful how you arrange them! Maybe individual pictures would be better than a group shot. Remember, meat eaters come in all shapes and sizes.

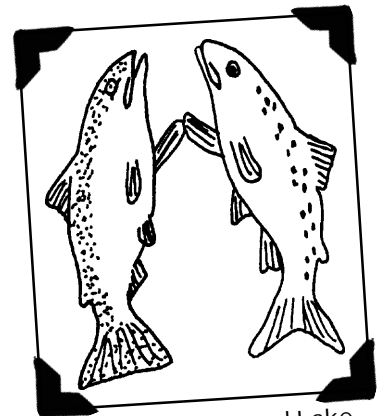
PREDATOR CLUB

This club is reserved for the elite members of the Consumer Ed class. They are the top predators in the Great Lakes ecosystem.



DECOMPOSITION CLASS

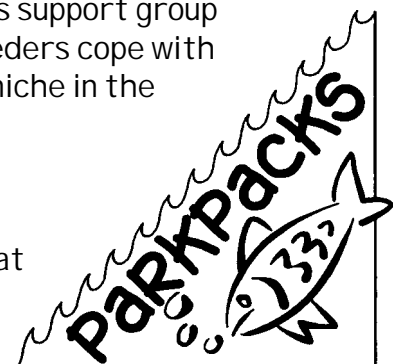
These guys don't write books, papers, or symphonies; they eat dead stuff! They also recycle the nutrients back into the Great Lakes ecosystem.



Chinook Salmon and Lake Trout congratulate each other after accepting their top predator honors.

BOTTOM FEEDERS SUPPORT GROUP

Living on the bottom can lead to poor self-esteem. This support group helps bottom feeders cope with their important niche in the lake ecosystem.

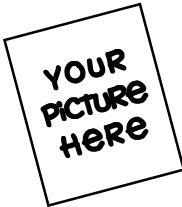


FOREIGN INVASION CLUB

These are not friendly foreign exchange students who come for a few months and then go home! These are plants and animals that have invaded the Great Lakes. People brought them here, either accidentally or on purpose. Now they are causing all kinds of problems.

CREATIVE PROBLEM SOLVING TEAM

Some animals were invited to the Great Lakes. They were brought here from other countries on purpose. Their introductions have not always been successful.

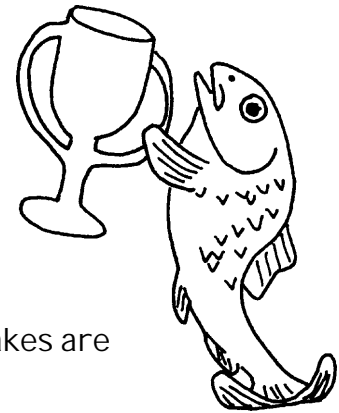


STUDENT COUNCIL

Hey, that's you! And your family, friends, and neighbors! Your actions and decisions count! You may not belong to the International Joint Commission or the Great Lakes Charter, but what you do can improve or harm the Great Lakes! Say "Cheese!"

AWARDS

Take time to single out some of the distinguished plants and animals living in the Great Lakes. Who would you recognize as . . . Most likely to succeed? Most likely to be a burden to society? Most likely to become a trophy fish? Best swimmer? Most unusual? Think of your own awards!



IN MEMORY

Not all the plants and animals that used to live in the Great Lakes are still here. Some have become extirpated or extinct.

DON'T STOP HERE!

You can create your own Great Lakes yearbook at home with magazine pictures, newspaper clippings, and imagination!

The Green Key Society - diatom, chrysophyte, cladophora, dinoflagellate
Chlorophyll Consumer Clique - snail, moss animal, mayfly nymph, midge larva
Federation of Meat Munchers - cormorant, brown trout, yellow perch, common goldeneye, slippershell, carp, bloater, human, planaria, daphnia, rainbow smelt, chinook salmon, lake sturgeon, spiny water flea, freshwater sponge, copepod, bald eagle, tern, zebra mussel, alewife, steelhead salmon, herring gull, lake trout, deepwater sculpin
Predator Club - chinook salmon, bald eagle, lake trout, brown trout, human
Decomposition Class - water mold, bacteria, moss animal, herring gull, planaria, amphipod, and other organic debris eaters
Foreign Invasion Club - zebra mussel, sea lamprey, spiny water flea, alewife
Creative Problem Solving Team - carp, brown trout, chinook salmon, steelhead salmon
Bottom Feeders Support Group - lake sturgeon, carp, planaria, amphipod, bacteria, water mold, midge larva, mayfly nymph, snail, slippershell mussel, zebra mussel
In Memory - blackfin ciscoe, deepwater ciscoe, shortnose ciscoe

PARKPACKS

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WISCONSIN Lakes Yearbook

Activities! Clubs! Sports! Class pictures! Yearbooks are great ways to remember the people you went to school with and what everyone did.

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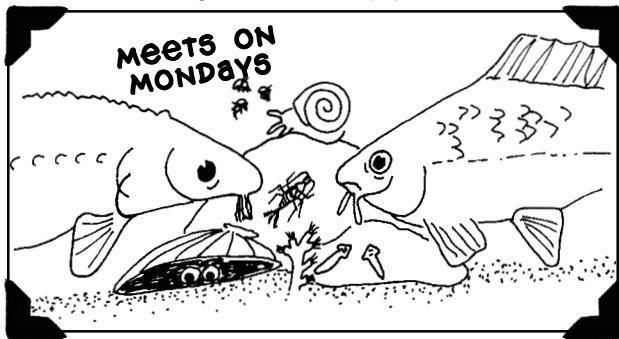
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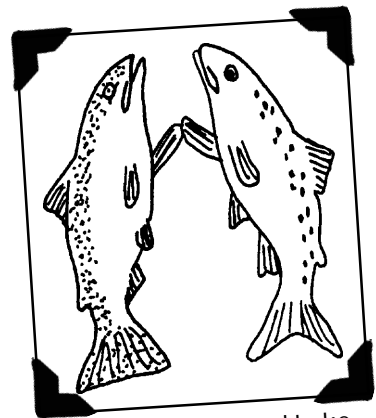
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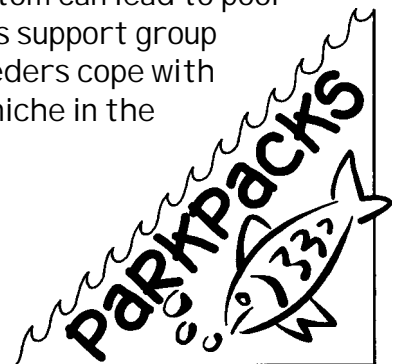
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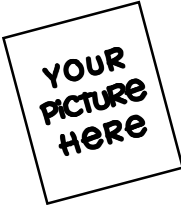


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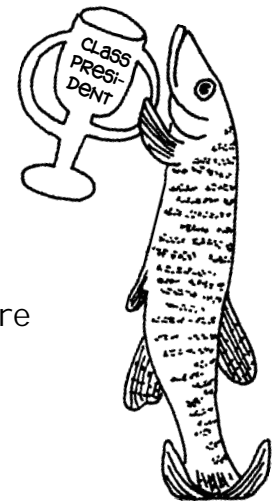


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Chlorophyll Consumer Clique - snail, moss animal, mayfly nymph, midge larva, copepod
Federation of Meat Munchers - cormorant, brown trout, yellow perch, common goldensye, slippershell, carp, human, planaria, daphnia, rainbow smelt, chinook salmon, lake sturgeon, spiny water flea, freshwater sponge, bald eagle, tern, zebra mussel, alewife, steelhead, herring gull, lake trout, rusty crayfish, longnose gar, three spine stickleback, round goby, ruffe, sea lamprey, great blue heron, painted turtle, muskellunge, pumpkinseed, largemouth bass, green frog, bullfrog, black bullhead, paddlefish, skipjack herring
Predator Club - chinook salmon, bald eagle, lake trout, brown trout, human, longnose gar, muskellunge, steelhead, great blue heron
Decomposition Class - water mold, bacteria, moss animal, herring gull, planaria, amphipod, painted turtle, rusty crayfish, copepod, carp, zebra mussel, daphnia, and other organic debris eaters
Foreign Invasion Club - zebra mussel, sea lamprey, spiny water flea, alewife, carp, Eurasian millfoil, purple loosestrife, rusty crayfish, three spine stickleback, round goby, ruffe, rainbow smelt
Creative Problem Solving Team - carp, brown trout, chinook salmon, steelhead
Bottom Feeders Support Group - lake sturgeon, carp, planaria, amphipod, midge larva, mayfly nymph, snail, slippershell mussel, zebra mussel, black bullhead, ruffe, rusty crayfish
In Memory - blackfin, deepwater, and shortnose ciscoes, and possibly skipjack herring and paddlefish

PARKPACKS

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CHOOSE YOUR RIPPLE EFFECT

Discuss the impact of personal choices on aquatic ecosystems.

OBJECTIVES

Recognize that the choices we make impact the earth.
Analyze a fictional story for deeper meanings.

WISCONSIN'S MODEL ACADEMIC STANDARDS

English Language Arts

A.8.3 Read and discuss literary and nonliterary texts in order to understand human experience

Environmental Education

B.8.5 Give examples of human impact on various ecosystems

D.8.5 Explain how personal actions can impact an environmental issue; e.g., doing volunteer work in conservation

D.8.7 Identify examples of how personal beliefs can influence environmental decisions

Social Studies

D.8.11 Describe how personal decisions can have a global impact on issues such as trade agreements, recycling, and conserving the environment

MATERIALS

Sticky Situation cards. The laminated set in the blue backpack can be used with small groups of students or at a learning center. The masters for making multiple sets are on pages 103 - 105 of this guide. Be sure you copy the cards appropriate to your location. For use on inland lakes, replace card #2 in the Great Lakes set with the card on page 108.

William the Curious: Knight of the Water Lilies. Found in the blue backpack.

PREPARATION TIME

Minimal

ACTIVITY TIME

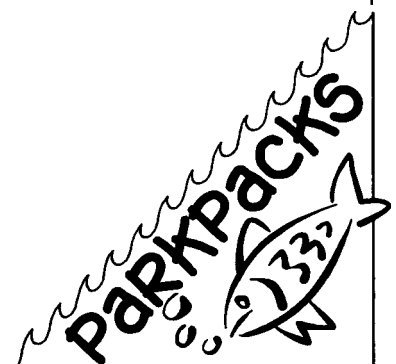
One or two 50-minute periods

SETTING

Indoors or outdoors

INSTRUCTIONAL STRATEGIES

1. Use the information on the activity card (pages 59 - 60) to introduce the topic.



2. Share the *Sticky Situations* with your students in large or small groups.
3. Read *William the Curious: Knight of the Water Lilies* and discuss the questions on page 59.

ASSESSMENT

Ask students to write their own *Sticky Situations*. Use the suggestions on page 60 or develop local situations. Allow students to read and discuss the ethical dilemmas they wrote.

ADDITIONAL RESOURCES AND IDEAS

Visit the Leave No Trace website to discover other ways that people can enjoy wild places without damaging them. <www.lnt.org>

TEACHERS' GUIDE TO FISH PACKS

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CHOOSE YOUR RIPPLE EFFECT

It's fun to watch the ripples when you throw a pebble into a lake. The waves of water radiate from the point of impact. Small and intense at first, they gradually spread out until you can barely see them. One pebble has little impact on the water!

But imagine handfuls of pebbles hour after hour, day after day, and year after year. The surface of the water is never calm. The ripples crash into each other and make waves. There is a huge ripple effect!

That's exactly what can happen in parks and on other public lands. One person should have little impact on the water and land. But what if one person leaves a piece of litter, another picks some wildflowers, someone else forgets to clean up after his pet, and a fourth person drives her dirt bike over the dunes? Hundreds and thousands of people can leave behind tiny ripples that soon become a gargantuan wave.

IT'S UP TO YOU!

The kind of ripples you leave in your wake is entirely up to you! Your lifestyle and decisions can cause major waves that crash on the shore or visible ripples of positive change. Find the **Sticky Situation cards** in the **PARKPACK**. Each card has a situation that you might face on a visit to a state property. Take turns reading them with your family and friends. Talk about what you would do in each challenging situation.

Think about the positive and negative consequences of your solutions.

READ ALL ABOUT IT!

Read *William the Curious: Knight of the Water Lilies*.

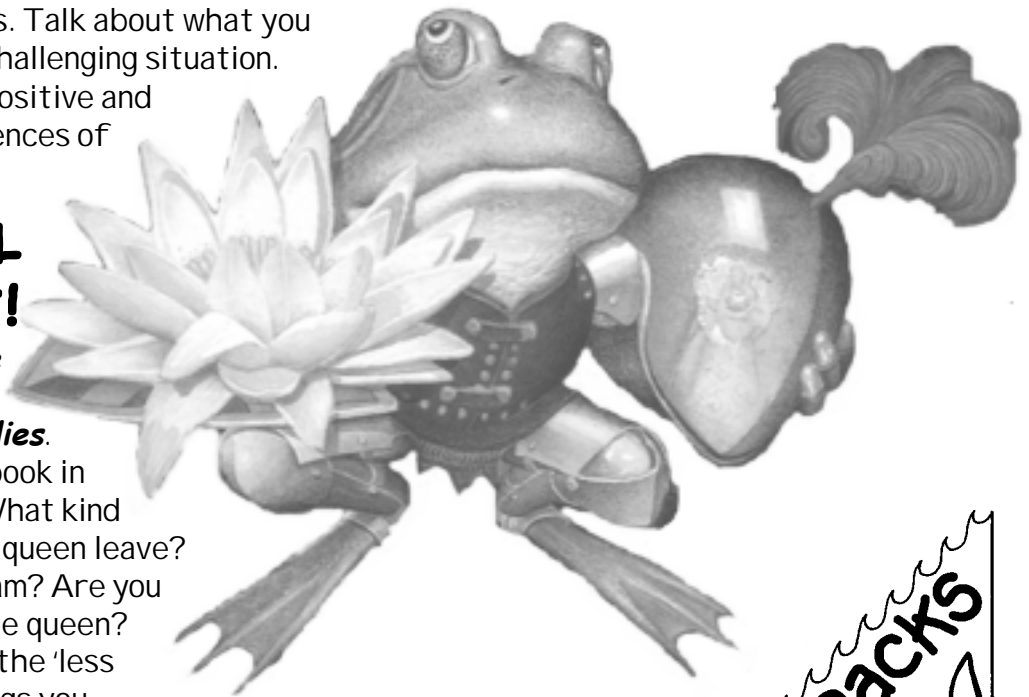
You can find the book in the **PARKPACK**. What kind of ripples did the queen leave?

What about William? Are you sometimes like the queen?

What happens to the 'less than perfect' things you discard?

Are you ever like the servants? What do you do when someone asks you to do something that will harm the earth?

Talk about a time when you have acted like William. When have you taken a risk to do something positive?



INVENT YOUR OWN STICKY SITUATIONS

How would your friends, family members, or classmates respond to other tough challenges? Create your own dilemmas and think about what you would do. Here are some ideas to get you started:

- 🌀 Jet skiing is cool – Will you ski in shallow wetlands or deep water?
- 🌀 Fishing is good – Should you leave the fish guts by the water or take them home with you?
- 🌀 Trails are muddy – Do you walk right through or make a new trail?
- 🌀 Firewood is scarce – Will you go without a fire or cut your own wood?
- 🌀 Luck is with you – Will you take home the arrowhead you found or report it to the park staff?

Leave NO TRACE

We need wild places. We also need to care for wild places as if they were our homes . . . for, in many ways, they are. *Leave No Trace* is a nationwide program that helps people know how to take care of America's public lands. When you get home, visit their website and learn more about how you can tread lightly.

<www.lnt.org>

PARKPACKS

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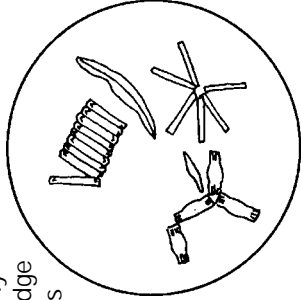
DIATOMS

YELLOW-GREEN ALGAE

DESCRIPTION. Diatoms are single-celled algae. Each diatom is formed of two halves, one of which fits over the other like the lid of a box.

DIATOMS ARE PRODUCERS. They are "the grass of the lake."

THEY ARE EATEN BY slippershells, zebra mussels, daphnia, copepods, snails, mayfly nymphs, midge larvae, moss animals, alewives, and freshwater sponges.



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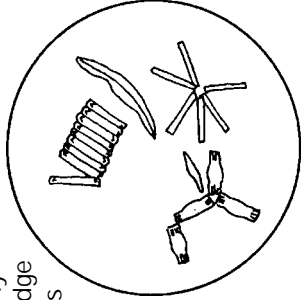
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CLADOPHORA

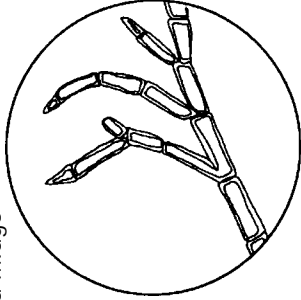
GREEN ALGAE

DESCRIPTION. Cladophora are made of long, slender cells that form branching filaments.

CLADOPHORA ARE PRODUCERS.

Cladophora convert sunlight into food. The pigment chlorophyll gives them their bright green color.

THEY ARE EATEN BY snails, mayfly nymphs, and midge larvae.



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CLADOPHORA

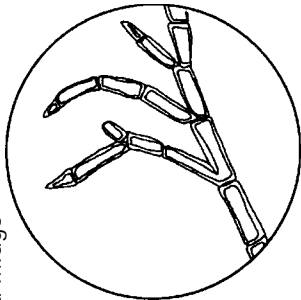
GREEN ALGAE

DESCRIPTION. Cladophora are made of long, slender cells that form branching filaments.

CLADOPHORA ARE PRODUCERS.

Cladophora convert sunlight into food. The pigment chlorophyll gives them their bright green color.

THEY ARE EATEN BY snails, mayfly nymphs, and midge larvae.



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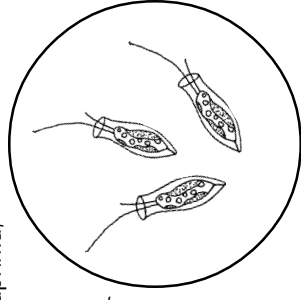
CHRYSTOPHYTES

GOLDEN-BROWN ALGAE

DESCRIPTION. Some chrystophytes have flagella for moving around in the water.

CHRYSTOPHYTES ARE PRODUCERS. They convert sunlight into food with the help of chlorophyll.

THEY ARE EATEN BY moss animals, slippershells, zebra mussels, alewives, daphnia, snails, copepods, and freshwater sponges.



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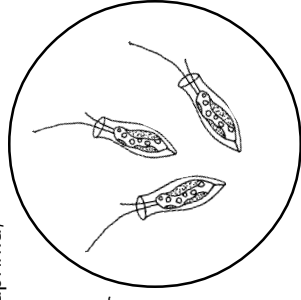
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DINOFLAGELLATES

ALGAE

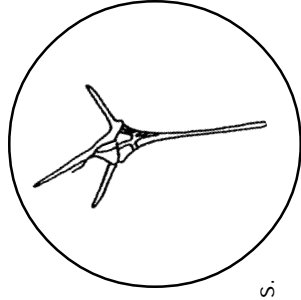
DESCRIPTION. These freshwater algae are free-swimming plants. They use their flagella to move about. In large numbers, they can cause a brown bloom on a lake.

DINOFLAGELLATES ARE

PRODUCERS. Like other plants, they can make their own food.

THEY ARE EATEN BY

copepods, zebra mussels, moss animals, daphnia, and slippershells.



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DAPHNIA

CRUSTACEANS

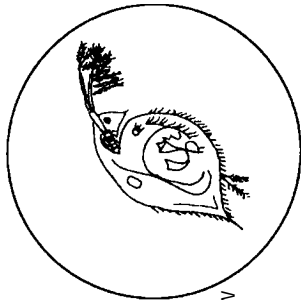
DESCRIPTION. The bodies of daphnia are enclosed in transparent cases called carapaces. They are about 0.02 inches long and look like swimming specks to the unaided eye.

DAPHNIA ARE OMNIVORES.

Daphnia feed on bacteria, diatoms, chrystophytes, organic debris, and other microscopic plants and animals.

THEY ARE EATEN BY

copepods, alewives, sculpins, bloaters, spiny water fleas, yellow perch, and ciscoes.



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DAPHNIA

CRUSTACEANS

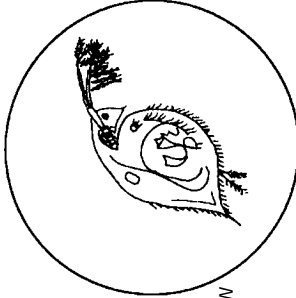
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THEY ARE EATEN BY

copepods, alewives, sculpins, bloaters, spiny water fleas, yellow perch, and ciscoes.



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COPEPODS

CRUSTACEANS

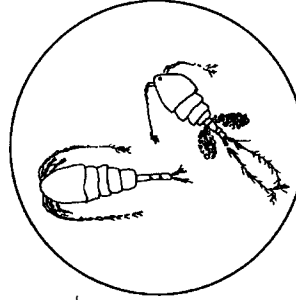
DESCRIPTION. Copepods' bodies are divided into three parts: head, thorax, and abdomen. The head has mouthparts, antennae, and one eye. They are less than 1/8 inch long.

COPEPODS ARE OMNIVORES.

Copepods feed on chrysophytes, diatoms, planaria, dinoflagellates, and organic debris.

THEY ARE EATEN BY

spiny water fleas, ciscoes, alewives, sculpins, and zebra mussels.



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COPEPODS

CRUSTACEANS

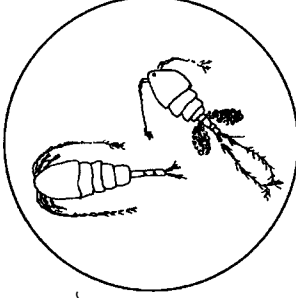
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COPEPODS ARE OMNIVORES.

Copepods feed on chrysophytes, diatoms, planaria, dinoflagellates, and organic debris.

THEY ARE EATEN BY

spiny water fleas, ciscoes, alewives, sculpins, and zebra mussels.



