

WEB OF LIFE

METHOD

Connect aquatic plants and animals into a food web using **Wildcards** and string.

GRADES

5 – 8

ACTIVITY TIME

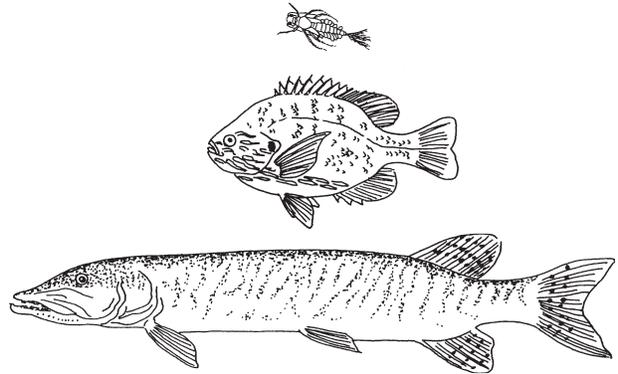
20 – 30 minutes

SETTING

Anywhere

MATERIALS

- **Wisconsin Wildcards: Natives and Alien Invaders** (see lists on page 19 and 20). Select the cards listed on page 56. You will need 1 set for each group of 8 - 15 kids.
- Extra cards on page 3 (1 copy for each group of 8 - 15 kids)
- Ball of string or yarn (1 for each group of 8 - 15 kids)



STANDARDS

Environmental Education: B.8.8

Science: F.8.9

SCOUT CONNECTIONS

Webelos: Naturalist

Boy Scouts of America: Insect Study, Nature

Junior Girl Scouts: Earth Connections

INTRODUCTION

Have you ever seen a perfect spider web? The rays connect to tree trunks, rocks, and fences to hold the web in place. The spirals are evenly spaced. They tie the rays together. If you follow the strands of silk, you can eventually get to any place on the web! Now picture a pond. The pond is made up of living and non-living things that are connected to each other. Pondweeds need sunlight to live and grow. Small invertebrates eat the pondweeds. Small fish eat the invertebrates. Big fish eat the small fish. When the big fish die, scavengers eat them. If we could take a pencil and magically draw the connections in the pond, the picture might start to look something like a crazy spider web. Let's play a game to see how this might work.

DOING THE ACTIVITY

1. **Divide the kids into groups.** Maximum group size is 15. The ideal size would be 8 – 12.
2. **Give each kid a Wildcard from the list on page 4.** Ask them to look over the information on the back and think about what they need to eat and what might eat them. Be prepared to help kids with vocabulary, especially on the aquatic invertebrate cards. Note: The leader should keep the “sun” card.
3. **Start the game.** Show the ball of string and explain that the string will let us see the ways plants and animals are connected to each other. Show the “sun” card, and explain that you will start, because all energy comes from the sun. Model the game by saying, “I am the sun. I am passing the ball of string to the diatom, because I give it energy to grow.” You hold onto the string and pass the ball to the diatom.
4. **Continue the play.** The “diatom” holds onto the string and passes the ball to another plant or animal in the circle that is connected to it in some way. Keep the string tight, but not too tight! Play continues until everyone is holding onto the string. Some plants or animals might have multiple connections, but everyone should be a part of the crazy web!
5. **Show the power of the sun.** Explain that you, representing the sun, are very important. Ask what might happen if the sun suddenly stopped shining. Briefly discuss some of the consequences. Ask everyone to sit still. Begin to tug gently on your piece of string. Tell the students that when they feel the tug, they should begin to tug gently. Ask them to watch as the tug moves through the web. Finally, the whole web will be shaking! Everything is connected to everything else.
6. **Explore other connections.** It is easy to understand how the sun influences the connections between plants and animals, because the sun is the source of all energy. What would happen if the sowbugs (or some other decomposer) disappeared? Sowbugs aren’t that important, are they? Try the experiment again with the sowbug gently tugging on the web. As the plants and animals in the circle feel the tug, they should call out the plants or animals they represent.
7. **Discuss impacts to the web.** Talk about things that might change the way the plants and animals are connected in the pond (e.g., drought, winter, pollution, invasive species).

ASSESSING STUDENT LEARNING

After the game, each student chooses one card to research. After finding out what their plants or animals need to survive and who depends on them for food, they can each draw a food web. Students should start by putting their chosen plants or animals in the center of large pieces of paper. Then, using words and/or pictures, draw all the connections to other plants and animals.

EXTENDING THE LEARNING

Introduce an alien invader. What happens when you add an invasive species or two to the food web? Try adding one of these alien invaders: curly-leaf pondweed (plant), rusty crayfish (plant eater), or rainbow smelt (meat eater). Invasive species often displace native species. What happens then? Identify one plant or animal that the new invasive species will displace. Ask the student representing the native plant or animal to let go of the string. What happens to the web? Ask the students to pull gently on the string. Watch as the web unravels.