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AMPHIPODS

CRUSTACEANS

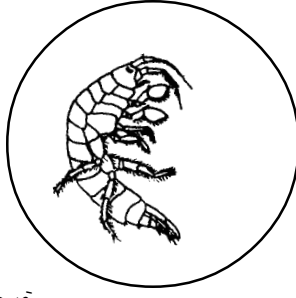
DESCRIPTION. Amphipods are also called sideswimmers. They usually live close to the bottom and avoid light.

AMPHIPODS ARE SCAVENGERS.

They eat plant and animal debris.

THEY ARE EATEN BY

lake sturgeon, deepwater sculpins, carp, smelt, spiny water fleas, deepwater ciscoe, and lake trout.



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FRESHWATER

SPONGES

PORIFERA

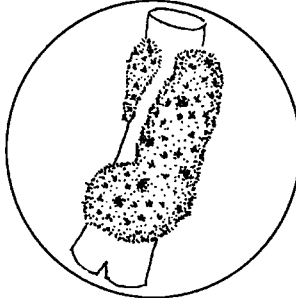
DESCRIPTION. Most sponges live in the ocean, but a few are adapted to freshwater. They are simple animals.

SPONGES ARE FILTER FEEDERS.

They filter diatoms, chrysophytes, and moss animals from the water.

THEY ARE EATEN BY

very few animals, because their bodies are supported by a skeletal system of sharp spicules.



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PLANARIA

FLATWORMS

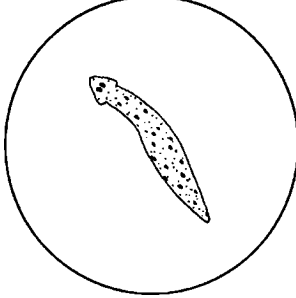
DESCRIPTION. Flatworms have soft, flat bodies. They are very simple animals. Their mouth is the only opening to their digestive tract. You can probably guess what that means!

FLATWORMS ARE PREDATORS.

Flatworms eat daphnia, copepods, and other small animals, living or dead.

THEY ARE EATEN BY

smelt, yellow perch, deepwater sculpin, carp, and lake sturgeon.



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SNAILS

MOLLUSKS

DESCRIPTION.

Snails are soft-bodied animals enclosed in spiral, cone-shaped shells. They have distinct heads with sensory tentacles.

SNAILS ARE HERBIVORES. They eat by scraping little pieces of cladophora and other algae with their radulas (file-like tongues).

THEY ARE EATEN BY herring gulls, common goldeneyes, carp, and sturgeon.



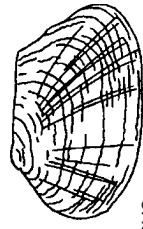
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SLIPPERSHHELLS

MOLLUSKS

DESCRIPTION.

Slippershells are freshwater mussels. They have a soft body enclosed in a two-part shell. Slippershells measure 2 - 2 1/2 inches at the widest point.



SLIPPERSHHELLS ARE FILTER

FEEDERS. They feed on chrysophytes, diatoms, dinoflagellates, daphnia, and copepods as they filter water in and out of their shells.

THEY ARE EATEN BY sturgeon, carp, and goldeneyes. They are most likely to be eaten when they are young.

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MAYFLIES

INSECTS

DESCRIPTION.

Mayflies are beautiful insects with large wings that look like netting. As adults, they live for only a few hours or days. The nymphs are aquatic.



MAYFLY NYMPHS ARE

HERBIVORES. They eat cladophora, chrysophytes, diatoms, other algae, bacteria, and dead plants.

THE NYMPHS ARE EATEN BY

ciscoes, sculpins, perch, bloaters, and young trout and salmon. When the adults die, they often float on the water and are eaten by fish.

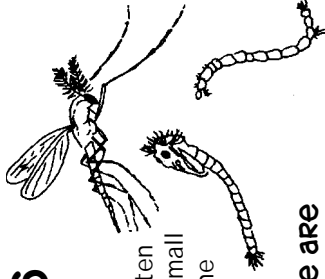
© 2002 Great Lakes ParkPacks - Lake Life 18

MIDGES

INSECTS

DESCRIPTION.

Midges are often mistaken for small mosquitoes. The larvae are aquatic.



MIDGE LARVAE ARE

HERBIVORES. They feed on diatoms, chrysophytes, cladophora, other algae, and organic matter in the water. Some midges do not feed as adults.

THE LARVAE ARE EATEN BY

ciscoes, sculpins, smelt, perch, bloaters, and young trout and salmon.

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DEEPWATER

SCULPINS

FISH

DESCRIPTION. Sculpins are grayish-brown to light brown fish about 5 inches long. They are scaleless and have large fanlike fins. Their heads are large and flattened.



SCULPINS ARE PREDATORS.

They eat midge larvae, amphipods, daphnia, copepods, planaria, and small fish.

THEY ARE EATEN BY larger fish including lake trout. Alewives also feed on larval sculpins.

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DEEPWATER

CISCOES

FISH

DESCRIPTION. Deepwater ciscoes averaged 11 inches in length and 1.5 pounds in weight. They were silvery with a faint pink to purple iridescence above the lateral line.



CISCOES WERE PREDATORS.

Ciscoes fed on daphnia, copepods, amphipods, mayfly nymphs, and midge larvae.

THEY WERE EATEN BY larger fish, but they are presently considered extinct. **Sorry, you can't make a food chain with deepwater ciscoes!**

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BLOATERS

FISH

DESCRIPTION.

Bloaters are silvery with some pink or purple iridescence. They grow about 8 - 10 inches long and weigh 6 - 9 ounces.



BLOATERS ARE PREDATORS. They eat daphnia, copepods, amphipods, midge larvae, and fish eggs.

THEY ARE EATEN BY lake trout, salmon, terns, and other large predators.

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YELLOW PERCH

FISH

DESCRIPTION.

Perch are small fish with a yellow-green to yellow color and 6 - 7 dark vertical bands on their sides. They reach 5 - 9 inches and weigh 4 - 10 ounces.



PERCH ARE PREDATORS. They eat most anything but prefer midge and mayfly larvae, daphnia, spiny water fleas, copepods, amphipods, and small fishes. As they grow, they switch to a diet of minnows and small fish.

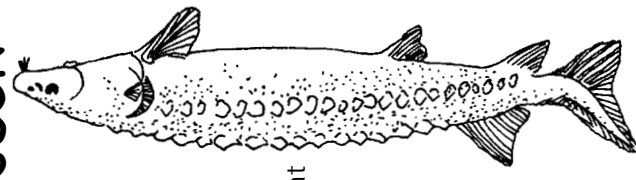
THEY ARE EATEN BY salmon, trout, eagles, and cormorants. They are also savored by human predators!

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LAKE STURGEON

FISH

DESCRIPTION. Lake sturgeon are very primitive-looking fish with rows of armor-like bony plates along their sides.



STURGEON ARE

OMNIVORES. They eat slippershells, snails, amphipods, midge larvae, copepods, mayfly nymphs, and other invertebrates.

ADULTS ARE EATEN

BY few predators other than people; however, their eggs are eaten by carp.

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LAKE TROUT

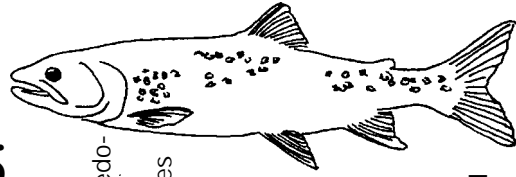
FISH

DESCRIPTION. Lake trout are fast, torpedo-shaped fish. They average 15 - 20 inches in length and weigh about 7 - 12 pounds.

TROUT ARE

PREDATORS. Young lake trout eat daphnia, copepods, amphipods, and small fish. Adults eat alewives, smelt, sculpins, ciscoes, and bloaters.

YOUNG ARE EATEN BY larger predatory fish. Adults are only sought by humans and sea lampreys.



HERRING GULLS

BIRDS

DESCRIPTION. Gulls are great filers

with long wings and square tails. Herring gulls have gray backs and wings. Their wings have black tips with white spots. Their bills are yellow with a red spot.

HERRING GULLS ARE

SCAVENGERS. They eat smelt, zebra mussels, snails, plants, garbage, and carrion (dead animals). **THEY ARE EATEN BY** eagles and other birds of prey.



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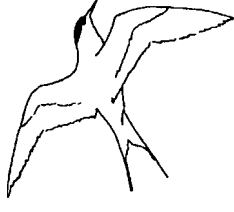
TERNs

BIRDS

DESCRIPTION. Terns are a little smaller than gulls. They have deeply forked tails and slender wings.

TERNs ARE PREDATORS. They feed on perch, alewives, bloaters, other small fish, mayflies, midges, and large insects.

THEY ARE EATEN BY eagles and other birds of prey.



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COMMON

GOLDENEYES

BIRDS

DESCRIPTION. Male goldeneyes have white bodies, black backs, and glossy-green heads. Females are grayish with a white neck ring and brown head.

GOLDENEYES ARE OMNIVORES. In winter, these ducks feed mainly on snails, slippershells, and zebra mussels. In summer, they feed on aquatic plants and insects.

THEY ARE EATEN BY eagles and humans.



CORMORANTS

BIRDS

DESCRIPTION. Cormorants are large blackish water birds. The skin on their faces is colorful, and their beaks are slender and hooked.

CORMORANTS ARE

PREDATORS. They eat alewives, smelt, yellow perch, sea lampreys, and larger crustaceans.

THEY ARE EATEN BY eagles. They are also shot accidentally, and on purpose, by humans.



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BALD EAGLES

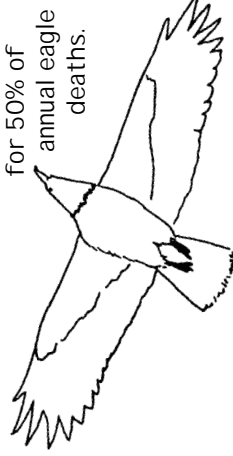
BIRDS

DESCRIPTION. Bald eagles grow their white head and tail feathers when they are four to five years old. Until then, they resemble big, brown hawks. Their wingspan is 6 - 7 1/2 feet.

BALD EAGLES ARE TOP

PREDATORS. They feed mainly on trout and salmon.

THEY ARE EATEN BY almost nothing! Illegal shooting accounts for 50% of annual eagle deaths.



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HUMANS

MAMMALS

DESCRIPTION. Humans come in a variety of sizes, shapes, and colors. They use tools to capture their food.

HUMANS ARE OMNIVORES. They capture trout, salmon, perch, smelt, and common goldeneye from the Lakes.

HUMANS ARE TOP

PREDATORS in Great Lakes food chains.



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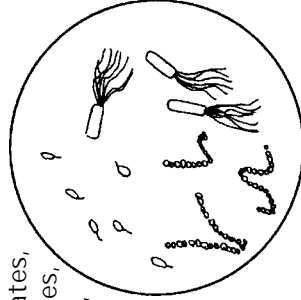
BACTERIA

DESCRIPTION. Bacteria are microscopic. They are believed to be among the simplest living organisms.

BACTERIA ARE DECOMPOSERS. Many bacteria obtain their nutrients from animal wastes and particles of decaying plants and animals.

THE NUTRIENTS THEY RECYCLE ARE USED BY

dinoflagellates, chrysophytes, cladophora, diatoms, and other phytoplankton.



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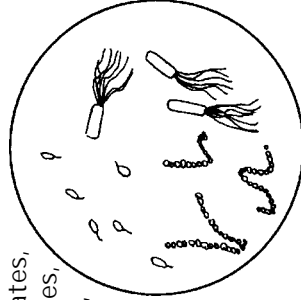
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WATER MOLDS

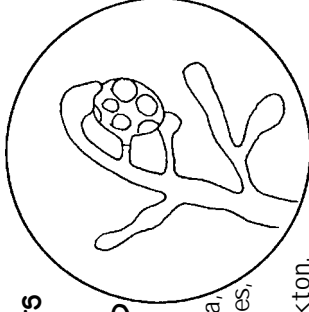
AQUATIC FUNGI

DESCRIPTION. Water molds look like whitish, fuzzy growths spreading over dead or living plants and animals.

WATER MOLDS ARE DECOMPOSERS. Fungi are not able to produce food. Some fungi are saprophytes, feeding on dead things; others are parasites, feeding on living things.

THE NUTRIENTS THEY RECYCLE ARE USED BY

diatoms, cladophora, chrysophytes, and other phytoplankton.



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STEELHEAD

FISH

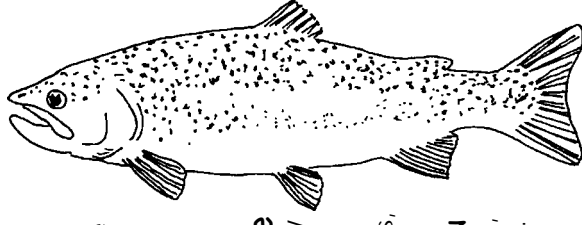
DESCRIPTION.

Steelhead, or rainbow trout, are large fish. They average 25 - 30 inches and 8 - 15 pounds.

STEELHEADS ARE PREDATORS. They eat spiny water

fleas, daphnia, copepods, alewives, and smelt.

THEY ARE EATEN BY chinook salmon, eagles, and people.



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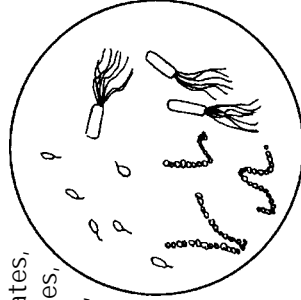
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WATER MOLDS

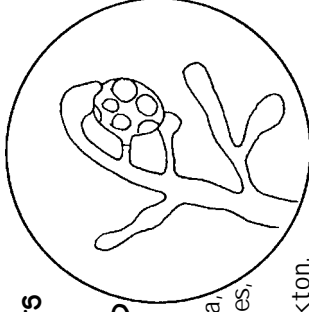
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STEELHEAD

FISH

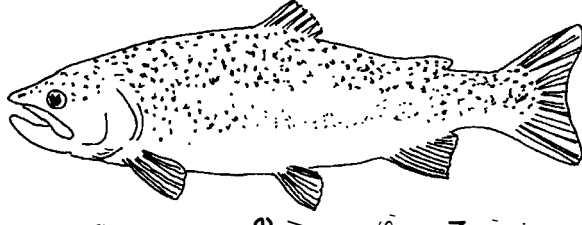
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THEY ARE EATEN BY chinook salmon, eagles, and people.



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BROWN TROUT

FISH

DESCRIPTION.

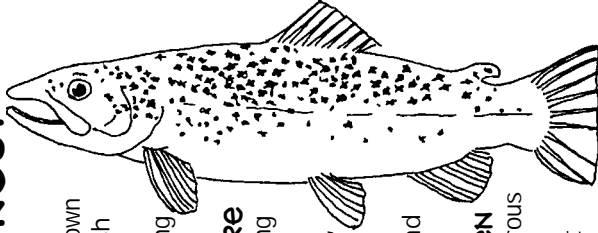
Brown trout are large fish measuring 16 - 30 inches and weighing up to 30 pounds.

BROWN TROUT ARE PREDATORS.

Young brown trout eat daphnia, copepods, and spiny water fleas. Adults eat alewives, smelt, and other fish.

YOUNG ARE EATEN BY

larger carnivorous fish. The main predators of adult brown trout are humans and sea lampreys.



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CHINOOK SALMON

FISH

DESCRIPTION.

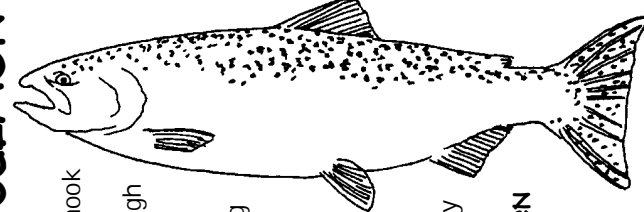
Chinook salmon average 34 inches long and weigh about 16 pounds.

CHINOOKS ARE PREDATORS.

Young chinooks feed on daphnia, copepods, and other zooplankton until they are large enough to eat fish. Adults eat primarily alewives and smelt.

ADULTS ARE EATEN BY

humans and lampreys.



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RAINBOW SMELT

FISH

DESCRIPTION.

Smelt are a saltwater species that naturally enter freshwater to spawn (reproduce). When smelt are introduced into inland lakes, they become invasive. They are only 7 - 9 inches long.

SMELT ARE PREDATORS.

They eat copepods, amphipods, planaria, daphnia, midge larvae, and mayfly nymphs.

THEY ARE EATEN BY

trout, salmon, cormorants, eagles, herring gulls, and humans.



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CARP

FISH

DESCRIPTION.

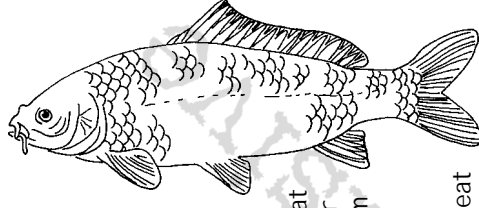
Carp can reach a length of 16 - 18 inches and weight of 30 - 40 pounds. They have two sets of barbels (whiskers) at the corners of their mouths to help them feel for food.

CARP ARE OMNIVORES.

They eat snails, amphipods, small fish, slipper shells, planaria, worms, plants, and organic debris.

YOUNG CARP AND CARP EGGS ARE EATEN BY

birds and larger fish. Adults are parasitized by lampreys.



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Alewives

FISH

DESCRIPTION.

Alewives are small ocean fish related to herring. They grow to about 6 inches in length.

Alewives are omnivores. They eat daphnia, copepods, amphipods, other plankton, and eggs.

They are eaten by cormorants, gulls, terns, trout, and salmon.

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Sea Lampreys

FISH

DESCRIPTION. Sea lampreys are members of an ancient family of "jawless fishes." These eel-like fish are 12 - 20 inches long.

Sea lampreys are parasites. As adults, they use their raspy, disc-

shaped mouths to hold fast to salmon and trout and feed on blood and body fluids.

They are eaten by bald eagles, cormorants, and salmon. Small fish feed on lamprey eggs.

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FISH

DESCRIPTION.

Alewives are small ocean fish related to herring. They grow to about 6 inches in length.

Alewives are omnivores. They eat daphnia, copepods, amphipods, other plankton, and eggs.

They are eaten by cormorants, gulls, terns, trout, and salmon.

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Spiny Water Fleas

CRUSTACEANS

DESCRIPTION. Spiny water fleas have long tail spines that are barbed and sharp. They are large zooplankton, measuring about 1 centimeter in length.

Spiny water fleas are predators. They eat daphnia, copepods, and small larval fish.

They are eaten

by salmon, trout, and yellow perch. It is hard for small fish to swallow them because of their spines.

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Zebra Mussels

MOLLUSKS

DESCRIPTION.

Zebra mussels range in size from dimes to quarters. Unlike native mussels, zebra mussels secrete byssal threads which they use to attach themselves to nearly any surface.

Zebra mussels are filter feeders. They filter diatoms, chrysophytes, dinoflagellates, other plankton, and bits of organic debris from the water.

They are eaten by goldeneyes and herring gulls. Not enough are eaten to control the growth of their population.

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Zebra Mussels

MOLLUSKS

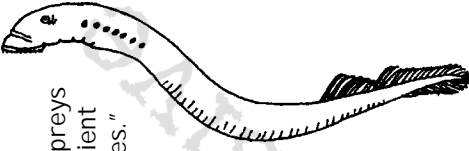
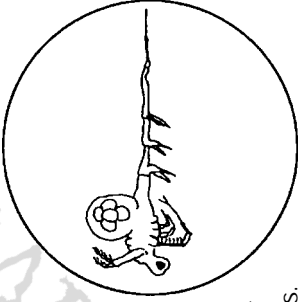
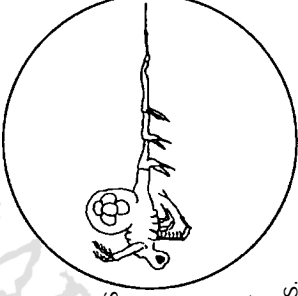
DESCRIPTION.

Zebra mussels range in size from dimes to quarters. Unlike native mussels, zebra mussels secrete byssal threads which they use to attach themselves to nearly any surface.

Zebra mussels are filter feeders. They filter diatoms, chrysophytes, dinoflagellates, other plankton, and bits of organic debris from the water.

They are eaten by goldeneyes and herring gulls. Not enough are eaten to control the growth of their population.

© 2002 Great Lakes ParkPacks - Lake Life 48



Fishhook flea competes with native fish for prey. Go back 3 spaces.



Rival for Survival

Invasive Species in the Great Lakes

A sea lamprey hitched a ride on your boat. Take an extra turn.

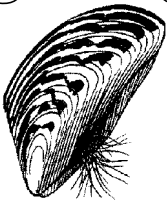


Free roll

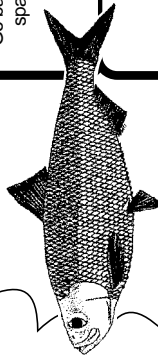


Leaping lamprey! Jump ahead 3 spaces.

Zebra mussels clogged your path. Go ahead 4 spaces.



Spotted purple loosesirife. Go back 1 space.

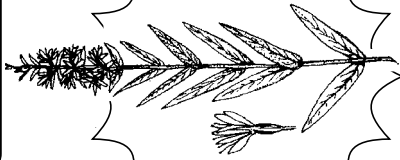


Caught an alewife. Jump back 2 spaces.

Use the map to identify the five Great Lakes. If you name them correctly, go back 4 spaces.



Encountered Eurasian watermilfoil. Trade spots on the board with the person on your right.



Go back 1 space for not dumping your bait water in the lake.

FINISH



Exact number required to arrive at the Great Lakes.

START

Sea Grant
Great Lakes Network

Developed by Pauline LeCascio, Carry Mielke, and Gwen Petrosini-McLaughlin as part of the Exotic Species Day Camp Education

All drawings used with permission. Fishhook flea provided by Backhaus Publishers, London, the Netherlands. Purple loosesirife drawings provided by Ohio Sea Grant Education Program. All other illustrations by the U.S. National Museum of Natural History, Minneapolis, Minnesota.

TEACHERS' GUIDE TO FISH PACKS

© 2003 BUREAU OF FISHERIES MANAGEMENT & HABITAT PROTECTION
WISCONSIN DEPARTMENT OF NATURAL RESOURCES
WISCONSIN ENVIRONMENTAL EDUCATION BOARD

Your aquarium is no longer functioning. You decide to get rid of the fish. What should you do?

- a. Flush them.
- b. Find them a new home in another aquarium.
- c. Drop them in the local pond.

1

How many of these species are non-native: goldfish, purple loosestrife, sea lamprey, starling?

- a. 1
- b. 3
- c. 4

3

Some non-native species can be invasive. How many of these are invasive species - carp, alewife, purple loosestrife, zebra mussel, sea lamprey?

- a. 2
- b. 3
- c. 5

5

The role an organism has in its environment is its *niche*. What niches do invasive species fill?

- a. They try to take over the niches of other organisms in an ecosystem.
- b. Invasive species don't have niches.
- c. Invasive species aren't organisms.

7

How could you find out about invasive species in this part of Wisconsin?

- a. Contact the local Department of Natural Resources or University of Wisconsin Sea Grant office.
- b. Complete an Internet search on the topic.
- c. Do both a and b.

9

What should you do when you move your boat from one lake to another?

- a. Pull your boat out quickly and move it without delay.
- b. Inspect your boat, trailer, and equipment and remove all vegetation and animal life.
- c. Wash your boat in cold water.

2

Bringing in natural predators may be the best way to handle invasive plant species. Which of these could be a potential problem?

- a. The invasive plant could decrease.
- b. The introduced predators may not die out after the plants are gone.
- c. Native plants might repopulate the area.

4

You find a beautiful plant while on vacation in Mexico. What do you do?

- a. Take a picture.
- b. Dig it up and transplant it in your garden.
- c. Pick the flowers off of it.

6

How many liters of water does a zebra mussel filter each day?

- a. 0.25
- b. 0.50
- c. 1.0

8

The sea lamprey is an invasive species in the Great Lakes. Why is it so damaging to other fish?

- a. It eats their eggs.
- b. It carries a large number of diseases.
- c. It uses its sucker-like mouth to suck the blood and body tissues of other fish.

10

Answers

- a = Minus 1 pt. Not a good idea. You might transfer species from one body of water to another.
- b = 3 pts. Good decision! You ensure there are no organisms transported on your boat.
- c = 1 pt. Hot water would be better. Use 104°F water to remove all organisms.

2

Answers

- a = 0 pts. This is what we want to happen!
- b = 3 pts. Yes! This could be a very real problem. Researchers need to make sure that they don't just trade one invasive species for another.
- c = 0 pts. This is a positive result of introducing a natural predator. The question asked for a potential problem.

4

Answers

- a = 3 pts. Correct! You can enjoy the plant without damaging it or carrying it into an ecosystem not its own.
- b = Minus 1 pt. You risk introducing an invader species into your yard.
- c = 0 pts. This could damage the plant.

6

Answers

- a = 0 pts. Sorry, guess again!
- b = 0 pts. Closer, but not quite.
- c = 3 pts. You got the right answer!

8

Answers

- a = 0 pts. Not true.
- b = 0 pts. Not the problem.
- c = 3 pts. Gross, but true.

10

Answers

- a = 0 pts. Not a good idea.
- b = 3 pts. This is the best thing to do.
- c = Minus 1 pt. You could be introducing a new species to the pond and upsetting the ecosystem!

1

Answers

- a = 1 pt. Would you believe all four are non-natives?
- b = 2 pts. You're close!
- c = 3 pts. That's right!

3

Answers

- a = 1 pt. True, but not the best answer.
- b = 2 pts. You are getting closer.
- c = 3 pts. This is right! All are invasives!

5

Answers

- a = 3 pts. Yes, that's exactly what they try to do!
- b = 0 pts. Everything has a niche.
- c = 0 pts. All living things are organisms.

7

Answers

- a = 1 pt. Good choice, but not the best!
- b = 1 pt. Good choice, but not the best!
- c = 3 pts. This is the best choice!

9

In any ecosystem, there is a limited amount of resources. What happens to the native species when a non-native species invades and does well?

- a. The natives have more resources than before.
- b. The natives have the same amount of resources as before.
- c. The natives have fewer resources than before.

11

You find some zebra mussels on a beach. What should you do?

- a. Pick them up and throw them in the garbage.
- b. Take them home.
- c. Put them in a pond near your home.

13

How do scientists think zebra mussels entered the Great Lakes?

- a. They traveled here in the ballast water of commercial freighters.
- b. They attached to large fish.
- c. They were brought here by people to increase the mussel population.

15

While traveling through another part of the country, you encounter a small tortoise. What do you do?

- a. Put it in your aquarium.
- b. Sell it to a pet store.
- c. Leave it alone.

17

What are indigenous plants and animals?

- a. Plants and animals that are naturally found in an ecosystem.
- b. Plants and animals imported into an ecosystem.
- c. Plants and animals that can make you sick if you eat them.

19

What are non-native species?

- a. They are rare organisms.
- b. They are organisms living in an environment that is not their own.
- c. They are organisms that are worth a lot of money.

12

What are invasive species?

- a. They are plants.
- b. They are animals.
- c. They can be plants or animals.

14

When people first brought purple loosestrife into the United States, what were they hoping to do with it?

- a. Beautify wetlands.
- b. Use it in landscaping.
- c. Feed large herbivores.

16

What North American habitat is purple loosestrife invading?

- a. Deserts
- b. Forests
- c. Wetlands

18

How do non-native species influence the environments they invade?

- a. Non-native species are beneficial.
- b. Non-native species are harmful.
- c. Some species are beneficial, some are harmful, and others have no significant influence.

20

Answers

- a = 0 pts. If they were rare, they wouldn't be a problem!
- b = 3 pts. This is the correct answer.
- c = 0 pts. No, but they cost us a lot of money!

12**Answers**

- a = 1 pt. True, but not the best choice.
- b = 1 pt. Also true, but not the best choice.
- c = 3 pts. Yes!

14**Answers**

- a = 0 pts. Not true.
- b = 3 pts. This was why people brought purple loosestrife into the United States.
- c = 0 pts. No animals native to the United States eat purple loosestrife.

16**Answers**

- a = 0 pts. No, too dry.
- b = 0 pts. No, too shady.
- c = 3 pts. Yes, purple loosestrife is a wetland plant.

18**Answers**

- a = 1 pt. Sometimes true, but not often.
- b = 1 pt. Sometimes true, but not always.
- c = 3 pts. This is the best choice.

20**Answers**

- a = 0 pts. No. Since there is more competition, natives probably have fewer resources.
- b = 0 pts. No. Since there is more competition, natives probably have fewer resources.
- c = 3 pts. Yes. There are more individuals competing for the same amount of resources.

11**Answers**

- a = 3 pts. This is the best choice.
- b = 0 pts. You risk spreading them to new locations.
- c = Minus 1 pt. This is not a good choice because you may infest the pond.

13**Answers**

- a = 3 pts. True. Ballast water is used by freighters to keep the ship evenly weighted.
- b = 0 pts. Sea lampreys attach to fish; zebra mussels do not.
- c = 0 pts. Not true.

15**Answers**

- a = 0 pts. While this wouldn't hurt the environment, it could be an endangered species and should be left alone.
- b = 0 pts. Same reason as choice a.
- c = 3 pts. Best choice. You are allowing the turtle to remain in its ecosystem. Don't forget to take a picture!

17**Answers**

- a = 3 pts. This is the correct definition of indigenous.
- b = 0 pts. This is the definition of nonindigenous.
- c = 1 pt. Some may make you sick, others may not. Not the best choice.

19

What do zebra mussels do to water intake pipes?

- a. They help rebuild them.
- b. They clog them.
- c. They clean them.

21

What can a round goby eat in 1 day?

- a. 5 sea lampreys
- b. 1 pound of purple loosestrife
- c. 78 zebra mussels

22

How are native fish affected by invasive species?

- a. Invasive species prey on native fish.
- b. Invasive species compete for the same food and space as native fish.
- c. Both a and b.

23

Why don't many animals eat fishhook fleas?

- a. Their long tails, shaped like fishhooks, make them difficult for fish to swallow.
- b. They latch on to fishhooks and escape when anglers pull their poles out of the water.
- c. They stay away from fishhooks to avoid being eaten by fish.

24

How can boaters and anglers prevent the spread of zebra mussels?

- a. Wear gloves while they are fishing.
- b. Never dump their bait buckets in lakes.
- c. Wash their boats, tackle, trailers, and other equipment in 104° F water.

25

Which length is closest to the size of an adult sea lamprey?

- a. 6"
- b. 36"
- c. 18"

26

What is the most likely way that the fishhook flea arrived in the United States?

- a. It attached to other fish migrating toward the United States.
- b. It got lost.
- c. It was carried here in the ballast water of commercial freighters.

27

How might a native lake trout be killed by an aquatic invader?

- a. Round gobies could eat its eggs.
- b. A sea lamprey could carve a hole in its side and suck out its body fluids.
- c. The lake trout could try to swallow a fishhook flea and get it stuck in its digestive system.

28

How many eggs can a female zebra mussel produce in one year?

- a. 10,000
- b. 100,000
- c. 1,000,000

29

Why do anglers dislike round gobies?

- a. Round gobies eat the eggs of native fish, leaving fewer fish to catch.
- b. Round gobies tease the anglers when they don't catch any fish.
- c. Round gobies take bait from anglers' hooks.

30

Answers

a = 0 pts. This would be helpful, but it is not true.

b = 0 pts. This is also incorrect.

c = 3 pts. This is correct.

22

Answers

a = 3 pts. Exactly! This is why they are called fishhook fleas.

b = 0 pts. Sorry, this is incorrect.

c = 0 pts. Nope.

24

Answers

a = 0 pts. Sea lampreys can get bigger than that!

b = 0 pts. Wow, that would be one giant sea lamprey.

c = 3 pts. That is correct!

26

Answers

a = 2 pts. This is close. Round gobies do eat the eggs of lake trout.

b = 3 pts. Exactly, this is why the sea lamprey is so dangerous!

c = 1 pt. This might be possible.

28

Answers

a = 3 pts. Smart anglers should be concerned about this!

b = 0 pts. This is unlikely.

c = 3 pts. Yea!

30

Answers

a = 0 pts. No, zebra mussels do not help rebuild pipes.

b = 3 pts. Yes! Zebra mussels cause problems because they clog water intake pipes.

c = 0 pts. They clog pipes; they don't clean them.

21

Answers

a = 2 pts. Yes, but that's not all!

b = 2 pts. Yes, but there is more!

c = 3 pts. You got it!

23

Answers

a = 0 pts. Unfortunately, wearing gloves has nothing to do with it.

b = 3 pts. Good job! This will help prevent the spread of zebra mussels.

c = 3 pts. This too will aid in the prevention of zebra mussel infestation.

25

Answers

a = 0 pts. No, it is the sea lamprey that attaches to fish.

b = 0 pts. This is incorrect.

c = 3 pts. You got it!

27

Answers

a = 0 pts. This isn't even close.

b = 1 pt. This is getting closer.

c = 3 pts. Yes, this is correct.

29

IMAGINE - NO LAKES!

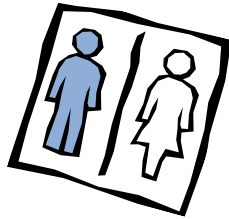
Check out how we depend on water for transportation, industry, recreation, and agriculture. Use the special pen to put an "X" next to each of the uses you find. This list was developed for use on the Great Lakes, but you can use it anywhere in Wisconsin. How many of these uses can you find?

MUNICIPAL WATER SUPPLY

The Great Lakes provide over one third of the municipal water used in the Great Lakes watershed. We use water to shower, flush toilets, brush teeth, cook, wash dishes, wash clothes, and water lawns.

Look for:

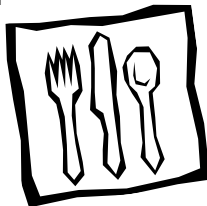
- flush toilets
- drinking fountains
- showers
- faucets



FARMING

The Great Lakes modify the climates along their shores. The shores are ideal places to grow fruits, vegetables, and other crops. Look for:

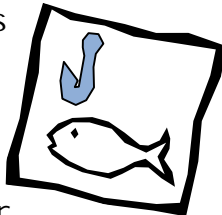
- orchards and vineyards
- produce stands
- vegetable gardens



FISHING

The Great Lakes support both commercial and sport fishing. Look for:

- commercial fishing boats
- fish markets
- bait and tackle shops
- charter fishing boats
- anglers
- net markers in the water



INDUSTRY

Industries use water for the manufacture of steel, chemicals, food, pulp, and paper. Many industries also use lake water for recycling waste discharges and cooling their equipment.

Look for:

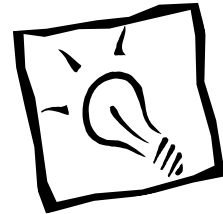
- smokestacks
- factories
- intake pipes
- discharge pipes



ELECTRIC POWER GENERATION

Electric utilities use Great Lakes water for steam condensers, service water, and boiler feedwater. Look for:

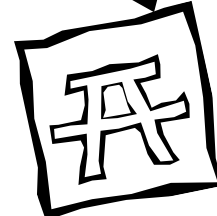
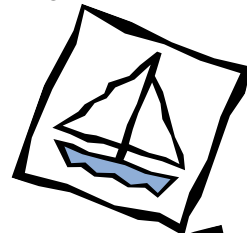
- dams for hydroelectric power
- power plants
- high tension power lines



TOURISM & RECREATION

Millions of people come to the Great Lakes to recreate. There are many attractions and services available to them. Look for:

- kayaks
- sailboats
- jet skis
- fishing boats
- campgrounds
- parks
- beaches
- vacation resorts
- golf courses
- gift/craft shops
- restaurants

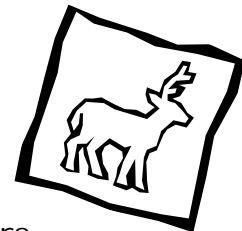


INSPIRATION & RELAXATION

People come do their own thing, too.

Look for:

- storytellers
- painters
- songwriters
- sand castlers
- photographers
- wildlife watchers



TRANSPORTATION/SHIPPING

The Great Lakes provide a quick and economical way to move raw materials and finished products. Ships carry iron ore, coal, limestone, and grain. Look for:

- harbors and ports
- locks
- buoys

- lighthouses
- ferries
- railroad stations where cargo is transferred to ships
- piles, tanks, and crates waiting to be shipped
- all kinds of boats and ships!

SILHOUETTES, INSIGNIAS, & FLAGS

Transportation on the Great Lakes means big money. If you watch long enough, you will see ships from many companies flying the flags of many nations! Use these pictures to help you sort out the kinds of vessels and to guess what they might be doing on the lakes.



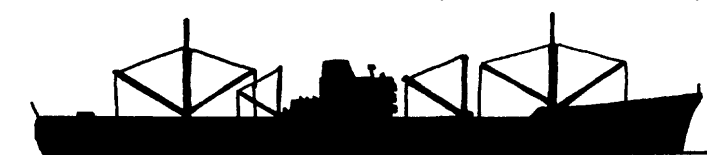
SELF-UNLOADING BULK FREIGHTER (500 - 1000 FEET)



LAKES BULK FREIGHTER (600 - 800 FEET)



OCEAN BULK FREIGHTER (500 - 730 FEET)



OCEAN CARGO VESSEL (500 - 730 FEET)



CAR FERRY (400 FEET)



DREDGE (100 - 200 FEET)



FISHING TUG (40 FEET)



SPORT FISHING BOAT (25 FEET)



PILOT BOAT (40 - 75 FEET)



HARBOR TUG (50 - 100 FEET)



COAST GUARD CUTTER (180 FEET)

Most ships on the Great Lakes are owned by private companies. These ships can be distinguished by their hull colors and smoke stack markings. Some government agencies such as the Army Corps of Engineers (insignia at right) also have their own distinctive fleet insignia.

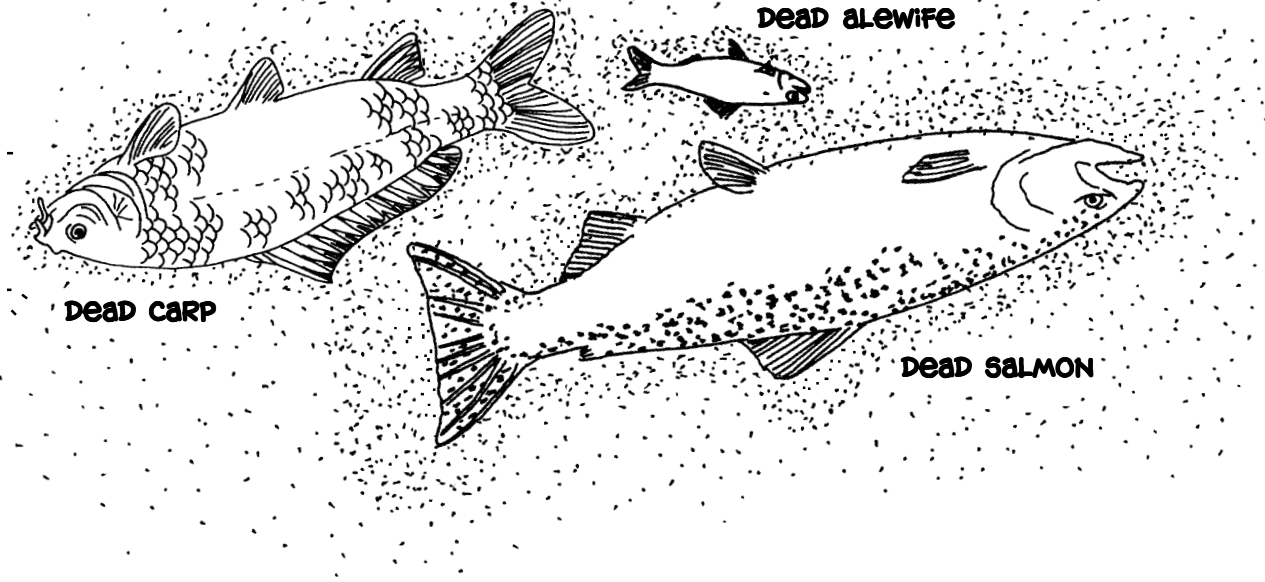


Ships registered in more than 60 countries visit Great Lakes ports annually, but most ships fly American or Canadian flags.

Special thanks to the Army Corps of Engineers for granting permission to reproduce some of these silhouettes from their website. This activity card is from the Great Lakes: Glacial Gifts ParkPack produced by WEEB, WDNR, and UW Sea Grant.

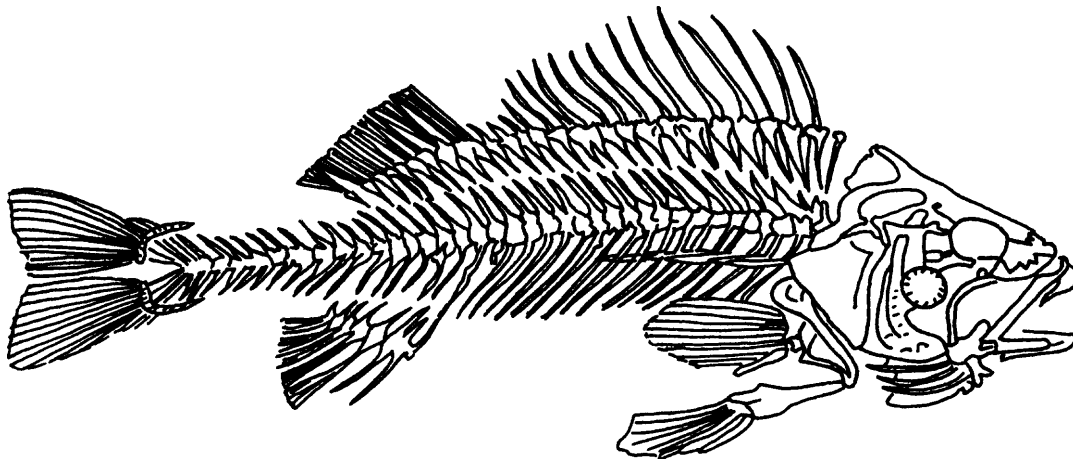
WHAT KIND OF FISH IS IT?

It's going to help if you know what kind of fish you are dealing with. Use the *Fishes* field guide and *Match Your Catch!* wildcards in the **PARKPACK** to try to identify your dead fish. Hint: The colors on fish fade quickly when they die, so that's not a great clue.



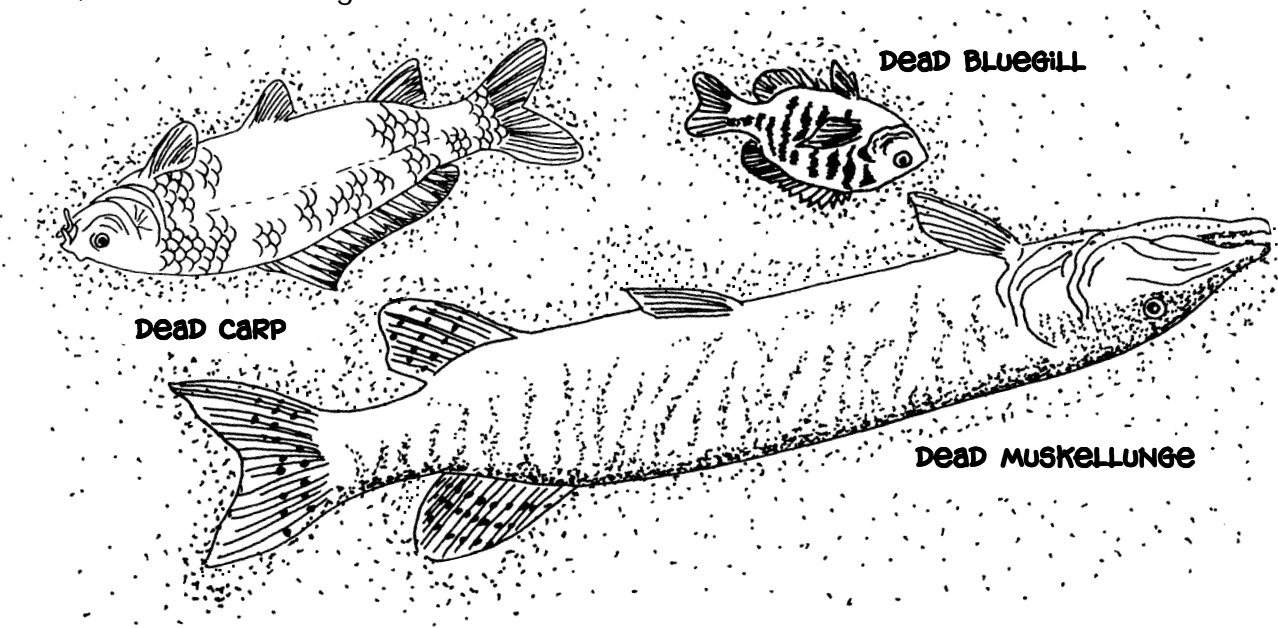
Of course, if all you have is a skeleton, you have a major mystery! Typically fish bones are very lightweight. The water helps to support the fish so the bones are primarily places for muscles to attach. Unfortunately, paper-thin bones are going to be crushed easily!