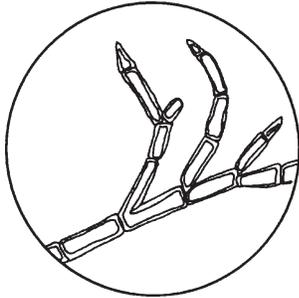
SUN

The source of all energy! All food chains begin with the sun!

CLADOPHORA

Cladophora (green algae) are made of long, slender plant cells that form branching filaments.

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



DIATOMS

Diatoms are single-celled algae. They are “the grass of the lake.”

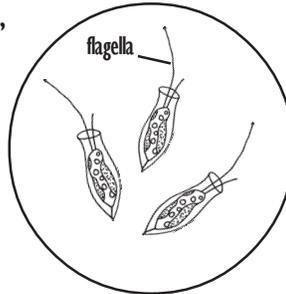
THEY ARE EATEN BY daphnia, snails, mayfly larvae, midge larvae, riffle beetles, and water penny larvae.



CHRYSOPHYTES

Some chrysophytes have flagella for moving around in the water. That’s unusual for algae!

THEY ARE EATEN BY slippershells, zebra mussels, alewives, daphnia, and snails.

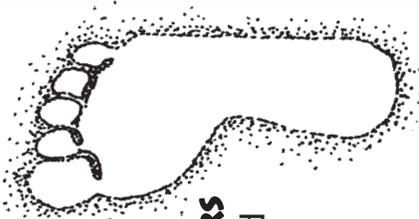


HUMANS

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

capture their food.

HUMANS ARE TOP PREDATORS in aquatic food chains.



COPY AND CUT OUT THESE EXTRA WILDCARDS

WILDCARDS NEEDED FOR WEB OF LIFE GAME

Producers (plants): cat-tails¹, diatoms, cladophora,
chrysophytes

First Order Consumers (eat plants): caddisfly larva,
muskrat, riffle beetle, mayfly larva, shorthead redhorse,
water penny larva, trumpeter swan

Second Order Consumers (eat plant eaters): Blanding's
turtle, Blanchard's cricket frog, dragonfly larva, green
sunfish, yellow perch, raccoon²

Third Order Consumers (eat meat eaters): northern pike,
walleye, people, common loon

Decomposers (eat dead plants and animals): crane fly
larva, sowbug, catfish

¹ The Wildcard for cat-tails features both native and non-native cat-tails, but it is in the Alien Invaders set.

² Raccoons eat plants, plant eaters, meat eaters, and dead plants and animals. They are only listed once to reduce confusion when gathering cards.

GO FISH!

METHOD

Play a game of Go Fish! Then, design your own fish that can survive somewhere in the state.

GRADES

3 – 6

ACTIVITY TIME

45 – 60 minutes

SETTING

Inside

MATERIALS

- **Wisconsin Wildcards: Match Your Catch!** (see list on page 19). You will need 4 each of 13 different fish for each group of 2 - 5 kids.
- Paper
- Art materials

STANDARDS

Environmental Education: B.4.6

Science F.8.2

SCOUT CONNECTIONS

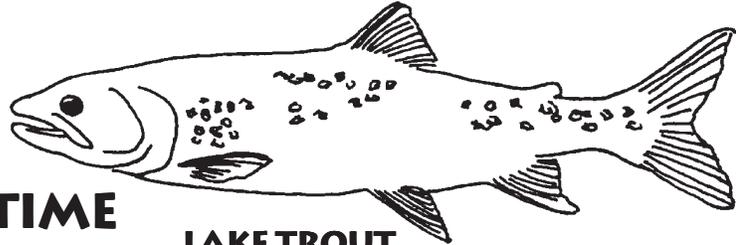
Junior Girl Scouts: Earth Connections

INTRODUCTION

Fish come in so many different shapes, sizes, and patterns that it's almost impossible to know them all. However, because fish live in a watery world, they have many things in common, like basic body shapes, scales, and gills. The small ways that they adapt to particular habitats, foods, or environmental conditions make each kind of fish special.

DOING THE ACTIVITY

1. **Play Go Fish!** Follow the game directions on page 7. Since only two groups of 2 - 5 kids can play the game at one time, set up a learning station with the cards or divide into teams and take turns playing the game. If you choose, you can play the version that best fits your location. See page 8.



LAKETROUT

- Light belly and dark back for camouflaging when seen from below or above. This common color pattern is called countershading.
- Torpedo-shaped body for fast movement. All fish are streamlined for slipping smoothly through the water.
- Large mouth for catching and eating prey fish.