Look at the fish bones you found. What part of the fish's body do you think they came from?



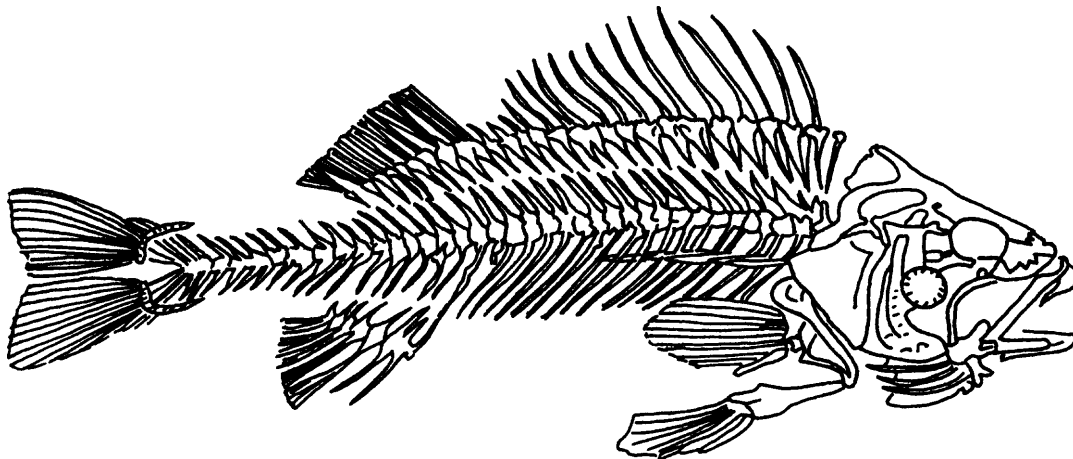
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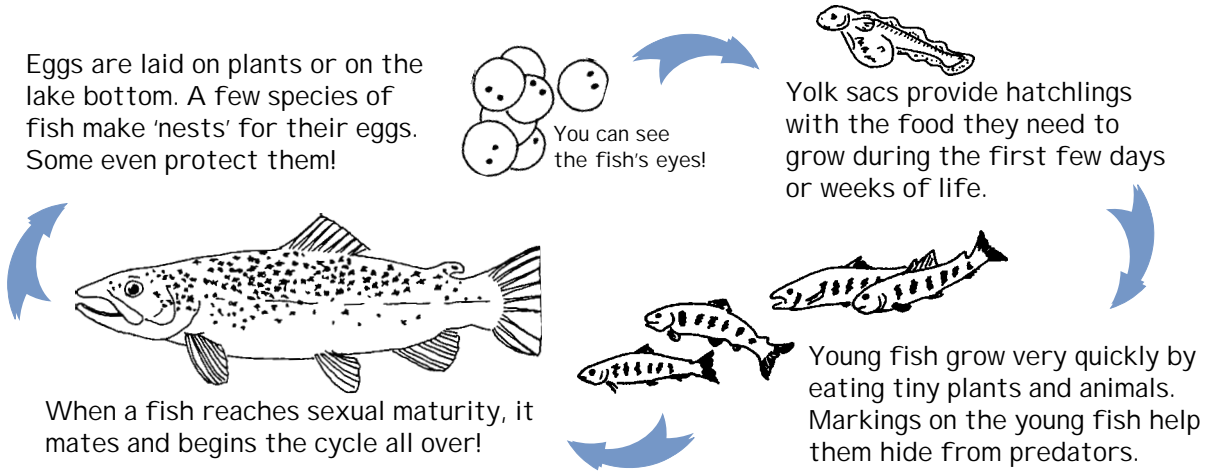
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For Inland Lakes - Use this card instead of page 77.

WHAT STAGE OF LIFE IS IT IN?

Fish are more likely to die at certain times in their lives than others. Take a look at this typical fish life cycle. When do you think fish are most likely to be eaten? When would it be most difficult for them to find the things they need to survive?



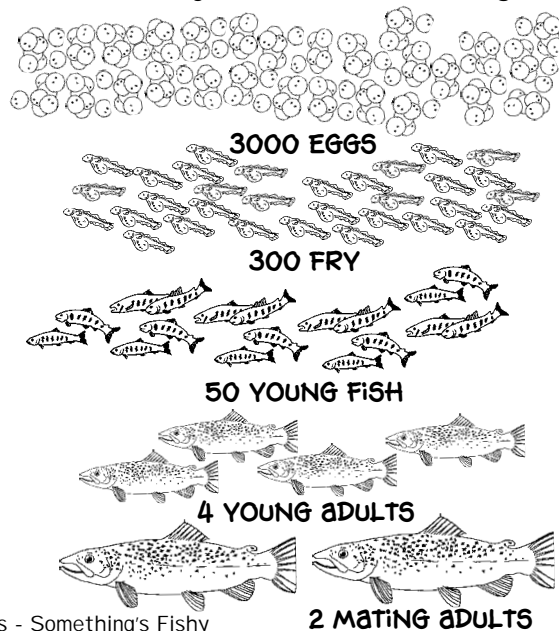
Check out the **Trout Life Cycle** plastimount in the **PARKPACK**. You can see *exactly* how the egg, fry, and fingerling stages of trout look. Cool!

THE CHANCES OF SURVIVAL

Most species of fish provide no care for their young. The parent fish release thousands of eggs and milt (sperm) into the water and then they swim away! The chances of survival are not good. Take a look at the chart below. On average, only 2 of 3000 trout eggs make it to maturity. Instead of asking "Why do fish die?", we might be better off asking "How do **any** survive?"

FISH STOCKING

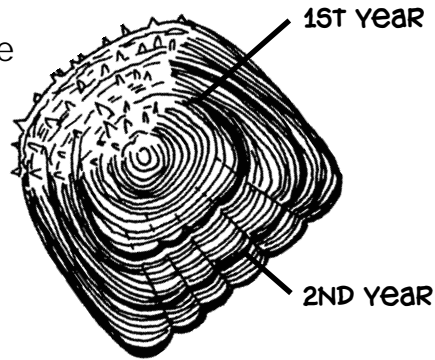
Without help, chinook salmon, coho salmon, and steelhead wouldn't last long in the Great Lakes! Hatcheries help these fish reproduce by collecting the eggs and raising the young fish. The hatchery-reared fish are stocked (released) into streams that run into Lake Michigan. You can watch the process at hatcheries and collection facilities along Lake Michigan tributaries.



HOW OLD WAS YOUR FISH?

Fish have the same number of scales throughout their lives. What changes is the size of the scales. As fish grow, the scales grow too, forming growth rings called circuli (cir-cu-lie). These growth rings are similar to the rings you see in a tree cross-section. In summer, when the water is warm and food is plentiful, fish growth is fast and the individual circuli are widely spaced. In winter, the circuli grow so close together that they appear as a thick dark ring.

Annual rings in fish scales give fish biologists some of the same information that annual rings in trees give foresters. By checking out the rings, biologists can learn about fish health, competition, and water quality.



THIS SCALE CAME FROM A FISH IN ITS 3RD YEAR

AGING FISH

Most scale rings are too small to see without a microscope. But don't worry, there are other ways of aging fish! Fish biologists also use length, weight, average lifespan, and sexual maturity to determine age.

Here are some age/length estimates for three kinds of fish you might find dead on the beach.

ALEWIFE

Check out the chart! An alewife grows very fast in its first year! Few alewives live beyond 5 or 6 years, but some live 8 to 10 years.

Age in years	birth	1	2	3 and older
Length	only this long!	5 1/2"	6"	7" and up

SALMON

Dead chinook salmon are probably 5 years old or less. That's because salmon usually reach sexual maturity and spawn (reproduce) by their fifth year. They die after spawning.

Age in years	1	2	3	4 and older
Length	10"	25"	34"	40" and up

CARP

Carp can live a long time. They usually live 9 - 15 years, but one lived 47 years!

Age in years	1	2	3	4	5	6	7	8	9	10	11	12 and older
Length	8"	12"	16"	19"	21"	23"	24"	25"	26"	27"	29"	30" and up

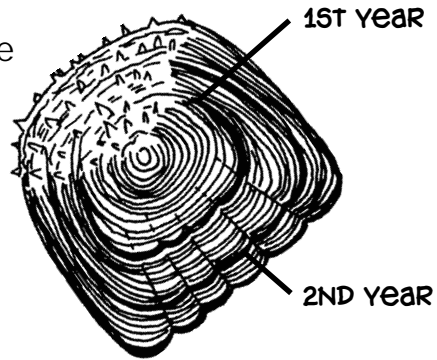
HOW OLD WAS YOUR FISH?

Fish have the same number of scales throughout their lives. What changes is the size of the scales. As fish grow, the scales grow too, forming growth rings called circuli (cir-cu-lie). These growth rings are similar to the rings you see in a tree cross-section. In summer, when the water is warm and food is plentiful, fish growth is fast and the individual circuli are widely spaced. In winter, the circuli grow so close together that they appear as a thick dark ring.

Annual rings in fish scales give fish biologists some of the same information that annual rings in trees give foresters. By checking out the rings, biologists can learn about fish health, competition, and water quality.

AGING FISH

Most scale rings are too small to see without a microscope. But don't worry, there are other ways of aging fish! Fish biologists also use length, weight, average lifespan, and sexual maturity to determine age.



THIS SCALE CAME FROM A FISH IN ITS 3RD YEAR

Here are some age/length estimates for three kinds of fish you might find dead on the shore.

CARP

Carp can live a long time. They usually live 9 - 15 years, but one lived 47 years!

Age in years	1	2	3	4	5	6	7	8	9	10	11	12 and older
Length	8"	12"	16"	19"	21"	23"	24"	25"	26"	27"	29"	30" and up

MUSKELLUNGE

Musky grow most rapidly during the first three years of life. On average, they take 7 years to reach the 34" legal size limit. They can live 30 years!

Age in years	1	2	3	4	6	8	10	12	14	16 and older
Length	7"	14.5"	20"	24.5"	31"	36.5"	40"	43"	45.5"	47" and up

BLUEGILL

Bluegills grow the most in the first five years of life. They rarely live over 10 years.

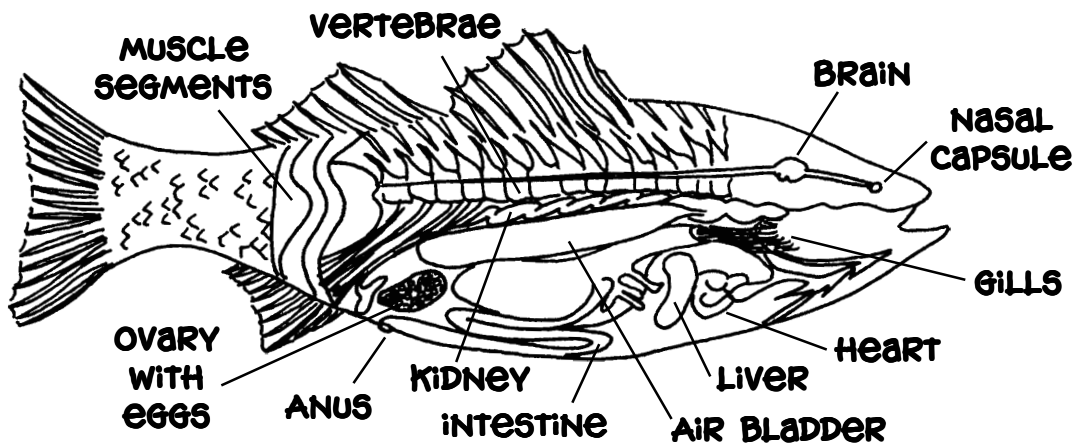
Age in years	birth	1	2	3	5	7	10
Length	only this long!	2"	3.25"	4.5"	6"	6.5"	7"

For Inland Lakes - Use this card instead of page 79.

WHAT KIND OF SHAPE IS IT IN?

Other than being dead, how does the fish look? Does it seem skinny and malnourished? Look for injuries, growths, parasites, or lesions.

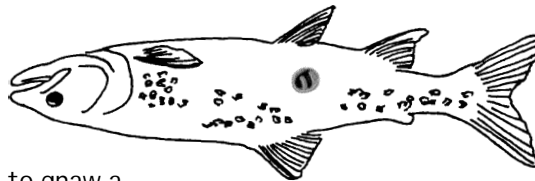
Unfortunately, you'll just be able to check the outside of your dead fish. Next time you catch a fish, cut it open and check out its internal organs. Use the diagram below to see if everything seems normal. Of course, you'll need to clean several fish before you know what normal looks like!



INJURIES?

DOES IT HAVE A CIRCULAR SCAR?

Your fish could have been the victim of a sea lamprey attack. A sea lamprey attaches itself to the body of a fish with its suction-cup mouth. It uses its raspy teeth to gnaw a hole in the fish. Then it sucks the blood and body fluids out of the fish.



ARE THERE RIPS NEAR THE MOUTH?

Your fish could be the one that got away! Or, it could be the victim of an inexperienced or careless angler who tore the fish's mouth when removing a hook.

ARE THERE INFECTED INJURIES?

Your fish could have been injured by a boat propeller or a predator. While it might have survived the initial injury, infection could have weakened and killed it.

Parasites?

Most fish have parasites. That's not unusual. Parasites are just part of life (or death!) for a fish. Common parasites seen in fish are black spot, yellow grubs, and tapeworms.

FUNGAL, BACTERIAL, OR VIRAL INFECTIONS?

You might find fungus growing on the skin, fins, or gills. It can be hard to tell if the fungus was there before the fish died or if it is just part of the decomposing process.

Look for external growths, tumors, sores, or other lesions. These are usually the result of bacterial or viral infections.

DID YOUR FISH DIE ALONE?

Sometimes there are fish die-offs. When massive numbers of fish die at the same time, biologists know that something isn't quite right! Could your fish have died from any of these causes?

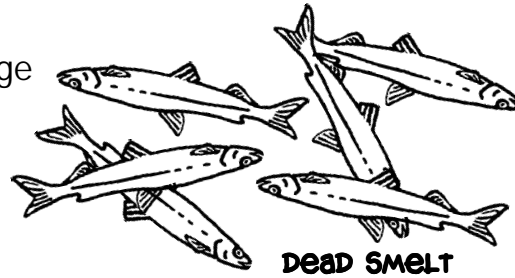
POLLUTION?

Municipal, industrial, and agricultural operations can kill fish if toxins are released into the water. Any sign of a spill or pipeline? What about sources of non-point pollution? This hard-to-trace pollution can come from golf courses, farm fields, or residential areas.



CONTAGIOUS DISEASE?

Sometimes a bacteria or virus can infect large numbers of fish. Way back in the winter of 1942, most of the smelt in Lake Michigan were killed by some kind of bacteria or virus.

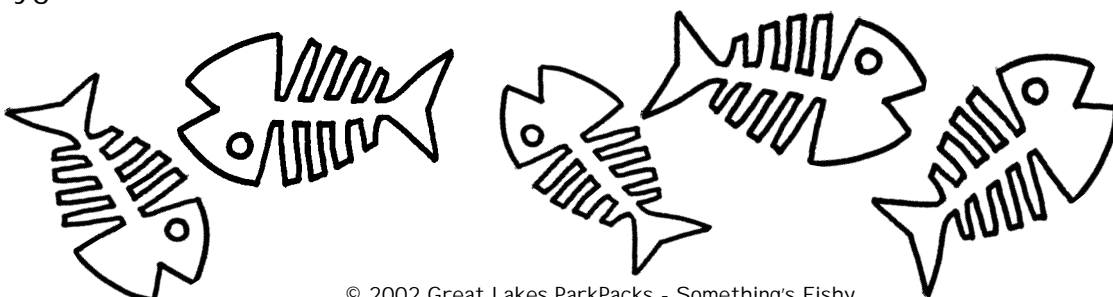


LACK OF OXYGEN?

Normally fish get all the oxygen they need from the water. However, some lakes can have very low oxygen levels, especially in the summer. One of the causes of low oxygen levels is the presence of too many plants. It is true that plants produce oxygen, but they also *use* oxygen when they respire and when they decompose. Dense mats of invasive plants often create problems for fish when the plants die and rot.

WINTERKILL?

After an unusually cold winter, there may be lots of dead fish washing up on the shores of a smaller lake. The lake might have frozen to the bottom and killed the fish, or maybe the fish and other living things used up all the oxygen and died.

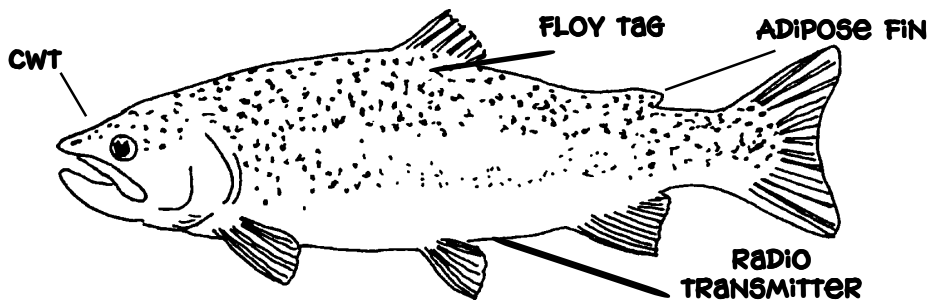


WAS YOUR FISH TAGGED?

Fish are marked with several different kinds of tags so fish biologists can learn more about them. Biologists are trying to:

- Determine how fast fish grow.
- Collect information on fish mortality and population size.
- Discover habitat preferences for fish at different ages.
- Follow fish movement over time and map migration patterns.

Fish tags can be external or internal. An external tag or mark may be used to call attention to the presence of an internal tag or mark. Check out the tags on this fish. Of course, you would never find a fish with this many tags!



CWT - CODED WIRE TAG

These are small pieces of magnetized stainless steel (size 0.5-2.0 mm x 0.25 mm), which have a code etched in the surface. The code is used to identify the origin of the fish and other information. CWTs are normally injected into the snout of a young fish. Because these tags are so small, the adipose fins are usually clipped to show that the fish has been tagged. A metal detector is used to find a CWT in a living or dead fish.

ACTUAL
SIZE OF
CWT



Northwest Marine Technology, Inc.

CWT UNDER MICROSCOPE

FLOY TAG

An external floy tag is a plastic filament two to three inches long. It works just like a garment tag you find on a new shirt in a store. It is inserted into the fish at the base of the dorsal fin. The "T" anchors the tag into the dorsal muscles or bones of the fish. A colored sleeve on the filament contains printed information regarding whom to contact if the tag is recovered.

DNR FLOY TAG (ACTUAL SIZE)



EACH TAG IS
PRINTED WITH A
UNIQUE NUMBER
AND A RETURN
ADDRESS.

RADIO TRANSMITTERS

Some walleye and smallmouth bass have been equipped with radio transmitters to study their movements in the Lower Milwaukee River Harbor.

WHAT DO YOU DO WITH A TAGGED FISH?

Good question! What you do depends on the kind of tag and the circumstances. Read on!

IF THE FISH IS DEAD . . . OR IF YOU CAUGHT IT AND PLAN TO KEEP IT . . .

Ask an adult to remove a floy tag and send it to the Department of Natural Resources (DNR) office printed on the tag or the nearest DNR office. If you think the fish has a CWT, freeze the head and take it to the nearest DNR office. There are rewards for returning fish with CWTs! You should include the information shown in the box on the back of this card.

IF YOU CAUGHT IT AND PLAN TO RELEASE IT . . .

Do not remove the tag. Collect as much of the information shown in the box on the back of this card as you can. Send the information to the DNR office printed on the tag or to the nearest DNR office.

IF IT HAS A RADIO TRANSMITTER . . .

If you catch a fish with a radio transmitter, call the DNR, report the location, day, and time you saw the fish, and release it. If it is deeply hooked, legal size, and a keeper, remove the transmitter and send it to the DNR. If the fish is dead, ask an adult to help you remove the transmitter and send it to the nearest DNR office.

Type of tag (send in a floy tag from a fish you keep or record the tag color and number for a fish you release)

Date and time of capture

Location of capture (report the name of the river or bay where it was caught or give the name of the nearest harbor, launch site, or town)

Fish species

Fish length (measure from tip of nose to tip of tail)

Fish weight (report weight in pounds or kilograms, if possible)

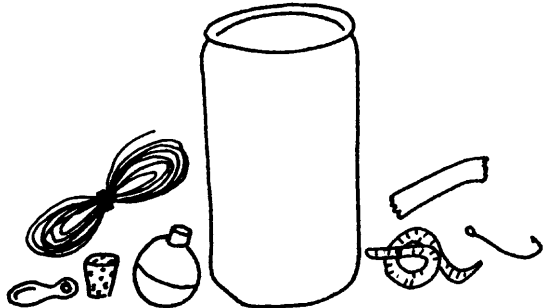
Sex of fish (determine by gutting)

Angler name, address, and phone number

SODA CAN CASTER

This fishing gear has a lot going for it. It's unique, it's partly recycled, and it's cheap!

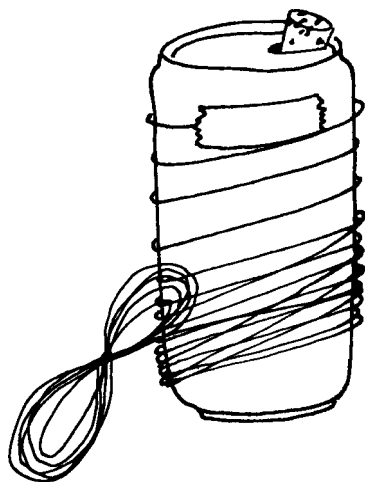
HERE'S WHAT YOU NEED



- soda can
- small piece of duct tape
- 25 feet of monofilament fishing line (4 - 6# test)
- hook (size 8 or 10)
- sinker (1/2 ounce or less)
- large bobber
- small cork to stick the hook in when you're not using it
- bait

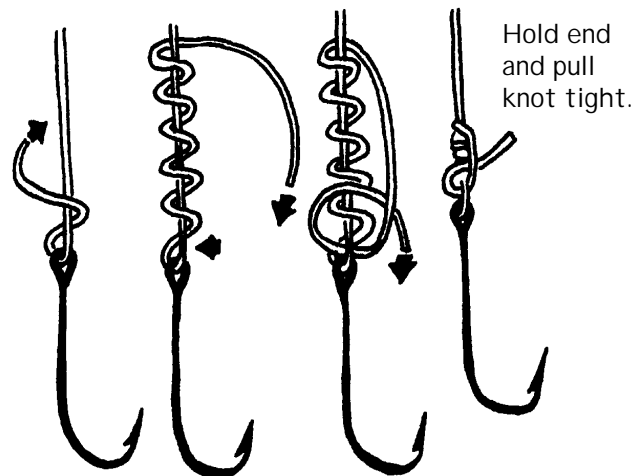
WRAP THE LINE

Tape one end of the fishing line to the soda can. Be sure the tape is smooth. If it's wrinkled, the line will catch on it when you cast. Wrap the line around the can so most of the line is at the bottom.



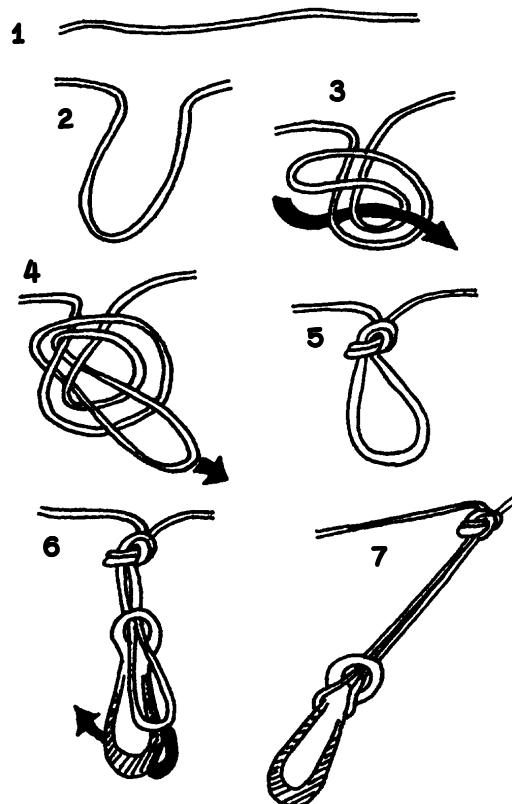
ATTACH THE HOOK

Attach the hook to the loose end of line with a clinch knot. Test it to be sure the hook is on securely.



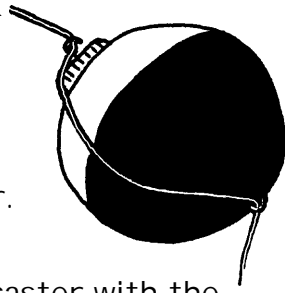
ATTACH THE SINKER

Two inches above the hook, attach the sinker.



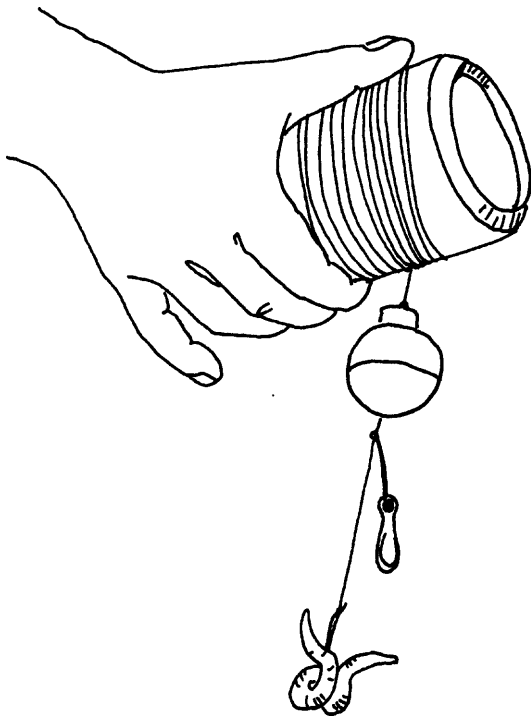
ATTACH THE BOBBER

Just press the plunger to raise the wire hooks on the top and the bottom. Run the line under each hook and let go. To move the bobber up or down the line, just press in the plunger and slide the bobber.

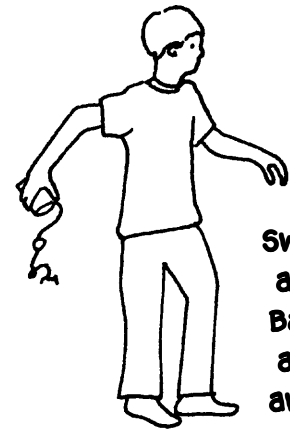


CAST AWAY!

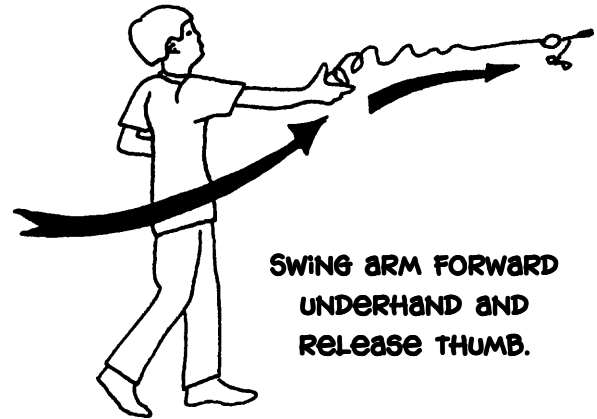
Hold your soda can caster with the bottom facing the direction you want to cast. Put your thumb on the line to hold it on the can. Then follow the steps on this page:



LOOK BEHIND YOU!



**SWING
ARM
BACK
AND
AWAY
FROM
BODY.**



**SWING ARM FORWARD
UNDERHAND AND
RELEASE THUMB.**

DON'T FORGET

Be careful with your hook. Keep it in the cork when you aren't using it.

Always throw pieces of line in the trash. Never leave line in the water or stuck in grass or trees.

Be sure any adults who are helping you fish have valid Wisconsin licenses. You need one if you are 16 or older.

Follow current fishing regulations.

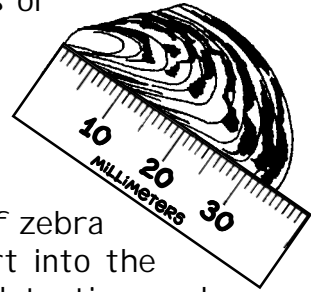
Enjoy your fishing experience—and your catch, if you are lucky!

Adapted from "The Amazing Tin Can Casting Machine" by Edward Matthews, *Ranger Rick's Nature Magazine*, August 1982.

OPERATION POPULATION

To choose a sample area, just toss the rope onto the rocks or sand. Arrange the rope into a circle.

Now, collect all the zebra mussel shells found inside the circle. Use the ruler to measure the ventral (bottom) edge of each shell. Measure to the nearest millimeter.



Use the chart below to keep a running tally of the number of zebra mussel shells in each size grouping. You can copy your chart into the **ParkPack** journal to share with other campers. Include the date, time, and your approximate location on the beach.



LENGTH OF SHELL IN MILLIMETERS	NUMBER OF SHELLS FOUND IN EACH SIZE GROUPING	APPROXIMATE AGE OF ZEBRA MUSSEL WHEN IT DIED*
LESS THAN 14 MM		less than 6 months old
14 - 18 MM		1 year
19 - 23 MM		2 years
24 - 28 MM		3 years
29 - 33 MM		4 years
OVER 34 MM		5 years - Few zebra mussels live longer than 5 years

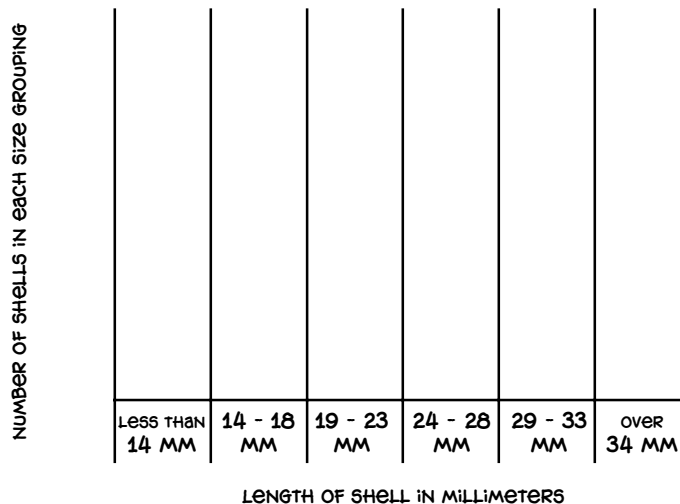


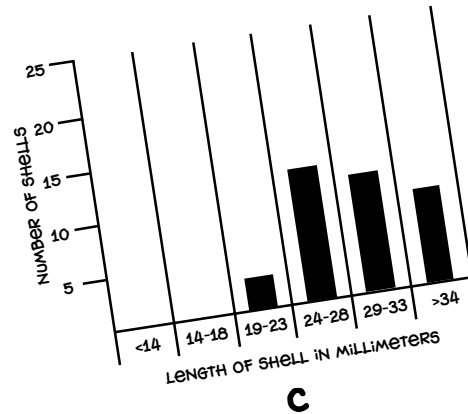
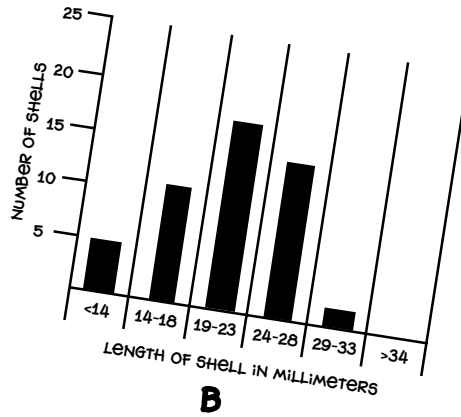
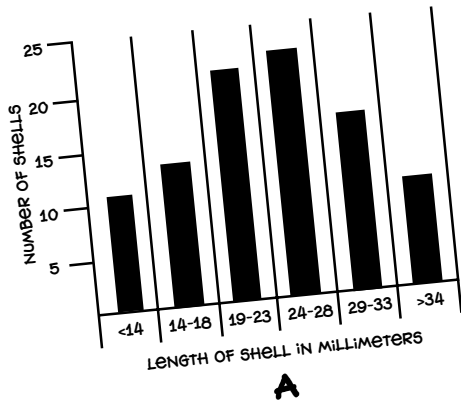
* Actual growth rates depend on the quality of the habitat, competition, and other physical conditions. This is just an estimate!

GRAPH IT!

Make a bar graph showing the number of shells you found for each size.

You will need to scale the vertical axis based on the greatest number of shells in any one category.





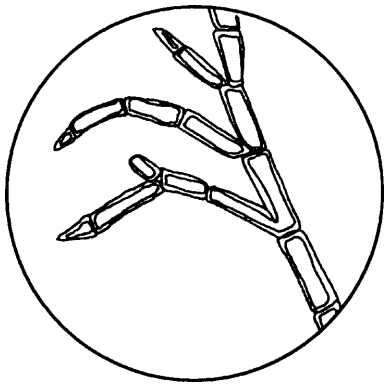
DOES YOUR GRAPH LOOK LIKE ANY OF THESE?

Zebra mussel shells were counted at 3 different locations. What predictions could you make about the populations of zebra mussels based on these bar graphs?

What predictions could you make about the zebra mussel population in this part of the lake based on your bar graph? How could you test your prediction?

- Some possible interpretations of the bar graphs:
- (A) You might predict that the population of zebra mussels is healthy and well established. There are young and old mussels spanning several years.
 - (B) You might hypothesize that:
 - This is a relatively new invasion of zebra mussels, and they haven't lived here long enough for older, larger mussels to be present, or
 - Something is preventing the zebra mussels from growing older, and they are dying young, or
 - The zebra mussels are not doing well. They might be old, but something is slowing down their growth.
 - (C) You might hypothesize that:
 - Something has changed and is preventing young zebra mussels from settling on solid surfaces and growing, or
 - There has been a change in the environment and only the larger mussels were able to survive.

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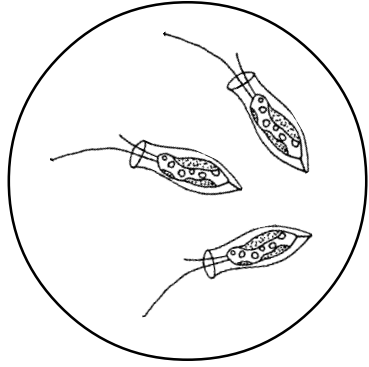


CLADOPHORA

GREEN ALGAE

Cladophora are made of long, slender cells that form branching filaments. Cladophora convert sunlight into food. Chlorophyll gives them their bright green color.

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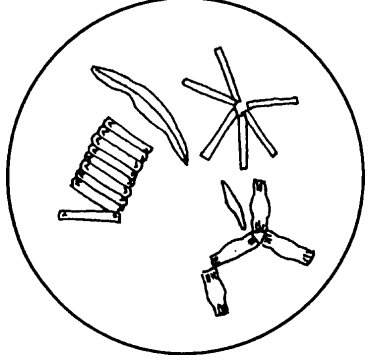


CHRYSOPHYTES

GOLDEN-BROWN ALGAE

Some chrysophytes have flagella for moving around in the water. They convert sunlight into food with the help of chlorophyll, but the carotenoids (pigments) in their bodies give them their colors.

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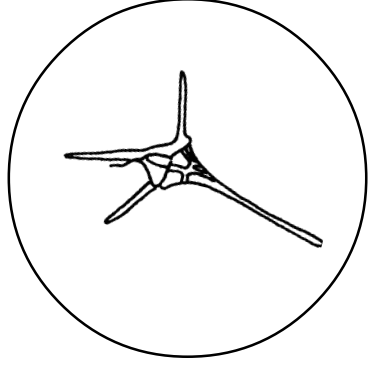


DIATOMS

YELLOW-GREEN ALGAE

Diatoms are formed of two halves, one of which fits over the other like the lid of a box. Diatoms have been called "the grass of the lake."

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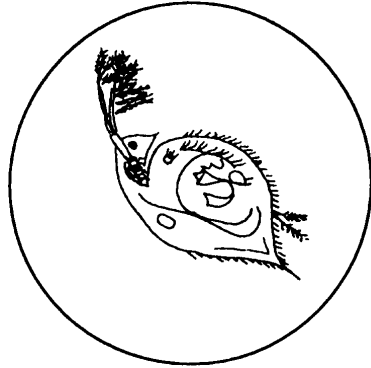


DINOFLAGELLATES

ALGAE

Dinoflagellates are free-swimming plants. They are brown in color and use their flagella to move about. Even though they are not green, they can make their own food.

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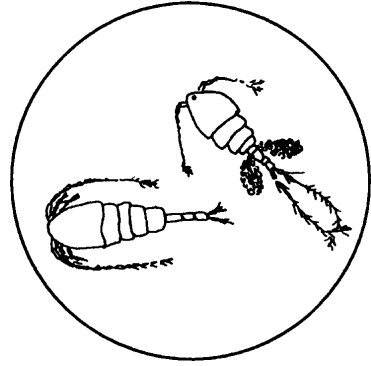


DAPHNIA

CRUSTACEANS

Daphnia look like little specks swimming in the water. They feed on bacteria, organic debris, and microscopic plants and animals.

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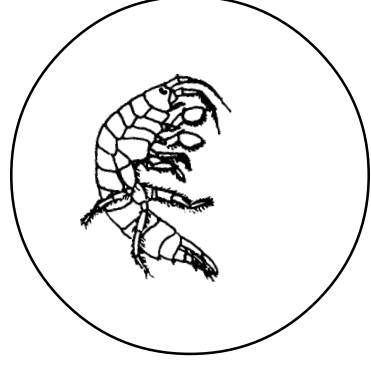


COPEPODS

CRUSTACEANS

Copepods only have one eye! They feed on microscopic plants, bacteria, and organic debris.

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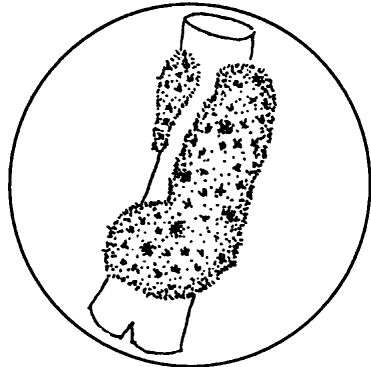


AMPHIPODS

CRUSTACEANS

Amphipods are also called sideswimmers. They usually live close to the bottom and avoid light. They are scavengers, eating plant and animal debris.

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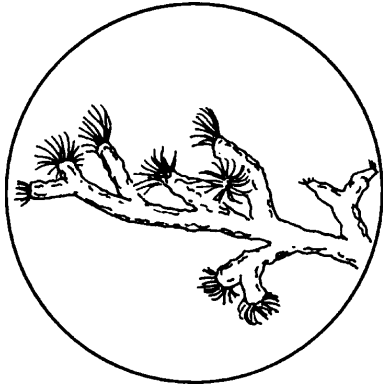


FRESHWATER SPONGES

PORIFERA

Most sponges live in the ocean, but a few are adapted to life in freshwater. Freshwater sponges are simple animals. They filter plankton from the water.

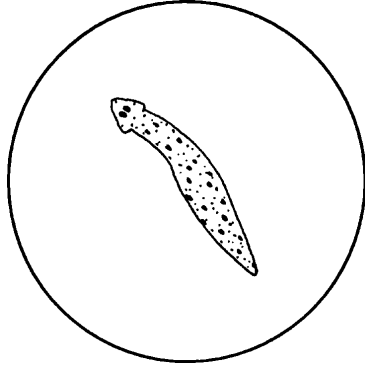
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MOSS ANIMALS BRYOZOANS

Individual moss animals are really tiny, but a colony of them resembles a grayish-green patch of moss. They feed on microscopic plants and decayed materials.

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PLANARIA FLATWORMS

Flatworms have soft, flat bodies. They are very simple animals. Flatworms eat zooplankton and other small animals, living or dead, from the bottom of the lake.

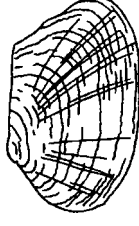
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SNAILS MOLLUSKS

Snails are soft-bodied animals enclosed in spiral, cone-shaped shells. They eat by scraping little pieces of algae with their radulas (file-like tongues).

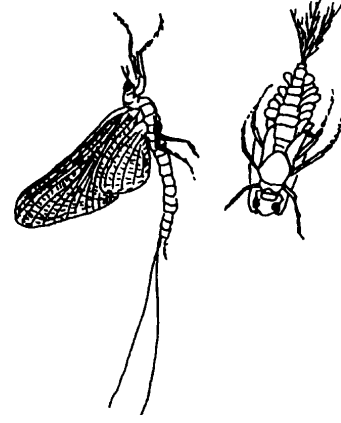
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SLIPPERSHELLS MOLLUSKS

Slippershells are freshwater mussels. They have a soft body enclosed in a two-part shell. They feed on plankton as they filter water in and out of their shells. They live on the lake bottom.

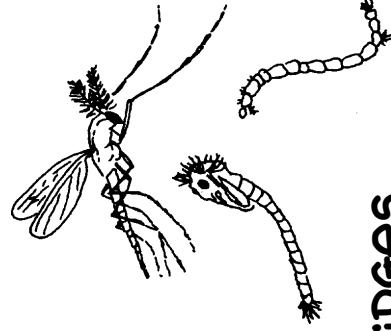
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MAYFLIES INSECTS

Mayflies are beautiful insects with large netlike wings. As adults, they live for only a few hours or days. The nymphs are aquatic herbivores that live on the lake bottom.

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MIDGES INSECTS

Midges are often mistaken for small mosquitoes. The aquatic larvae are herbivores. They feed on algae and organic matter on the lake bottom.

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DEEPWATER SCULPINS FISH

Sculpins are grayish-brown to light brown fish. They are scaleless and have large fanlike fins. They eat insects, zooplankton, planaria, and small fish.

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SHORTNOSE CISCOS FISH

Shortnose ciscos were popular as a smoked fish in the past, but they are probably extinct now.

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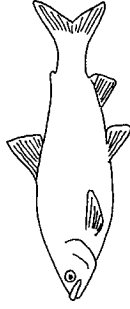


DEEPWATER CISCOES

FISH

Deepwater ciscoes were silvery with a faint pink to purple iridescence above the lateral line. They are considered extinct.

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BLACKFIN CISCOES

FISH

If you guessed their fins were blue-black, you are right! They are considered extirpated from the Great Lakes. Extirpated means no longer found in a certain area, but not extinct.

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BLOATERS

FISH

Bloaters are silvery with some pink or purple iridescence. They eat zooplankton, insect larvae, and fish eggs.

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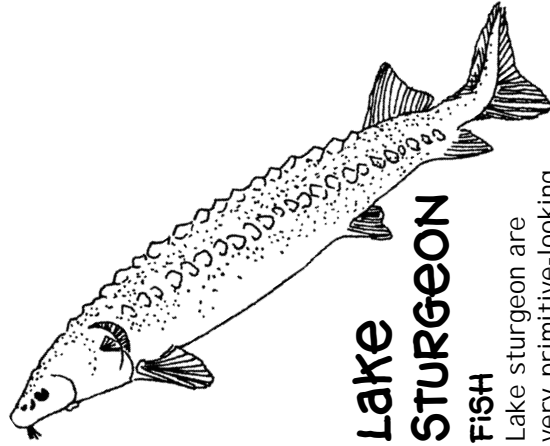


YELLOW PERCH

FISH

Perch are small fish with dark vertical bands on their sides. They eat most anything, but prefer insect larvae, planaria, zooplankton, and small fishes.

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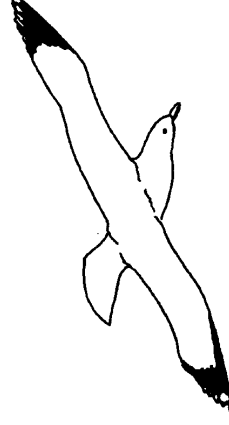


LAKE STURGEON

FISH

Lake sturgeon are very primitive-looking fish with rows of armor-like bony plates. They eat mussels, insect larvae, and other invertebrates on the bottom of the Lakes.