2. **Talk about fish adaptations.** Allow kids to study the illustrations and the information on the backs of the cards. Use the information in this activity about lake trout, yellow perch, and lake sturgeon to take a closer look at fish adaptations.
3. **Design a fish.** Using the information from your discussion, ask the kids to design a fish. They should decide where it will live, what it will eat, and how it will avoid predators. They can also think about how it will reproduce and compete with invasive fish species.

ASSESSING STUDENT LEARNING

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

EXTENDING THE LEARNING

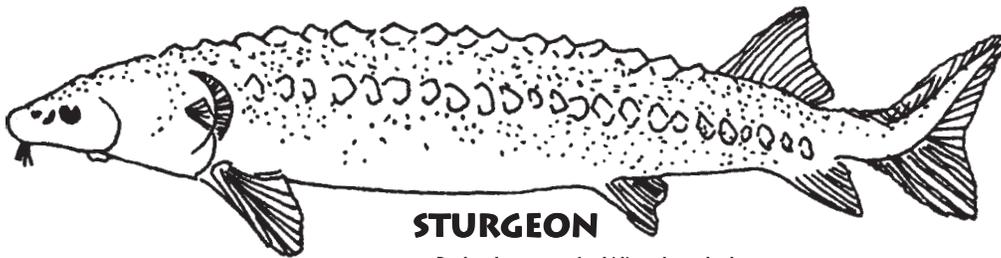
Be a fish for a day! What if you could be a fish for a day? What kind of a fish would you want to be? Would you live in the open water, on the murky bottom, or among vegetation? Would you eat plankton or other fish? How would you avoid being eaten by bigger fish? What would an underwater life be like?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

FINDING OUT MORE!

Fish Do the Strangest Things. 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.

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

Fishes. 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.

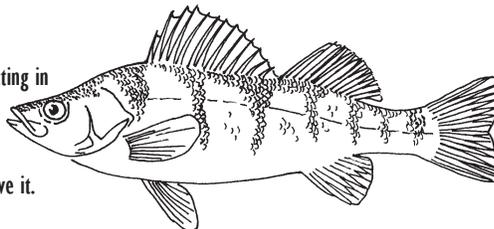


STURGEON

- Dark color on top for hiding along the bottom.
- Mouth on the underside of head for sucking up bottom-dwelling creatures.

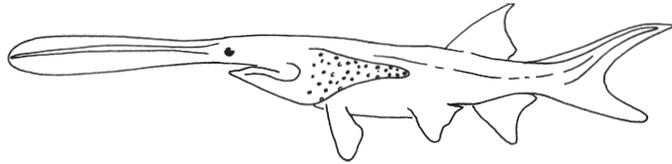
YELLOW PERCH

- Flattened body for swimming slowly and fitting in small places.
- Stripes for hiding in vegetation.
- Uprturned mouth for feeding on things above it.



GO FISH!

CARD GAME
EASY
2 - 5 PLAYERS



OBJECT

Collect the most groups of four matching cards by “fishing” in other players’ “ponds.”

WILDCARDS

4 each of 13 different fish (See next page for cards needed to play special versions of this game: The Great Lakes, The Mississippi River, or Wisconsin’s Inland Lakes.)

DEAL

Shuffle and cut the cards. Deal five cards to each person, one at a time and facedown. If two or three play, deal seven cards to each. Place the rest of the cards facedown in a pile. This is the fishing hole.

PLAY

Everyone: Arrange your cards so that matching fish are together. If you have four of a kind, announce what kind of fish it is and put the cards face up on the table in front of you.

Player on the Dealer’s Left: You go first. Look at your hand and decide which fish you need to make a set of four. You can ask any player to hand over any fish as long as you have at least one of that fish in your hand. For example, if you have at least one paddlefish in your hand, you can ask, “Sarah, do you have any paddlefish?” If Sarah has any paddlefish in her hand, she must give them all to you!

You continue asking the same or different players for specific cards and receiving them until a player doesn’t have the card you asked for.

Other Players: If you don’t have any of the cards that the first player wants, say “Go Fish.” Then, that player goes fishing in the fishing hole, chooses the top card without peeking, and puts the card in his hand. His turn is over, unless, by sheer luck or coincidence, he gets the card that he was asking for. When this happens, he shows the card and starts his turn all over again!

Everyone: Play continues to the left around the table with asking and fishing. When you get a group of four, announce the kind of fish, and put the set faceup in front of you. If you run out of cards, you can take one from the fishing hole on your next turn.

When the fishing hole is empty, players without cards are out of the game. When the last card has been played, count your groups of four. The player with the most groups wins.