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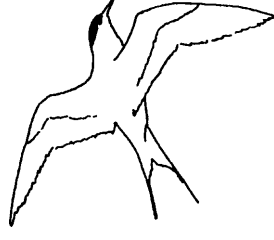


HERRING GULLS

BIRDS

Gulls are great fliers with long wings and square tails. They eat plants, animals, garbage, and carrion (dead animals).

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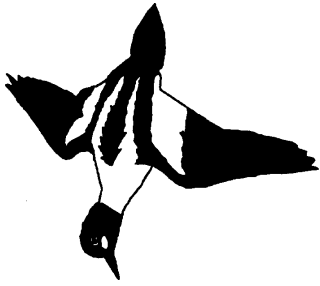


TERNS

BIRDS

Terns are a little smaller than gulls. They have deeply forked tails and slender wings. They feed on small fish and insects.

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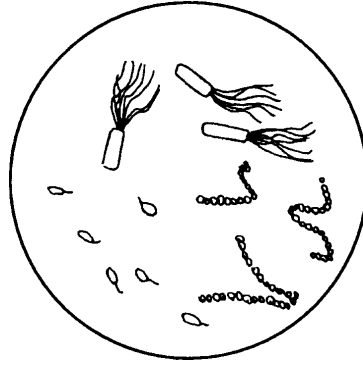


COMMON GOLDENEYES

BIRDS

Male and female goldeneyes look very different. In winter, these ducks feed mainly on mussels. In summer, they feed on aquatic plants and insects.

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BACTERIA

Bacteria are microscopic. They are believed to be among the simplest living organisms. Many bacteria obtain their nutrients from animal wastes and particles of decaying plants and animals.

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CORMORANTS

BIRDS

Cormorants are large, blackish water birds. The skin on their faces is colorful, and their beaks are slender and hooked. They eat small fish and larger crustaceans.

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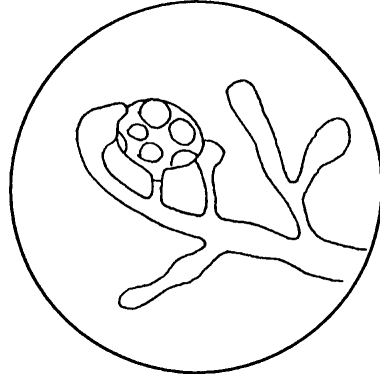


BALD EAGLES

BIRDS

Bald eagles grow their white head and tail feathers when they are four to five years old. They are top predators in the Great Lakes, feeding mainly on fish.

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WATER MOLDS

AQUATIC FUNGI

Water molds look like whitish, fuzzy growths. They aren't able to produce their own food. Some fungi are saprophytes, feeding on dead things; others are parasites, feeding on living things.

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HUMANS

MAMMALS

Humans come in a variety of sizes, shapes, and colors. They use tools to capture their food. They eat trout, salmon, perch, smelt, sturgeon, and common goldeneye.

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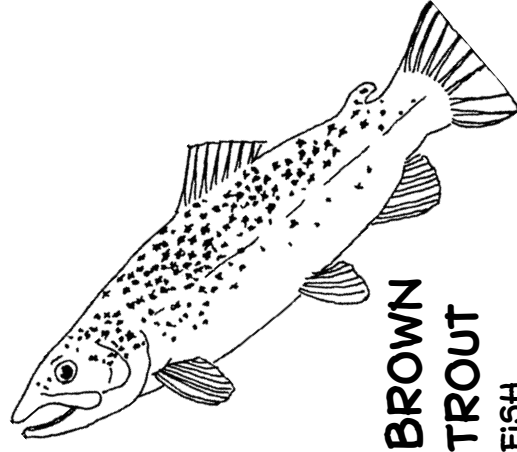


STEELHEAD

FISH

Steelhead, or rainbowtrout, were introduced into the Great Lakes. They eat small fish, insect larvae, and zooplankton.

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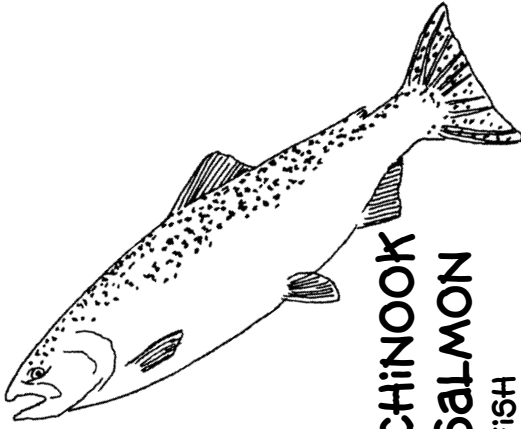
BROWN

TROUT

FISH

Brown trout are large fish that were introduced from Europe. Young brown trout eat zooplankton. Adults eat fish.

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CHINOOK SALMON

FISH

Chinook salmon are large fish that were introduced into the Great Lakes. Young chinooks feed on zooplankton until they are large enough to eat fish.

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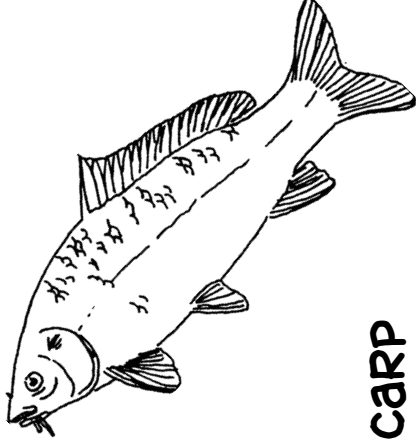


RAINBOW SMELT

FISH

Smelt are a saltwater species that naturally enter freshwater to spawn (reproduce). When smelt are introduced into inland lakes, they become invasive. They eat zooplankton and insect larvae.

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CARP

FISH

Carp were introduced into the Great Lakes. Their whiskers help them feel for food on the lake bottom. These invaders eat mussels, small fish, crustaceans, worms, plants, and organic debris.

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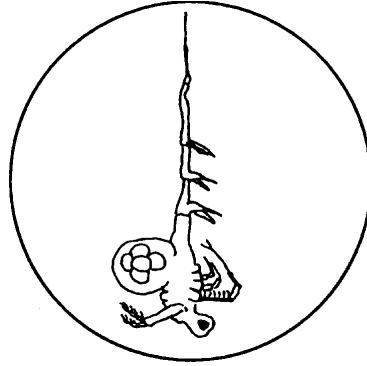


ALEWIVES

FISH

Alewives are small ocean fish that have invaded the Great Lakes. They eat microscopic plants, zooplankton, and eggs.

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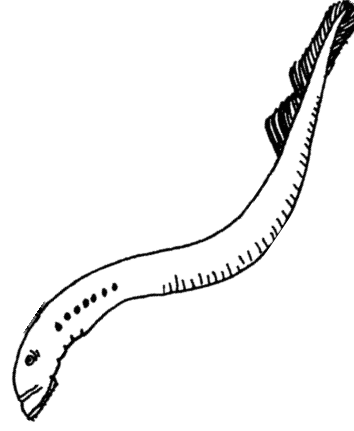


SPINY WATER FLEAS

CRUSTACEANS

Spiny water fleas have invaded the Lakes. They have long tail spines that are barbed and sharp. They eat zooplankton and small larval fish.

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SEA LAMPREYS

FISH

Sea lampreys are members of an ancient family of jawless fishes that have invaded the Great Lakes. As adults, they use their raspy, disc-shaped mouths to feed on the blood and body fluids of fish.

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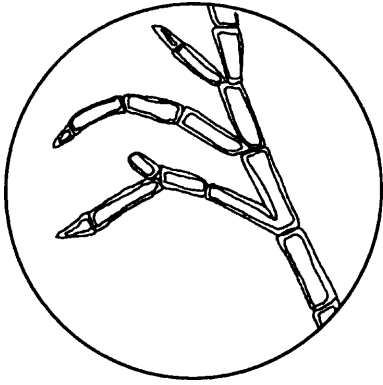


ZEBRA MUSSELS

MOLLUSKS

Zebra mussels are an invasive species. They range in size from dimes to quarters. They filter phytoplankton, zooplankton, and bits of organic debris from the water.

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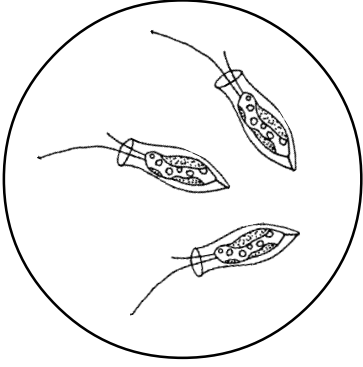


CLADOPHORA

GREEN ALGAE

Cladophora are made of long, slender cells that form branching filaments. Cladophora convert sunlight into food. Chlorophyll gives them their bright green color.

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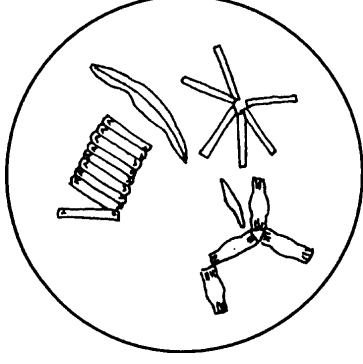


CHRYSOPHYTES

GOLDEN-BROWN ALGAE

Some chrysophytes have flagella for moving around in the water. They convert sunlight into food with the help of chlorophyll, but the carotenoids (pigments) in their bodies give them their colors.

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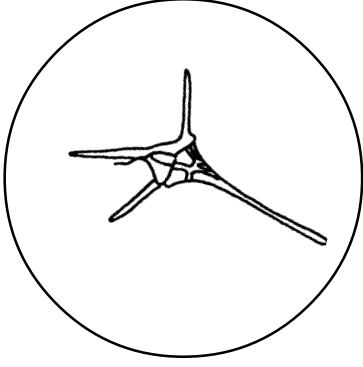


DIATOMS

YELLOW-GREEN ALGAE

Diatoms are formed of two halves, one of which fits over the other like the lid of a box. Diatoms have been called "the grass of the lake."

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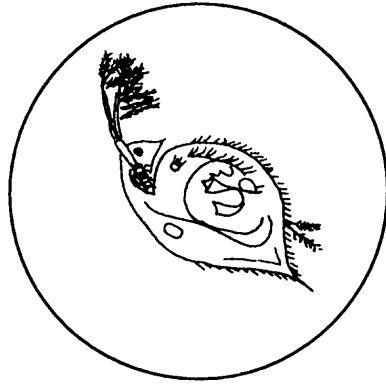


DINOFLAGELLATES

ALGAE

Dinoflagellates are free-swimming plants. They are brown in color and use their flagella to move about. Even though they are not green, they can make their own food.

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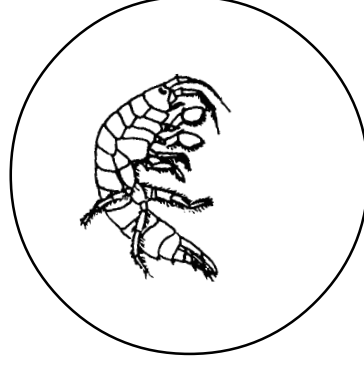


DAPHNIA

CRUSTACEANS

Daphnia look like little specks swimming in the water. They feed on bacteria, organic debris, and microscopic plants and animals.

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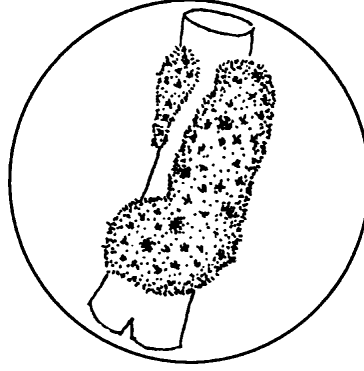


AMPHIPODS

CRUSTACEANS

Amphipods are also called sideswimmers. They usually live close to the bottom and avoid light. They are scavengers, eating plant and animal debris.

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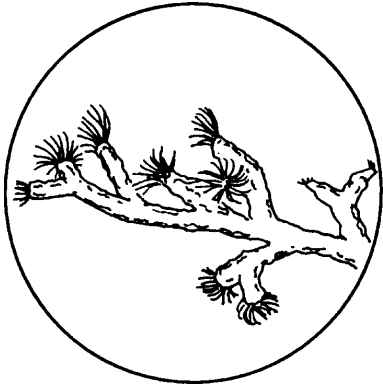
FRESHWATER SPONGES

PORIFERA

Most sponges live in the ocean, but a few are adapted to life in freshwater. Freshwater sponges are simple animals. They filter plankton from the water.

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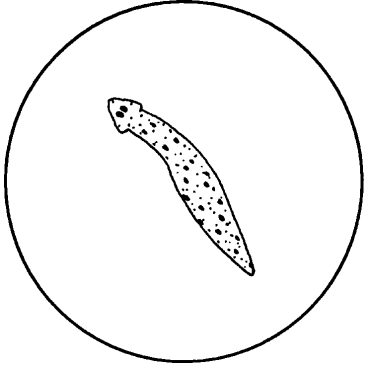
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MOSS ANIMALS BRYOZOANS

Individual moss animals are really tiny, but a colony of them resembles a grayish-green patch of moss. They feed on microscopic plants and decayed materials.

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PLANARIA FLATWORMS

Flatworms have soft, flat bodies. They are very simple animals. Flatworms eat zooplankton and other small animals, living or dead, from the bottom of the lake.

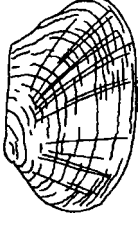
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SNAILS MOLLUSKS

Snails are soft-bodied animals enclosed in spiral, cone-shaped shells. They eat by scraping little pieces of algae with their radulas (file-like tongues).

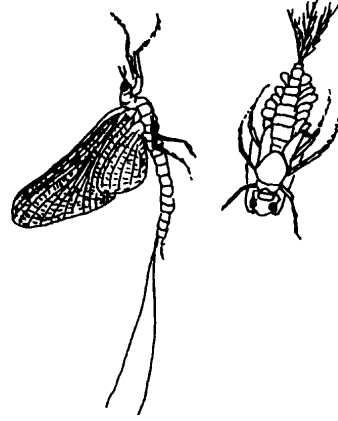
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SLIPPERSHELLS MOLLUSKS

Slippershells are freshwater mussels. They have a soft body enclosed in a two-part shell. They feed on plankton as they filter water in and out of their shells. They live on the lake bottom.

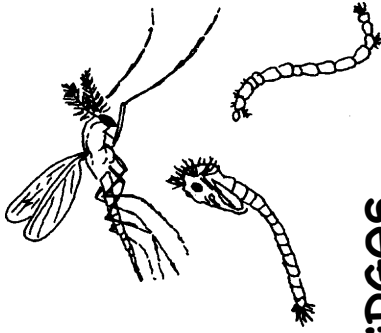
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MAYFLIES INSECTS

Mayflies are beautiful insects with large netlike wings. As adults, they live for only a few hours or days. The nymphs are aquatic herbivores that live on the lake bottom.

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MIDGES INSECTS

Midges are often mistaken for small mosquitoes. The aquatic larvae are herbivores. They feed on algae and organic matter on the lake bottom.

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EURASIAN WATER MILFOIL AQUATIC PLANT

Milfoil is an invasive plant from Eurasia. It can form dense mats that crowd out native plants and make recreation almost impossible.

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PURPLE LOOSESTRIFE PLANT

Purple loosestrife is beautiful, but it invades marshes and lakeshores, replacing native wetland plants.

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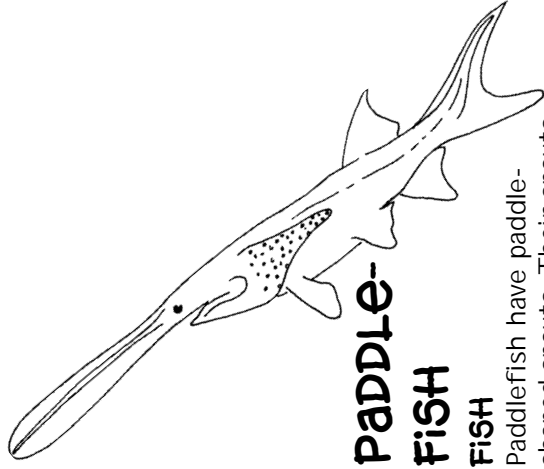


DEEPWATER CISCOES

FISH

Deepwater ciscoes were silvery with a faint pink to purple iridescence. They, along with blackfin and shortnose ciscoes, were common to Lake Michigan. All are now considered extirpated or extinct.

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PADDLE-FISH

FISH

Paddlefish have paddle-shaped snouts. Their snouts work like plankton nets by filtering small crustaceans, plants, and insect larvae from the water. They are a threatened species in Wisconsin.

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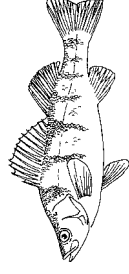


SKIPJACK HERRING

FISH

Skipjacks feed in large schools, skipping out the water while pursuing plankton, minnows, and insect larvae. Skipjacks are nearly extirpated in Wisconsin.

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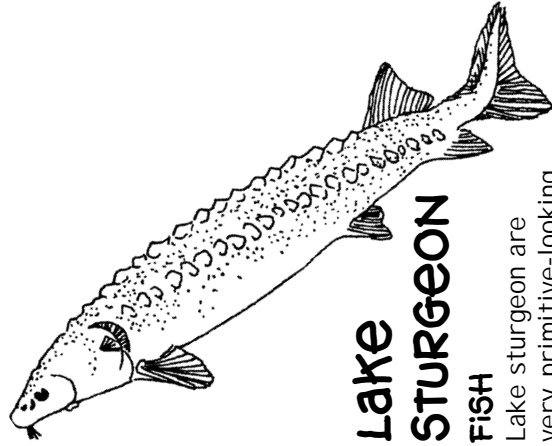


YELLOW PERCH

FISH

Perch are small fish with dark vertical bands on their sides. They eat most anything, but prefer insect larvae, planaria, zooplankton, and small fishes.

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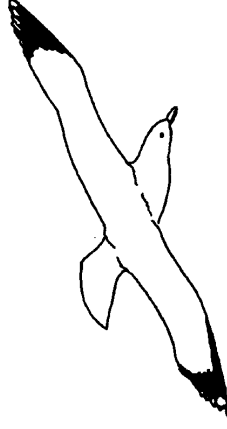


LAKE STURGEON

FISH

Lake sturgeon are very primitive-looking fish with rows of armor-like bony plates. They eat mussels, insect larvae, and other invertebrates on the bottom of lakes.

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HERRING GULLS

BIRDS

Gulls are great fliers with long wings and square tails. They eat plants, animals, garbage, and carrion (dead animals).

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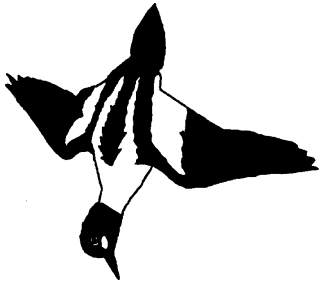


TERNS

BIRDS

Terns are a little smaller than gulls. They have deeply forked tails and slender wings. They feed on small fish and insects.

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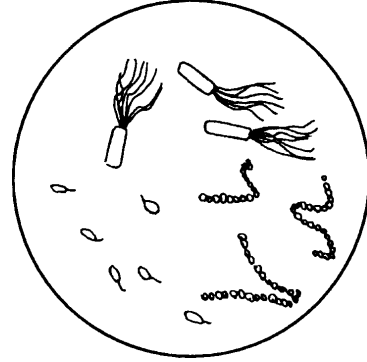


COMMON GOLDENEYES

BIRDS

Male and female goldeneyes look very different. In winter, these ducks feed mainly on mussels. In summer, they feed on aquatic plants and insects.

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BACTERIA

Bacteria are microscopic. They are believed to be among the simplest living organisms. Many bacteria obtain their nutrients from animal wastes and particles of decaying plants and animals.

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CORMORANTS

BIRDS

Cormorants are large, blackish water birds. The skin on their faces is colorful, and their beaks are slender and hooked. They eat small fish and larger crustaceans.

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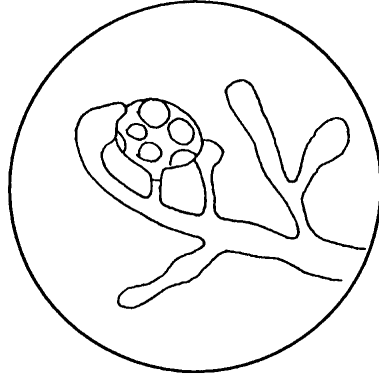


BALD EAGLES

BIRDS

Bald eagles grow their white head and tail feathers when they are four to five years old. They are top predators, feeding mainly on fish.

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WATER MOLDS

AQUATIC FUNGI

Water molds look like whitish, fuzzy growths. They aren't able to produce their own food. Some fungi are saprophytes, feeding on dead things; others are parasites, feeding on living things.

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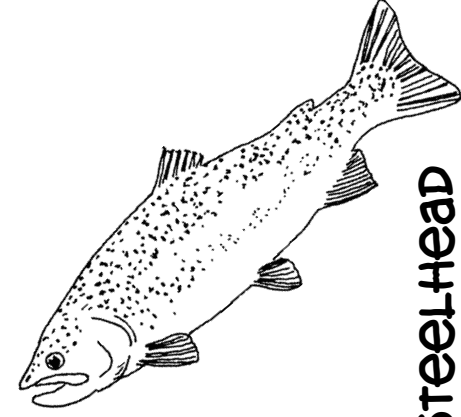


HUMANS

MAMMALS

Humans come in a variety of sizes, shapes, and colors. They use tools to capture their food. They eat trout, salmon, perch, smelt, sturgeon, and common goldeneye.

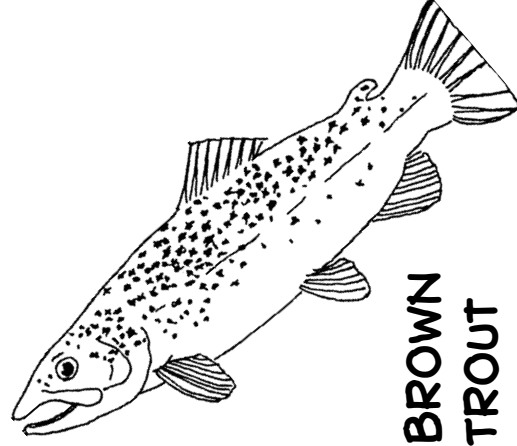
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STEELHEAD FISH

Steelhead, or rainbow trout, were introduced into the Great Lakes. They eat small fish, insect larvae, and zooplankton.