SPECIAL GO FISH! CARD GAMES

You need four of each fish for a total of 13 groups of four.

GO FISH

THE GREAT LAKES!

1. Bowfin
2. Brook Trout
3. Burbot
4. Freshwater Drum
5. Lake Sturgeon
6. Lake Trout
7. Lake Whitefish
8. Northern Pike
9. Smallmouth Bass
10. Walleye
11. White Bass
12. White Sucker
13. Yellow Perch

GO FISH

THE MISSISSIPPI RIVER!

1. Black Crappie/White Crappie
2. Channel Catfish/Flathead Catfish
3. Grass Pickerel
4. Iowa Darter
5. Largemouth Bass
6. Longnose Gar
7. Paddlefish
8. Quillback
9. Sauger
10. Shorthead Redhorse
11. Shovelnose Sturgeon
12. Smallmouth Buffalo
13. Walleye

GO FISH

WISCONSIN'S INLAND LAKES!

1. Bluegill
2. Common Shiner
3. Green Sunfish
4. Largemouth Bass
5. Mottled Sculpin
6. Muskellunge
7. Northern Pike
8. Pumpkinseed
9. Smallmouth Bass
10. Walleye
11. White Sucker
12. Yellow Bullhead/Brown Bullhead
13. Yellow Perch

MEET THE FISH!

METHOD

Use a dichotomous key from the Junior Angler Program to identify the Wisconsin fish pictured on Wildcards.

GRADES

4 – 8

ACTIVITY TIME

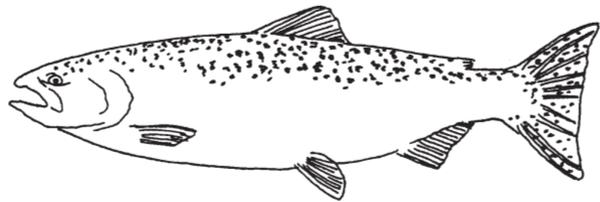
30 – 40 minutes

SETTING

Anywhere

MATERIALS

- Wisconsin Wildcards: Match Your Catch! Select fish cards that are included in the key (see list on page 10).
- Fish Key on pages 11 - 12 (1 copy for each pair of kids)



STANDARDS

Science B.4.1

SCOUT CONNECTIONS

Boy Scouts of America: Fishing, Nature

INTRODUCTION

(This information is adapted from the Junior Angler Instructor's Guide.)

If you were fishing in Wisconsin, why would you need to know what kind of fish you were catching? (There are some fish that you can catch and eat, others that you must catch and release). What if you were planning to eat your catch? (Some people prefer the taste of one kind of fish to another. People should take caution when eating some types and sizes of fish due to health advisories.) Can you think of other reasons why you might want to or need to know the identity of a fish? (Be sure to discuss legal and ethical issues of harvest limits and size restrictions.)

DOING THE ACTIVITY

1. **Introduce the key.** Scientists and naturalists use dichotomous keys to identify plants and animals. Explain how to navigate through the key. Begin with the first set of characteristics and decide whether choice a or choice b is true for the fish you are looking at. At the end of each line will be either instructions to go to another clue or the name of the fish.
2. **Pass out Wildcards and let the kids use the key.** Allow kids to work with a partner.
3. **Offer help as needed.** Without actual specimens, some key characteristics of fish may be difficult to see in an illustration. Here are some hints you may want to share with the group to keep them from getting stuck as they make their way through the key.
 - **Single dorsal fin vs. two dorsal fins** — Some fish clearly have just one dorsal fin and some clearly have two distinct dorsal fins. Others have two that may be joined together with a spiny anterior part and a soft posterior part. The adipose fin is something different altogether.
 - **Noticeable sharp teeth** — This is tough to see in an illustration! To help them stay on the right track, tell kids to think about **toothy predators**.
 - **Fin rays and fin spines** — For some species, the number of rays or spines may be the clincher in distinguishing one species from another. You can see these by looking at a good illustration and counting carefully.

ASSESSING STUDENT LEARNING

Note how successfully students are able to follow the directions in the key and arrive at an accurate identification.

EXTENDING THE LEARNING

Make keys for other Wildcards. Try snakes, furbearers, or aquatic stream critters.

FINDING OUT MORE!