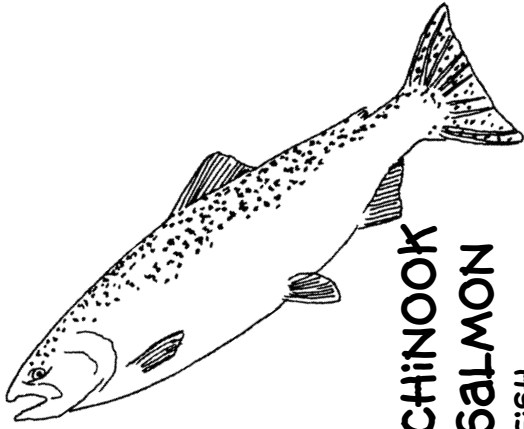
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BROWN TROUT FISH

Brown trout are large fish that were introduced from Europe. Young brown trout eat zooplankton. Adults eat fish.

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CHINOOK SALMON

FISH

Chinook salmon are large fish that were introduced into the Great Lakes. Young chinooks feed on zooplankton until they are large enough to eat fish.

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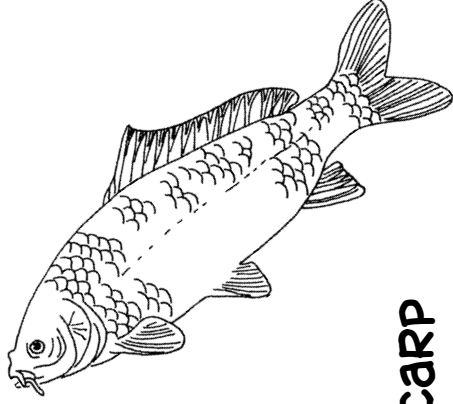


RAINBOW SMELT

FISH

Smelt are a saltwater species that naturally enter freshwater to spawn (reproduce). When smelt are introduced into inland lakes, they become invasive. They eat zooplankton and insect larvae.

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CARP

FISH

Carp were introduced into Wisconsin. Their whiskers help them feel for food on the lake bottom. These invaders eat mussels, small fish, crustaceans, worms, plants, and organic debris.

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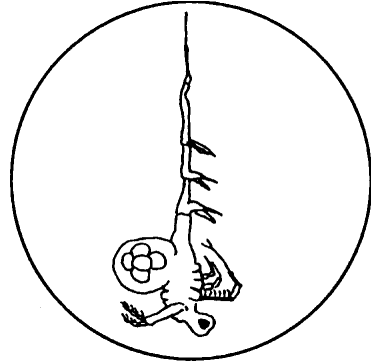


ALEWIVES

FISH

Alewives are small ocean fish that have invaded the Great Lakes. They eat microscopic plants, zooplankton, and eggs.

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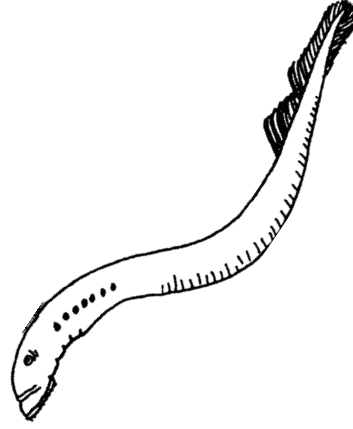


SPINY WATER FLEAS

CRUSTACEANS

Spiny water fleas have invaded Wisconsin waters. They have long tail spines that are barbed and sharp. They eat zooplankton and small larval fish.

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SEA LAMPREYS

FISH

Sea lampreys are members of an ancient family of jawless fishes that have invaded the Great Lakes. As adults, they use their raspy, disc-shaped mouths to feed on the blood and body fluids of fish.

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ZEBRA MUSSELS

MOLLUSKS

Zebra mussels are an invasive species. They range in size from dimes to quarters. They filter phytoplankton, zooplankton, and bits of organic debris from the water.

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RUSTY CRAYFISH

CRUSTACEAN

Like native crayfish species, invasive rusty crayfish eat almost anything! Their diet includes a variety of aquatic plants, worms, snails, insects, crustaceans, and decaying plants and animals.

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THREE SPINE STICKLEBACKS

FISH

Tough spines make it hard for predators to swallow these tiny invasive fish. Sticklebacks eat zooplankton, eggs, larvae, and small crustaceans.

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ROUND GOBIES

FISH

Round gobies are frog-faced fish that have invaded the Great Lakes area. They eat invertebrates, fish eggs, small fish, insect larvae, and zebra mussels.

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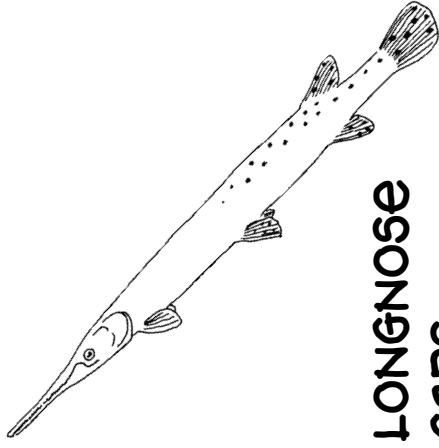


RUFFE

FISH

Ruffe (rhymes with tough) are invaders from Eurasia. They eat almost anything, but prefer small aquatic insects, bottom-dwelling organisms, and, sometimes, fish eggs.

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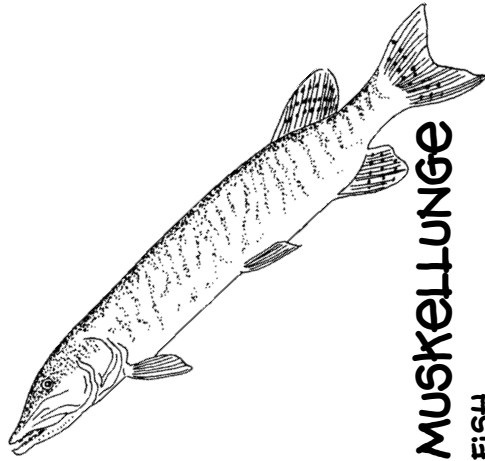


LONGNOSE GARS

FISH

Gars living in oxygen-poor water can come to the surface for a breath of air! They use their long snouts and sharp teeth to eat other fish.

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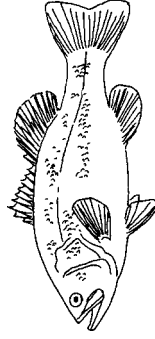


MUSKELLUNGE

FISH

Our state fish lures many anglers to Wisconsin for a chance to catch 'the big one.' Musky are top predators that eat other fish, amphibians, and even birds and mammals.

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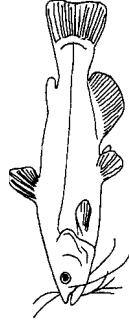


LARGEMOUTH BASS

FISH

Bass have excellent senses of sight, smell, and hearing. They eat crayfish, frogs, large insects, and smaller fish.

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BLACK BULLHEADS

FISH

Bullheads can tolerate low oxygen levels; they can even survive on land for hours! Bullheads are bottom-feeders. They eat snails, clams, insects, small fish, algae, and crayfish.

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GREEN FROGS

AMPHIBIAN

The call of green frogs sounds like someone strumming on a loose banjo string. The tadpoles eat aquatic plants, but the adults eat insects and other invertebrates.

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BULLFROGS

AMPHIBIAN

You can hear the "jug-o-rum" calls of bullfrogs from far away. Tadpoles eat aquatic plants, but adults eat insects, other invertebrates, small fish, mammals, ducklings, and other frogs.

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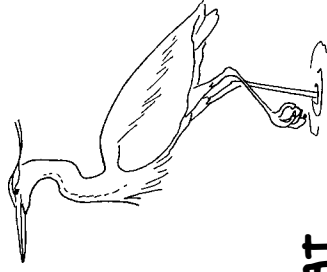


PAINTED TURTLES

REPTILE

Painted turtles spend a lot of time basking in the sun. They eat mainly plants, but they also eat small animals, either dead or alive.

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GREAT BLUE HERONS

BIRD

With their long legs and sharp bills, herons are perfectly equipped to eat fish and frogs.

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STICKY SITUATION #1

You've been fishing most of the day. Things were going great until your line got tangled in some bushes along the shore. Now it's time for you to be back at camp for supper, and the line is still tangled. What do you do?

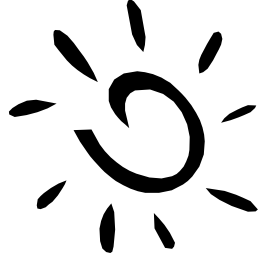


You could leave the whole mess, cut off your hook and leave the line, or take the time to free the line from the bushes. You might be in hot water with your folks for getting back a little later, but leaving the line is not good. Fishing line can get wrapped around animals and kill them. It is also illegal to dispose of any plastic into the Great Lakes.

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STICKY SITUATION #2

You can easily see the boardwalk that leads over the dunes. The sign says "Please stay on the boardwalk." Your friends have just taken a well-used shortcut that heads straight for the beach. They are going to get there first! What do you do?



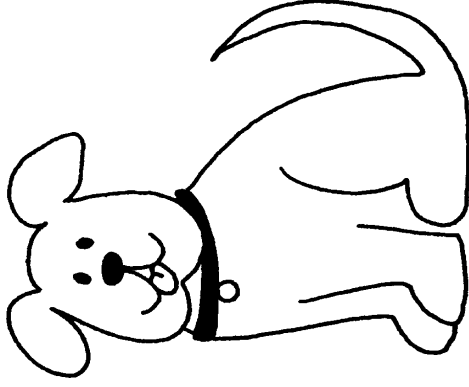
Shortcuts are tempting! But you really need to watch what you're doing! The plants growing on dunes protect the area. Taking shortcuts increases erosion caused by wind and water.

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Sticky Situation #3

You and your brand new puppy just arrived at your favorite park for a day of hiking and exploring. The puppy is

soooo excited! The first thing he does is leave a little present by the side of the parking lot. What do you do?



It's just a little present and it's in the grass! Do you really have to clean it up? Here's the scoop on poop: Pet waste can carry diseases, bacteria, and viruses. Besides it's ugly and it smells! The right thing to do is clean up after your pet.

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Sticky Situation #4

You love to throw bread crumbs, corn, and other food to geese. The babies are just adorable, and the adults put on quite a show as they fight over the little tidbits you offer. You have seen signs and read warnings about feeding the geese, but you know how those geese love a handout! Could one person really cause a huge problem?



No, one person probably wouldn't cause a huge problem. But do you know how many other people have fed those adorable little goslings? Feeding the geese encourages them to stay. Where there are a lot of geese - there is a lot of goose poop.


When goose poop gets in the water, it adds nutrients that increase algae and other plant growth. It also adds pathogens (nasty germs) that cause all kinds of public health problems, especially in urban areas! It's not easy, but the best solution is to 'Just Say No.' Keep wild animals wild by letting them find their own food.

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STICKY SITUATION #5

You and your family have been out all day on the boat. Your portable toilet is full, and now somebody has to go to

 the bathroom! It's several minutes back to the dock,

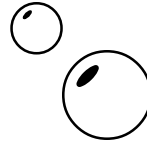
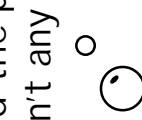
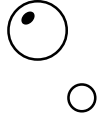
 real bathrooms, and the pump-out facility. There aren't any other

boaters

within view. You could

just empty the toilet over the side of the

boat. What do you do?



Human waste floating on the surface of the water is gross and disgusting! Just imagine swimming along next to floating poopsies! It's not a pretty thought. Besides, human waste can carry pathogens, bacteria, protozoans, and viruses that can make people sick.

Practice responsible waste disposal when you are outdoors away from modern toilets! Bury solid human waste in catholes dug 6 to 8 inches deep at least 200 feet from water, camp, and trails. Cover and disguise the cathole when finished. Pack out toilet paper and hygiene products.

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STICKY SITUATION #6

Your family loves to canoe camp. Your favorite thing to do is travel from one lake to another.

You don't mind the portages, but your dad's obsession with cleaning all the vegetation and aquatic animals off the canoe is driving you crazy. He even makes you clean

the mud off your shoes! Now you

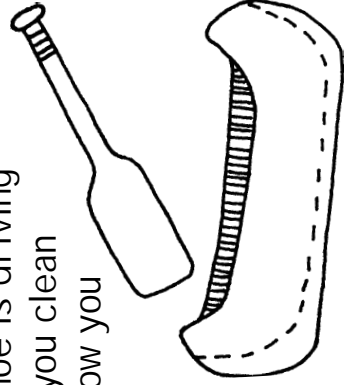
are old enough to canoe on

your own with some

friends. You are leaving

one lake for a new one.

Do you clean the canoe?

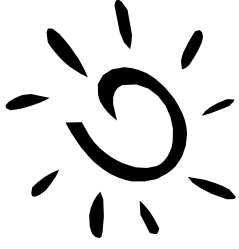


OK, maybe dads can be a little unreasonable at times, but this time Dad has the right idea. Non-native plants and animals move easily from lake to lake on you, your shoes, clothes, packs, tents, canoes, pets, bait buckets, and anything else you use. If everyone was as careful as your dad, we might be able to control the spread of non-natives like zebra mussels, Eurasian milfoil, and spiny water fleas.

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STICKY SITUATION #2

You can easily see the trail with switchbacks leading down to the shore. The sign says "Please stay on the trail." Your friends have just taken a well-used shortcut that heads straight for the water. They are going to get there first! What do you do?



Shortcuts are tempting! But the plants growing on shores protect the area and provide valuable habitat. Taking shortcuts increases shoreline erosion.

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For use on inland lakes -
Use this card instead of
Sticky Situation #2 on
page 105.

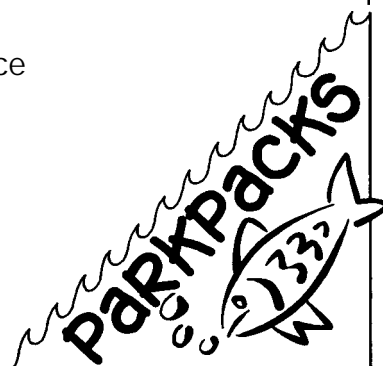
ACADEMIC STANDARDS

ENGLISH LANGUAGE ARTS

- A.8.3 Read and discuss literary and nonliterary texts in order to understand human experience
Choose Your Ripple Effect (pages 57 - 60)
- E.8.3 Create media products appropriate to audience and purpose
Great Lakes/Wisconsin Lakes Yearbook (pages 51 - 56)

ENVIRONMENTAL EDUCATION

- A.8.4 Use critical-thinking strategies to interpret and analyze gathered information
Unfair Advantage! (pages 43 - 46)
- B.8.3 Explain the importance of biodiversity
Lake Life (pages 9 - 12)
- B.8.5 Give examples of human impact on various ecosystems
Rival for Survival (pages 13 - 16)
Imagine - No Lakes! (pages 23 - 26)
Choose Your Ripple Effect (pages 57 - 60)
- B.8.8 Explain interactions among organisms or populations of organisms
Lake Life (pages 9 - 12 and 27 - 30)
Rival for Survival (pages 13 - 16)
Something's Fishy pages 35 - 38)
Unfair Advantage! (pages 43 - 46)
A Life of Crime (pages 47 - 50)
Great Lakes/Wisconsin Lakes Yearbook (pages 51 - 56)
- B.8.9 Explain how the environment is perceived differently by various cultures
Gone Fishin' (pages 39 - 42)
- D.8.5 Explain how personal actions can impact an environmental issue; e.g., doing volunteer work in conservation
Choose Your Ripple Effect (pages 57 - 60)
- D.8.7 I identify examples of how personal beliefs can influence environmental decisions
Choose Your Ripple Effect pages 57 - 60)



MATHEMATICS

- D.8.3 Determine measurement directly using standard units with these suggested degrees of accuracy - lengths to the nearest mm
Unfair Advantage! (pages 43 - 46)
- E.8.1 Work with data in the context of real-world situations
Unfair Advantage! (pages 43 - 46)
- E.8.2 Organize and display data from statistical investigations using appropriate tables, graphs, and/or charts
Unfair Advantage! (pages 43 - 46)
- E.8.4 Use the results of data analysis to make predictions, develop convincing arguments, and draw conclusions
Unfair Advantage! (pages 43 - 46)

SCIENCE

- C.8.1 I identify questions they can investigate using resources and equipment they have available
Something's Fishy (pages 35 - 38)
- E.8.6 Describe through investigations the use of the earth's resources by humans in both past and current cultures, particularly how changes in the resources used for the past 100 years are the basis for efforts to conserve and recycle renewable and nonrenewable resources
Fish Stories (pages 17 - 20)
Gone Fishin' (pages 39 - 42)
- F.8.2 Show how organisms have adapted structures to match their functions, providing means of encouraging individual and group survival within specific environments
Lake Life (pages 27 - 30)
Read A Fish (pages 31 - 34)
A Life of Crime (pages 47 - 50)
- F.8.8 Show through investigations how organisms both depend on and contribute to the balance or imbalance of populations and/or ecosystems, which in turn contribute to the total system of life on the planet
Unfair Advantage! (pages 43 - 46)
- F.8.9 Explain how some of the changes on the earth are contributing to changes in the balance of life and affecting the survival or population growth of certain species
Rival for Survival (pages 13 - 16)
A Life of Crime (pages 47 - 50)

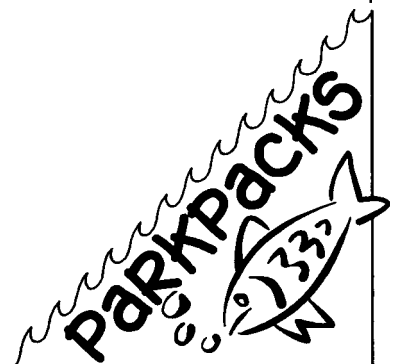
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- G.8.3 I illustrate the impact that science and technology have had, both good and bad, on careers, systems, society, environment, and quality of life
Fish Stories (pages 17 - 20)
Gone Fishin' (pages 39 - 42)

SOCIAL STUDIES

- B.8.12 Describe how history can be organized and analyzed using various criteria to group people and events chronologically, geographically, thematically, topically, and by issues
Fish Stories (pages 17 - 20)
- D.8.7 I identify the location of concentrations of selected natural resources and describe how their acquisition and distribution generates trade and shapes economic patterns
Imagine - No Lakes! (pages 23 - 26)
- D.8.11 Describe how personal decisions can have a global impact on issues such as trade agreements, recycling, and conserving the environment
Rival for Survival (pages 13 - 16)
Choose Your Ripple Effect (pages 57 - 60)



SUBJECT MATRIX

	FISH PACK ACTIVITIES	English Language Arts	Environmental Education	Mathematics	Science	Social Studies	Visual Arts
PRETRIP	Lake Life						
	Rival for Survival						
	Fish Stories						
FIELD TRIP	Imagine - No Lakes!						
	Lake Life						
	Read a Fish						
	Something's Fishy						
	Gone Fishin'						
	Unfair Advantage!						
	A Life of Crime						
POST TRIP	Wisconsin Lakes/Great Lakes Yearbook						
	Choose Your Ripple Effect						

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SCOUTS

Following each badge is a list of Fish Pack activities that address the requirements.

BOY SCOUTS OF AMERICA

BIRD STUDY

A Life of Crime

CAMPING

2. Learn the Leave No Trace principles and the Outdoor Code and explain what they mean. Write a personal plan for implementing these principles on your next outing.

Choose Your Ripple Effect

FISH AND WILDLIFE MANAGEMENT

7. Do ONE of the following:
 - a) Determine the age of five species of fish from scale samples or identify various age classes of one species in a lake and report the results.
 - c) Examine the stomach contents of three species of fish and record the findings.

Something's Fishy

FISHING

7. Catch two different kinds of fish by any legal, sportsmanlike method and identify them. Demonstrate how you released at least one of them unharmed. Tell how you cleaned and cooked another fish.

Gone Fishin'

NATURE

3. Explain the term "food-chain." Give an example of a four-step land food chain and a four-step water food chain.

Lake Life

Birds

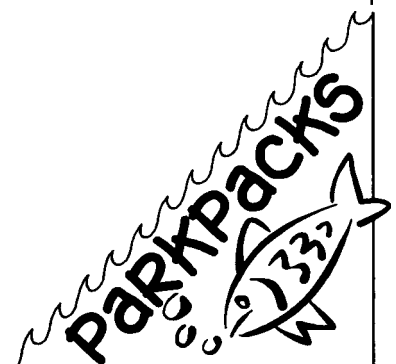
- (a) In the field, identify eight species of birds.

A Life of Crime

Fish

- (a) Catch and identify two species of fish.

Gone Fishin' and Something's Fishy



JUNIOR GIRL SCOUTS

ENVIRONMENTAL HEALTH

4. Life Underwater - Visit an aquarium, fish hatchery, . . . and look closely at the aquatic animals. Learn how their adaptations allow them to live in water.
Read a Fish
5. Water Food Chain - Find out about water ecosystem food chains by looking for animals. Make a food chain that would include the animals you observed.
Lake Life
7. Visit a place where water has been put to work, such as a . . . fish hatchery . . .

CAMP TOGETHER

3. Walk Softly - Learn about "leave no trace" camping. . .
Choose Your Ripple Effect
6. Challenge Yourself - Learn a new outdoor skill such as how to pitch a tent, use a map and compass, rappel, dry food, bird-watch, purify water, or cook outdoors.
Gone Fishin'

EARTH CONNECTIONS

5. Eco-Games - Help others understand relationships within an ecosystem by playing a game that shows how plants and animals depend upon each other.
Lake Life and Rival for Survival
7. Adapt or Perish - Look for some examples of ways that plants or animals have developed or adapted in order to survive in their habitat.
Rival for Survival, Read a Fish, and Unfair Advantage!