Junior Angler Instructor's Guide. Theresa Stabo. Wisconsin Department of Natural Resources. 2002. For more information, visit the Angler Education website. <www.dnr.wi.gov/org/water/fhp/fish/kidsparents/anglereducation/index.shtml>

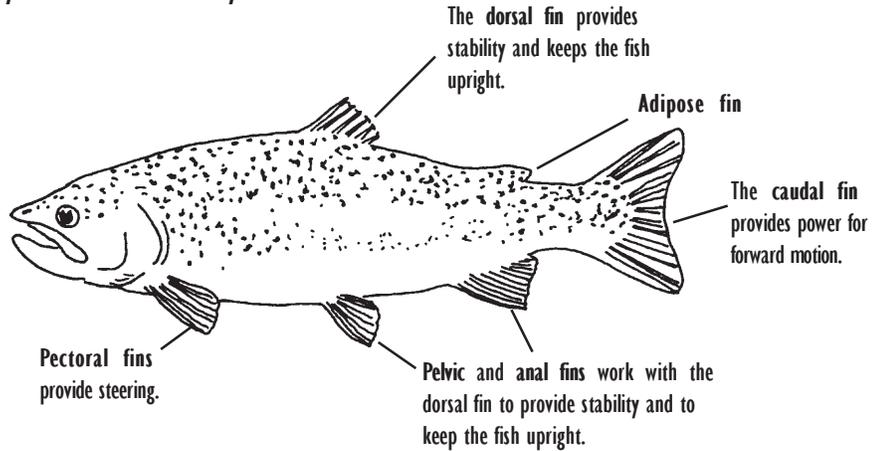
Fishing Regulations. Wisconsin Department of Natural Resources. 2005. <www.dnr.wi.gov/org/water/fhp/fish/regulations>

THE FOLLOWING FISH ARE INCLUDED IN THE KEY.

Black Crappie	Chinook Salmon	Largemouth Bass	Walleye
Bluegill	Coho Salmon	Muskellunge	Smallmouth Bass
Bowfin	Flathead Catfish	Northern Pike	White Sucker
Brook Trout	Grass Pickerel	Pumpkinseed	Yellow Bullhead
Brown Bullhead	Lake Trout	Rainbow Trout	Yellow Perch
Brown Trout	Lake Sturgeon	Rock Bass	
Channel Catfish	Lake Whitefish	Sauger	

FISH KEY

Scientists use dichotomous (die-COT-o-mus) keys to classify and identify everything from plants to bugs to fish. Choose a fish from the **Wisconsin Wildcards** collection to key out. Start with the first pair of characteristics. Work your way step by step through the key until you have identified your fish.



A KEY TO COMMON WISCONSIN FISH

1. a. Body without very noticeable large bony plates Go to #2
 b. Body with several rows of large bony plates.
 Also has whiskers (barbels) and a sucker-like mouth **Lake Sturgeon**
2. a. Single dorsal fin Go to #3
 b. Two dorsal fins, that may be separated or joined with
 distinct spiny and soft fins, or an adipose fin Go to #7
3. a. Dorsal fin short, much less than half of body length Go to #4
 b. Dorsal fin very long, half of total body length or longer **Bowfin**
4. a. Has very noticeable sharp teeth (Pike Family) Go to #5
 b. No noticeable teeth, fleshy sucker-like mouth **White Sucker**
5. a. Tips of tail fin rounded Go to #6
 b. Tips of tail fin pointed **Muskellunge**
6. a. Both cheek and gill cover fully scaled **Grass Pickerel**
 b. Cheek fully scaled and just the upper half of the gill cover **Northern Pike**
7. a. Small fleshy adipose fin present Go to #8
 b. Adipose fin absent Go to #19
8. a. Has whiskers (barbels) Go to #9
 b. No whiskers (barbels) Go to #13
9. a. Tail deeply forked **Channel Catfish**
 b. Tail rounded or slightly indented, but not forked Go to #10

10. a. Lower jaw protruding beyond upper jaw;
 patchy, mottled markings on body **Flathead Catfish**
 b. Lower jaw not protruding beyond upper jawGo to #11
11. a. Anal fin rays 24-27, barbels whitish, tail fin rounded **Yellow Bullhead**
 b. Anal fin rays 15-24, barbels gray to black, tail fin squarish, slightly notchedGo to #12
12. a. Pectoral fin spine toothless or with poorly developed teeth;
 anal fin rays 15-21, side not mottled (no Wildcard for this one!)..... **Black Bullhead**
 b. Pectoral fin spine with strong saw-like teeth,
 anal fin rays 21-24, side mottled **Brown Bullhead**
13. a. Tail deeply forked Go to #14
 b. Tail slightly forked or not forked Go to #16
14. a. Mouth turned down **Lake Whitefish**
 b. Mouth not turned down Go to #15
15. a. Densely mottled marking pattern on back and sides **Lake Trout**
 b. Marking pattern not densely mottled (scattered spots instead) **Coho Salmon**
16. a. Worm-like markings on back and white edge on lower fins **Brook Trout**
 b. No worm-like markings on back or white edge on lower fins Go to #17
17. a. Lower fins speckled **Chinook Salmon**
 b. Lower fins not speckled Go to #18
18. a. Prominent, pink lateral line **Rainbow Trout**
 b. Lateral line not pink or prominent **Brown Trout**
19. a. Anal fin with two or fewer spines on leading edge (Perch Family) Go to #20
 b. Anal fin with three or more spines on leading edge (Sunfish Family) Go to #22
20. a. Teeth very large, white tip on lower tip of tail..... **Walleye**
 b. Teeth not noticeable, no white tip on tail Go to #21
21. a. Polka-dotted dorsal fin **Sauger**
 b. Polka dots absent from dorsal fin **Yellow Perch**
22. a. Having more than three anal fin spines Go to #23
 b. Having only three anal fin spines Go to #24
23. a. Body silver colored with random black scales **Black Crappie**
 b. Body not silver colored, black scales forming lateral rows of spots **Rock Bass**
24. a. Mouth very large, back of upper jaw extending to below or beyond eyeGo to #25
 b. Mouth very small, back of upper jaw not extending to eye Go to #26
25. a. Tip of upper jaw extending beyond eye **Largemouth Bass**
 b. Tip of upper jaw not extending beyond eye **Smallmouth Bass**
26. a. Red spot at tip of gill flap **Pumpkinseed**
 b. Gill flap all black, no red spot **Bluegill**

Adapted from a key developed by Steve Gilbert, WDNR

BIOTIC INDEX

METHOD

Find out about the Water Action Volunteers' (WAV) method of assessing water quality in Wisconsin streams by simulating a stream critter sampling process.

GRADES

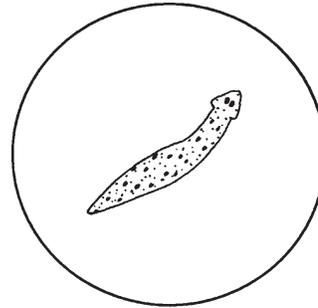
5 – 8

ACTIVITY TIME

30 – 40 minutes

SETTING

Anywhere



MATERIALS

- Wisconsin Wildcards: Native Species: Aquatic Invertebrates (see list on page 19). You will need 4 of each of the 19 cards.
- Bucket or other container
- Key to Macroinvertebrate Life in the River on page 15 (1 copy per group)
- Citizen Monitoring Biotic Index on page 16 (1 copy per group)
- Calculate the Index Score on page 17 (1 copy per group)
- Damselfly nymph drawing (1 for each group, if needed)

STANDARDS

Mathematics: B.8.7

Science: F.8.8, F.8.9

SCOUT CONNECTIONS

Boy Scouts of America: Fish and Wildlife Management

Junior Girl Scouts: Science Discovery

Cadette and Senior Girl Scouts: Eco-Action

INTRODUCTION

(This information is adapted from Wisconsin's Water Action Volunteers (WAV) materials developed by the Wisconsin Department of Natural Resources and the University of Wisconsin – Extension)

WAV uses a biotic index to help assess water quality in streams throughout the state. The biotic index is based on the macroinvertebrates that are present in a stream. Aquatic macroinvertebrates have some general characteristics that make them very useful for assessing stream health:

- Because there are a lot of them in the water, they are fairly easy to sample.
- Their limited mobility and extended presence in the water means that they are exposed on a continuous basis to water quality in that stream or river.
- Many of these organisms breathe oxygen that is in the water.

Macroinvertebrates have varying oxygen demands. Some can only live in water that has a lot of oxygen. Others can live in water that doesn't have much oxygen dissolved in it at all. Generally, we assume that the more pollution there is in water, the less oxygen. The biotic index works by assigning different levels of pollution tolerance to the different kinds of macroinvertebrates. WAV's Citizen Monitoring Biotic Index has macroinvertebrates separated into four categories: tolerant, semi-tolerant, semi-sensitive, and sensitive to pollution.

DOING THE ACTIVITY

1. **Divide into groups and pass out materials.** Form groups of 3 - 4 kids each. Pass out a copy of the **Key to Macroinvertebrate Life in the River, Citizen Monitoring Biotic Index**, and **Calculate the Index Score** worksheet to each group.
2. **Review the use of keys to identify things.** If your group has never used a key, use the damselfly nymph drawings on page 18 to practice. Go through the key step by step, demonstrating how to look at the choices at each step and follow the lines on the chart to the next set of choices. If necessary, enlarge other critters on the key and repeat.
3. **Take "samples."** Allow a representative from each group to "dip" into the bucket and collect nine stream critter cards. Challenge them not to look at the backs of the cards!
4. **Sort and identify the stream critters.** Each group should sort their cards to determine how many different stream critters they "collected". Then, use the key to identify each kind.
5. **Complete the Citizen Monitoring Biotic Index form.** Each group should circle the animals that they identified in their samples.
6. **Tally up animals in each group.** Count the number of types of animals that are circled in each group and write that number in the box provided. Do not count individual animals in your sample. Only count the number of types of animals.
7. **Calculate the Index Score using the formula.** See page 17.