WILDLIFE

2. It's All in the Details - Field scientists often sketch, draw, or photograph the plants and animals they study. Try your hand . . .
A Life of Crime
7. Take a Closer Look - Use two of the following items to see a plant or animal up close: binoculars, magnifying lens, . . .
Lake Life and A Life of Crime
8. Animal Watcher - Use field markings, behaviors, and the song or call of an animal to identify at least three kinds of birds or other animals in your neighborhood.
Lake Life, Something's Fishy, and A Life of Crime
10. How Was Your Day? - Field biologists learn a lot about animals by observing them doing everyday things. . . Pick an animal and discover three of the following . . .
Lake Life, Read a Fish, and A Life of Crime

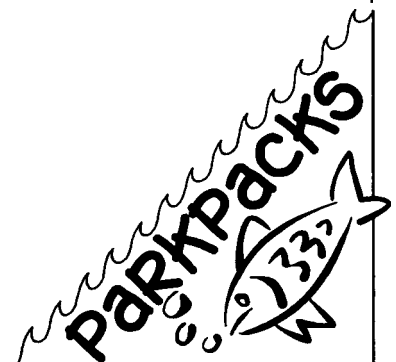
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ACTIVITY MATRIX

Youth leaders will find this chart helpful if they choose to use the Fish Pack while camping with their groups.

FISH PACK ACTIVITIES	Explore the lakes	Take a hike	Play a game	Read a book	Use a field guide	Be creative	Visit the past	Consider the future	Do it on a rainy day
DISCOVER UNDERWATER LIFE									
Lake Life	🐟		🐟		🐟				🐟
Read a Fish					🐟	🐟			🐟
Something's Fishy	🐟				🐟	🐟			
Great Lakes Yearbook			🐟		🐟	🐟	🐟	🐟	🐟
CATCH A FISH TALE									
Gone Fishin'	🐟						🐟	🐟	
Fish Stories				🐟			🐟		🐟
PONDER FISHY PROBLEMS									
A Life of Crime	🐟				🐟				
Unfair Advantage	🐟							🐟	
Rival for Survival			🐟				🐟	🐟	🐟
SEEK YOUR CONNECTION									
I imagine - No Lakes!	🐟	🐟						🐟	
Choose Your Ripple Effect			🐟	🐟				🐟	🐟



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ANGLER EDUCATION PROGRAM

Angler Education workshops provide training for adult volunteers to offer fishing programs in their schools and communities. The program introduces children to basic fishing skills and connects them to Wisconsin's lakes and streams.

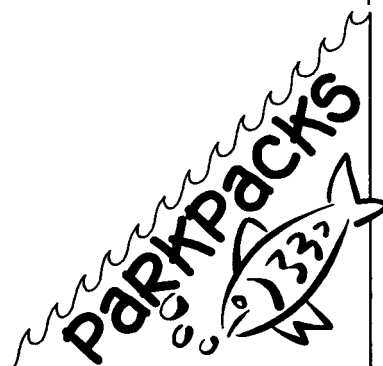
Adults who attend the workshops receive free materials that they can use to teach their own angler education courses and help guide adventures in local water resources investigations. Fishing equipment and other supplies are available for loan to instructors.

Youth leaders, classroom teachers, fishing club members and civic leaders are encouraged to attend as a team or form one at the workshop. Start an after-school fishing club, offer it as a summer enrichment class, build a school event around a fishing clinic, or include one as part of a community festival! Materials are correlated to Wisconsin's academic standards making the program an easy fit in the classroom.

Several other DNR programs complement Angler Education. Ask about *Hooked On Fishing - Not On Drugs*, *Project WILD*, *Water Action Volunteers*, and *Project WET* as possible workshop components.

NEED MORE INFORMATION?

Angler Education Office
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707
(608) 266-2272 or (608) 261-6431
www.dnr.state.wi.us/org/water/fhp/fish/equip.htm



SCHOOL AQUARIUMS

There are laws regarding the keeping of game fish in aquariums. Schools are encouraged to purchase game fish from a licensed privately owned fish hatchery. It is important to keep the receipt on file. A list of private hatcheries is available from the Department of Agriculture, Trade and Consumer Protection (DATCP) in Madison. Aquaculture classes are advised to contact DATCP for further information on fish rearing, 608/224-5137.

If a class wishes to capture the fish themselves, they must obtain a scientific collector's permit from the fisheries expert or biologist in their DNR region. Undersized fish are allowed with a scientific collector's permit. Without a permit, any fish caught and kept must be taken in season, be of legal size, and be counted toward the teacher's possession limit.

Fish raised or kept in a school aquarium cannot be introduced or returned to the wild without approval from the Department of Natural Resources as it constitutes stocking without a permit. Disease and genetic dilution are the major concerns.

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BEST PRACTICES

COLLECTING AQUATIC ORGANISMS

Taking groups to the lakeshore or stream bank for field observations of living organisms gives students unique perspectives on biological processes and ecological systems that a textbook or video can't provide. It also provides them with insights into possible career choices - "this is what scientists do". Field collecting and habitat exploration, however, carries a responsibility for appropriate collection methods. Here are some things to consider before you go afield:

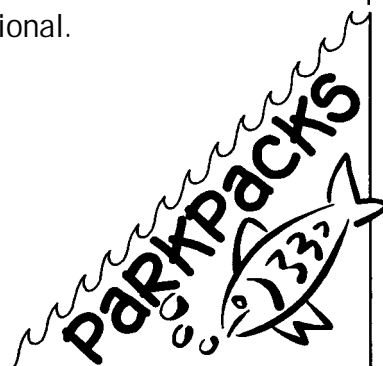
- ≈ Look for an acceptable alternative. If your goal is limited to dissection, perhaps a whole fish from the market or bait shop would do the job. Save the field trip for when you have time to observe the habitat.
- ≈ Avoid going to the same spot time after time.
- ≈ Minimize the group's impact on the site by dividing the group into teams of three to five members and spreading them out with their assigned tasks. Remind students to step lightly and replace rocks and logs they may have turned over to examine, as they found them.
- ≈ Minimize impacts on individual organisms with gentle handling. Return organisms to their original location.

KEEPING ANIMALS IN THE CLASSROOM

Bringing animals into the classroom allows students to observe and compare life cycles on a long-term basis and develop a keener understanding of the interrelationships, unity, and complexity of life. Collecting organisms for classroom observations requires a commitment to appropriate, humane care of them. Teachers are expected to be knowledgeable about the proper care of organisms under study and the safety of their students.

The National Science Teachers Association (NSTA) recommends the following guidelines for responsible use of animals in the classroom:

- ≈ Acquisition and care of animals must be appropriate to the species.
- ≈ Student classwork and science projects involving animals must be under the supervision of a science teacher or other trained professional.
- ≈ Teachers sponsoring or supervising the use of animals in instructional activities—including acquisition, care, and disposition—will adhere to local, state, and national laws, policies, and regulations regarding the organisms.
- ≈ Teachers must instruct students on safety precautions for handling live animals or animal specimens.



- ≈ Plans for the future care or disposition of animals at the conclusion of the study must be developed and implemented.
- ≈ Laboratory and dissection activities must be conducted with consideration and appreciation for the organism.
- ≈ Laboratory and dissection activities must be conducted in a clean and organized work space with care and laboratory precision.
- ≈ Laboratory and dissection activities must be based on carefully planned objectives.
- ≈ Laboratory and dissection objectives must be appropriate to the maturity level of the student.
- ≈ Student views or beliefs sensitive to dissection must be considered; the teacher will respond appropriately.

Adopted by the NSTA Board of Directors in July, 1991

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Great Lakes BIBLIOGRAPHY

CHILDREN'S FICTION

The Care and Feeding of Fish: a Story with Pictures by Sarajo Frieden © 1996. Following the instructions in an old notebook her Great Aunt Eclair accidentally mailed to her, Loulou takes her pet fish to a tailor, to charm school, and to tea, causing him to become the toast of the town.

Fish Riddles by Viki Woodworth © 1996. A collection of jokes relating to fish. Example: How did the dogfish pay for dinner? With her credit cod.

Gleam and Glow by Eve Bunting © 2001. After his home is destroyed by war, eight-year-old Viktor finds hope in the survival of two very special fish.

Gull # 737 by Jean Craighead George © 1964. Luke and his family spend summers on a small island in the Atlantic Ocean studying gulls as part of his father's scientific research. When they are almost ready to call it quits, they are summoned to help solve an aviation crisis. The book looks a little dated, but it is also filled with insights into gull behavior and the scientific process.

The Gulls of the Edmund Fitzgerald by Tres Seymour © 1996. Squawking gulls on Lake Superior warn of danger, for the hungry lake has swallowed up many ships, even the mighty Edmund Fitzgerald.

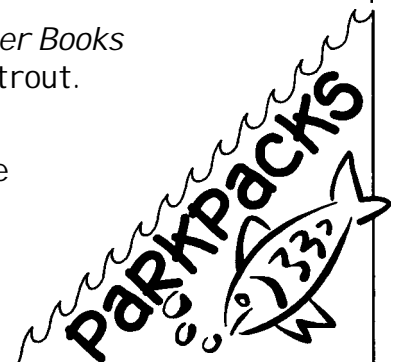
The Great Fish by Peter Parnall © 1973. An Indian boy's grandfather tells him of the time when the mothers' tears for their hungry children brought the salmon to now polluted and lifeless waters.

Jonathan Livingston Seagull by Richard Bach © 1970. Johnathan is not a typical gull. The story recounts his struggles with being different and what he learns about seagull life.

LaSalle of the Mississippi by Ronald Syme © 1953. The story of the explorer LaSalle, who traveled through Lakes Huron, Michigan, and Erie and down the Mississippi River. An exciting story full of physical hardships and dreams of opening up an inland empire of fur trading.

Little Fish by Ralph Moisa Jr. © 1997. *Cover-to-Cover Chapter Books* series. Last two chapters contain non-fiction information on trout.

The Mishomis Book: The Voice of the Ojibway by Edward Benton-Banai © 1988. Written by a Wisconsin Ojibway of the Fish Clan. The book is written in the manner of oral tradition with the author "speaking" to the reader and telling the stories of creation, discovery, and movement of the Ojibway.



Minas and the Fish by Olga Pastuchiv © 1997. A young boy wishes to learn to swim so he can go fishing with his older brothers, but when a magic fish teaches him, his brothers no longer recognize him.

Paddle-to-the-Sea by Holling Clancy Holling © 1941. In the Nipigon country north of the Great Lakes, a young boy carves a wooden canoe carrying an Indian. He christens his artwork *Paddle-to-the-Sea* and sets it on a journey through the Great Lakes. As the Lakes and people help him on his way, Paddle learns about life on the Lakes, including the wildlife, weather, shipping, and industry, and how the Lakes flow to the sea.

Scholastic's The Magic School Bus Gets Cold Feet: A Book About Warm-and-Cold-Blooded Animals by Tracey West © 1997.

Shingebiss: A Ojibwe Legend retold by Nancy Van Laan © 1997. Shingebiss, the merganser duck, bravely challenges the Winter Maker and manages to find enough food to survive a long, harsh winter by ice fishing in the Great Lakes.

Swimmer by Shelley Gill © 1995. The story of the Chinook salmon—Swimmer's journey over 10,000 miles illustrates the cycles of life for the salmon and the girl Katya, who is coming of age.

Traders in Time: A Dream-Quest Adventure by Janie Lynn Panagopoulos © 1993. Eight-year-old Nick and his older brother, Chris, travel back in time to the late 1700s. Chris's escape from a dishonest fur trader sets the stage for a vivid portrayal of the sights, smells, and drama taking place along the shores of Lake Michigan and at Fort Mackinac.

Trouble at Fort LaPointe by Kathleen Ernst © 2000. *History Mysteries from American Girl* series. In the early 1700s, twelve-year-old Suzette, an Ojibwa-French girl, hopes that her father will win the fur-trapping contest so that he can quit being a voyageur and stay with his family year 'round, but when he is accused of stealing, Suzette must use her knowledge of both French and Ojibwa ways to find the real thief.

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CHILDREN'S NONFICTION

About Fish: A Guide for Children by Cathryn Sill © 2002. Introduces various species of fish, describing their food needs, body structures, protective mechanisms, habitats, and reproduction.

Amazing Fish by Mary Ling © 1991. *Eyewitness Juniors* series. Introduces memorable members of the fish world, explains what makes them unique, and describes important characteristics of the entire group.

Bird Watching for Kids by Steven and Elizabeth May Griffin © 1995. *Family Bird Watching Guide* series.

Exotic Invaders: Killer Bees, Fire Ants and Other Alien Species Are Infesting America by Jeanne M. Lesinski © 1996. Describes five species that are not native to North America – the sea lamprey, fire ants, zebra mussels, European starlings, and African honeybees – and efforts to handle the problems their introductions have caused.

Fish by Steve Parker © 1990. *Eyewitness Book* series. A photo essay about the natural world of fish and their importance in human life.

Fish by Edward R. Ricciuti © 1993. *Our Living World* series. Examines the physical structure, metabolism, and life cycle of fishes and discusses how they fit into the food chain.

Fish, Fish, Fish by Georgie Adams © 1993. Colorful collage illustrations introduce various sizes and shapes of fish.

Fish Do the Strangest Things by Leonora and Arthur Hornblow © 1990. *Step-up Nature Books* series. Describes 17 fishes that have peculiar characteristics and habits, including fish that spit, fly, climb trees, blow up like balloons, and sleep out of water.

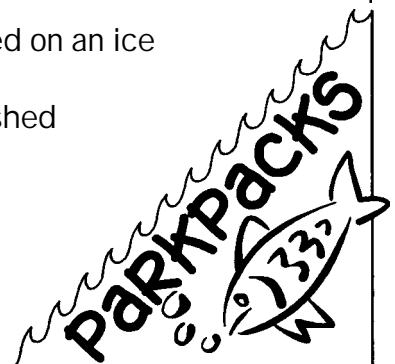
A Fish Hatches by Joanna Cole and Jerome Wexler © 1978. Describes the life cycle of a trout from the laying of eggs in a hatchery to maturity.

Fishes by Melissa Stewart © 2001. *A True Book* series. Describes the basic behavior, physical traits, and life cycle of fishes.

Freshwater Fish by Trevor Housby © 1995. Descriptions of 40 of the major North American and European freshwater fish.

Frozen Terror as told to Ben East © 1979. A man is stranded on an ice floe in Lake Michigan while ice fishing and endures perilous adventures attempting to get back to shore. Originally published in "Narrow Escapes" by *Outdoor Life*.

Funny Fishes by Sara Swan Miller © 2001. Discusses several species of fishes that have unusual appearances, habits, or behaviors.



Gulls by George K. Peck © 1998. Describes the life cycle, behavior patterns, and habitat of various species of gulls, focusing on those found in North America.

The Gull's Way by Louis Darling © 1965. The author describes his observations of a gullery in spring.

Lake Michigan: Great Lakes of North America by Harry Beckett ©1999. Discusses Lake Michigan's geography, history, early inhabitants, important events, economy, and more.

Lake Superior: Great Lakes of North America by Harry Beckett © 1999. Discusses Lake Superior's geography, history, early inhabitants, important events, economy, and more.

Lakes by Randy Frahm © 1997. Defines lakes and explains how they are formed. Briefly discusses lake food chains, temperature variations, the aging of lakes, and how humans affect lakes. Beautiful book with full-page photos.

Lakes by Brian Knapp © 1992. *Landshapes* series. Describes patterns produced where water collects in hollows, behind natural dams and in deep valleys over the Earth's land surface.

Native Americans of the Great Lakes by Stuart A. Kallan © 2000. *Indigenous Peoples of North America* series. Discusses the history, daily lives, culture, religion, and conflicts of the Indians that lived in the Great Lakes region, including the various Iroquois and Algonquin peoples.

One Small Square: Pond by Donald Silver © 1994. *Scientific American Books for Young Readers* series. Invites kids to adopt a 2-foot cube of a pond and observe all the creatures that live there. Provides activities to aid exploration.

Salmon Stream by Carol Reed-Jones © 2000. *Sharing Nature with Children* series. The life cycle of salmon and its place in ecology are illustrated and explained to the reader.

Shorebirds by Jonathan P. Latimer and Karen Stray Nolting © 1999. *Peterson Field Guides for Young Naturalists* series. A field guide to shorebirds in the air, on the water, on the ground, and in the grass, including gulls, coots, sandpipers, and egrets.

Watching Water Birds by Jim Arnosky © 1997. Provides a personal look at various species of fresh- and saltwater birds, including loons and grebes, mergansers, mallards, wood duck, Canada geese, gulls, and herons.

What is a Fish? by Bobbie Kalman & Allison Larin © 1999. *Science of Living Things* series. Introduces fishes, showing and describing different types including freshwater and saltwater, and discussing their anatomy, habitats, reproduction, and diet.

Zoobooks: Seabirds by Beth Wagner Brust © 1990. A basic introduction to seabirds, of which there are more than 260 species distributed all over the world.

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FISHING SKILLS

Fish in a Flash! A Personal Guide to Spin-Fishing by Jim Arnosky © 1991. An introduction to the techniques and joys of the most popular method of fishing in the world, one which uses lures that spin.

Fishing by David Armentrout © 1998. Briefly describes the equipment, techniques, safety, laws, and tournaments involved in both freshwater and saltwater fishing.

Fishing Is for Me by Art Thomas © 1980. *Sports For Me* series. Kevin and his friend Virgil explain the techniques of fishing, equipment, bait, kinds of fish, and preparing fish for cooking.

Freshwater Fishing: A Step-by-Step Guide by Richard Smithsen © 1990. *Be the Best* series. Discusses how and where to fish, what kind of equipment to use, and what kinds of freshwater fishes can be caught.

Freshwater Fish & Fishing by Jim Arnosky © 1982. Describes different varieties of freshwater fishes and instructs how to catch them.

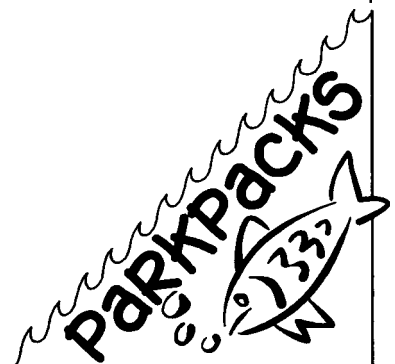
Let's Go Fishing: A Book for Beginners by Gerald Schmidt © 1990. Focusing on freshwater fishing in North America, this book takes the mystery out of the most popular form of recreation in the U.S. and Canada.

Let's Go Fishing in Streams, Rivers, and Lakes by George Travis © 1998. Describes the equipment and techniques used in freshwater fishing.

Let's Go Fishing on the Ice by George Travis © 1998. Describes some of the techniques used to catch fish in frozen lakes.

Panfish by Dick Sternberg © 1996. Gives information on rods, reels, lines, and ice fishing, and explains how to catch sunfish, crappies, white bass, yellow perch, white perch, and rock bass.

The Young Fishing Enthusiast by John Bailey © 1999. An introduction to the basic techniques of fishing, including advice on tackle, bait, and clothing.



FIELD GUIDES

Fishes by C. Lavett Smith © 2000. *National Audubon Society First Field Guide* series. Explores the world of fishes, discussing their classification, anatomy, behavior, and habitat, and providing photographs and detailed descriptions of individual taxonomic families.

Fishes by Michael Filisky © 1989. *Peterson First Guide* series. A simplified field guide to the fishes of North America.

Through the Looking Glass: A Field Guide to Aquatic Plants by Susan Borman, Robert Korth, and Jo Temte © 1997. A field guide to Wisconsin's emergent plants, free-floating plants, and submersed plants. Beautiful line drawings are accompanied by descriptions, habitat, value in the community, phenology, and folklore.

ADULT REFERENCE

Around the Shores of Lake Michigan: A Guide to Historic Sites by Margaret Beattie Bogue © 1985. Historic photos and drawings. Main focus of book is an auto tour of points of interest along the shores. Extensive bibliography.

The Enduring Great Lakes: A Natural History Book edited by John Rousmaniere © 1979.

The Faces of the Great Lakes: A Sierra Club Book by Jonathan Ela and B. A. King © 1977. Natural and cultural history of the area. Mostly text, except for photos in back.

Fixin' Fish: The Complete Guide to Cleaning, and Cooking Freshwater Fish by Sylvia Bashline © 2000.

Great Lakes Country by Russell McKee © 1966. Interesting information on early inhabitants and explorers. Some historic drawings, maps, and photos.

Land of the Inland Seas by William Donohue Ellis © 1974. Information about the Great Lakes, plants and animals, early Europeans, struggles and early government, harvesting, and shipping.

A Pictorial History of the Great Lakes by Harlan Hatcher and Erich A. Walter ©1963. Geology, early history, ships, cities along the shores, locks, and lighthouses. Includes maps and historical documents.

TEACHERS' GUIDE TO FISH PACKS

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CURRICULUM AND ACTIVITY GUIDES

Biodiversity, Wetlands, and Biological Control: Information and Activities for Young Scientists - Purple Loosestrife: A Case Study by Michael Jeffords and Susan Post © 1999. Introductory activities about biodiversity and wetlands lead to lessons concerning the biological control of purple loosestrife in wetland areas. Based in Illinois, but very adaptable.

Caring For Our Lakes: A Curriculum of the Yahara Watershed by Institute for Environmental Studies - UW-Madison © 1990. A local resource that demonstrates how a curriculum can be designed to further educational goals about a local water resource, lakes. Yet, includes aspects that are applicable to any community with small lakes in its watershed. Goals for students to achieve include: understanding lakes as part of a larger ecosystem; ability to identify problems and issues concerning the Yahara lakes; familiarity with geography of the watershed; and recognition of human activities related to lake problems.

Earth: The Water Planet by Jack Gartrell, Jane Crowder, and Jeffery Callister © 1992. Produced by the National Science Teachers Association. This activity book was produced for middle grade teachers in Earth Science. It contains 5 modules: Groundwater; Reshaping the Surface of the Earth; Raindrops Keep Falling on My Head; Water, Water Everywhere; and Investigating the Physical Properties of Water.

Exploring the Great Lakes: Teacher's Edition produced by US EPA Great Lakes National Program Office © 1999. CD-ROM that also includes the *Great Lakes Environmental Atlas*.

The Great Lakes in My World: An Activities Workbook for Grades K - 8 produced by the Lake Michigan Federation and the Great Lakes Commission © 1989. Activities divided into 3 sections: People and the Great Lakes, The Great Lakes Today, Natural Processes in the Great Lakes.

WOW!: The Wonders of Wetlands: An Educator's Guide by Britt Eckhardt Slattery © 1995. A product of Environmental Concern Inc. Activities for K - 12 cover the basics of wetlands, the wetland community, the physical aspects of water, wetland soils, and action projects related to wetlands.