ASSESSING STUDENT LEARNING

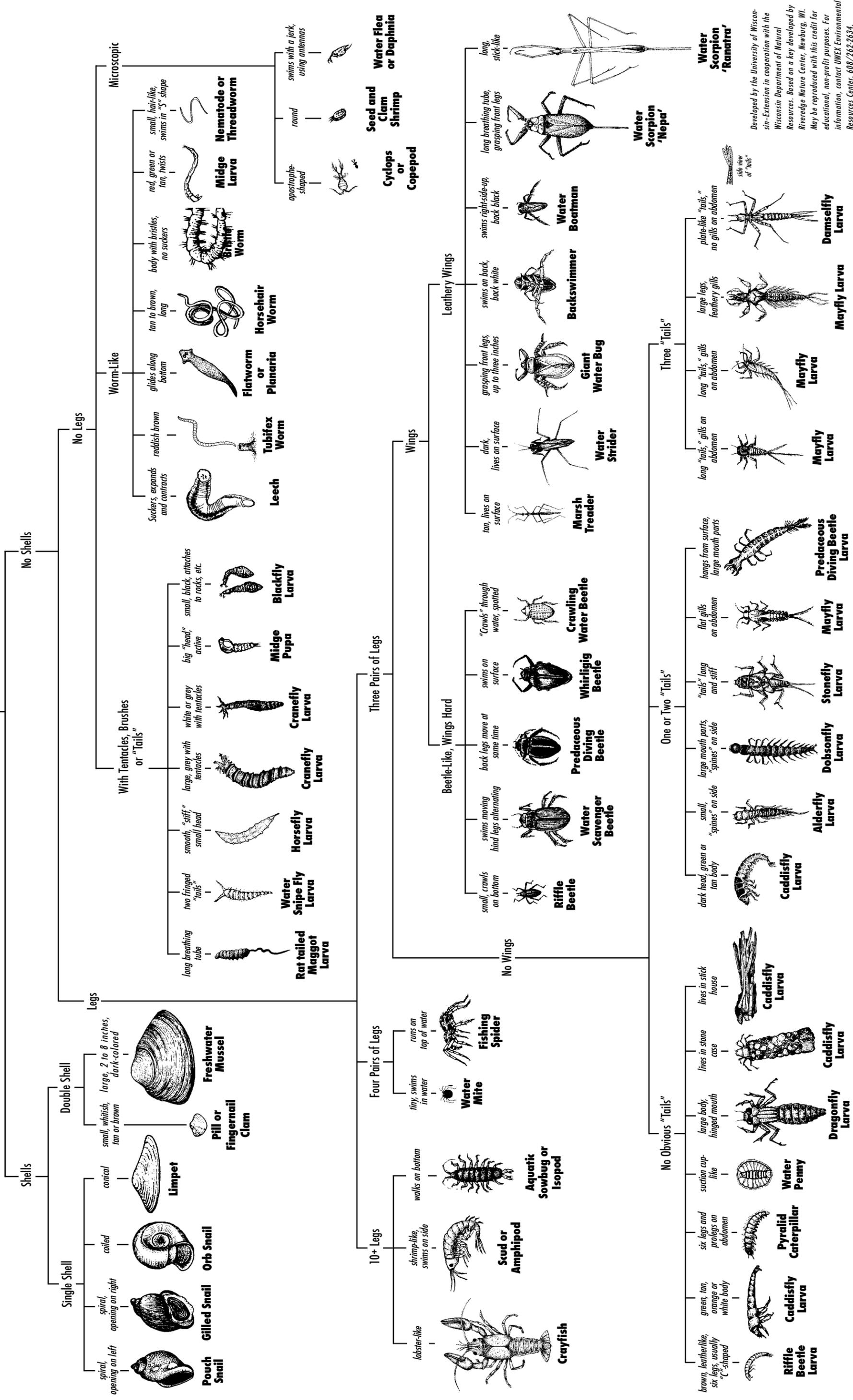
Observe students as they participate in the activity, use the dichotomous key, calculate the index score, and interpret their data.

EXTENDING THE LEARNING

Join the WAV. Wisconsin's Water Action Volunteers (WAV) is a statewide program for Wisconsin citizens who want to learn about and improve the quality of Wisconsin's streams and rivers. WAV currently offers informational materials and support for citizen stream monitoring, as well as storm drain stenciling, river cleanups, and other action-oriented water resource protection projects. See **Citizen Monitoring Biotic Index** for more information on how to collect samples from nearby streams. <<http://clean-water.uwex.edu/wav/index.html>>

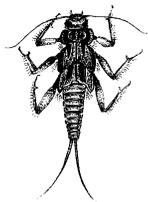
Key to Macroinvertebrate Life in the River

(Sizes of illustrations are not proportional.)



Developed by the University of Wisconsin-Extension in cooperation with the Wisconsin Department of Natural Resources. Based on a key developed by Riveredge Nature Center, Newburg, WI. May be reproduced with this credit for educational, non-profit purposes. For information, contact UWEX Environmental Resources Center, 608/262-2634.

Group 1: These are sensitive to pollutants. Circle each animal found.



Stonefly Larva



Dobsonfly Larva



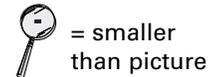
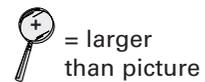
Alderfly Larva



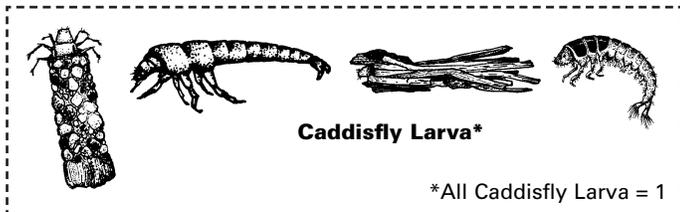
Water Snipe Fly Larva

No. of group 1 animals circled:

Relative Size Key:



Group 2: These are semi-sensitive to pollutants. Circle each animal found.



Caddisfly Larva*

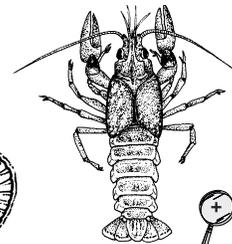
*All Caddisfly Larva = 1



Dragonfly Larva



Water Penny

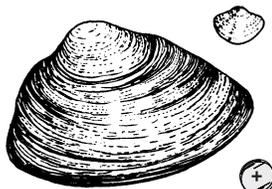


Crawfish

No. of group 2 animals circled:



Crane Fly Larvae



Freshwater Mussel or Fingernail clam



Mayfly Larva



Damselfly Larva



Damselfly tail (side view)



Riffle Beetle Larva*



Riffle Beetle Adult*

*All Riffle Beetles = 1

Group 3: These are semi-tolerant of pollutants. Circle each animal found.



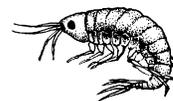
Black Fly Larva



Non-Red Midge Larva



Snails: Orb or Gilled (right side opening)



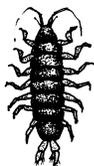
Amphipod or Scud

No. of group 3 animals circled:

Group 4: These are tolerant of pollutants. Circle each animal found.



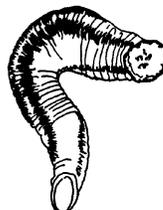
Pouch Snail (left side opening)



Isopod or Aquatic Sowbug



Bloodworm Midge Larva (red)



Leech



Tubifex Worm

No. of group 4 animals circled:

CALCULATE THE INDEX SCORE

To assign a biotic index value to a sampled site, citizens first collect macroinvertebrates from the stream and separate them into groups of similar-looking organisms. Then, they use an identification key to help determine which organisms they have in their sample. Next, they circle those organisms on their recording form and determine an index score for the site. The biotic index value for the stream site depends on how many types of organisms are present in a sample and the tolerance category of those organisms. Streams are rated as having poor, fair, good, or excellent water quality with the biotic index.

HOW TO USE THE FORMULA

- Enter each boxed number from the Biotic Index in the formula below.
- Multiply the entered number from each group by the group value.
- Total the number of animals in column A.
- Total the calculated values in column B.
- Divide the total value by the total number of types of animals that were found (B divided by A) to arrive at the Index Score.

	A	GROUP VALUE	B
NO. OF ANIMALS CIRCLED FROM GROUP 1	<input type="text"/>	x 4 =	<input type="text"/>
NO. OF ANIMALS CIRCLED FROM GROUP 2	<input type="text"/>	x 3 =	<input type="text"/>
NO. OF ANIMALS CIRCLED FROM GROUP 3	<input type="text"/>	x 2 =	<input type="text"/>
NO. OF ANIMALS CIRCLED FROM GROUP 4	<input type="text"/>	x 1 =	<input type="text"/>
TOTALS	<input type="text"/>		<input type="text"/>

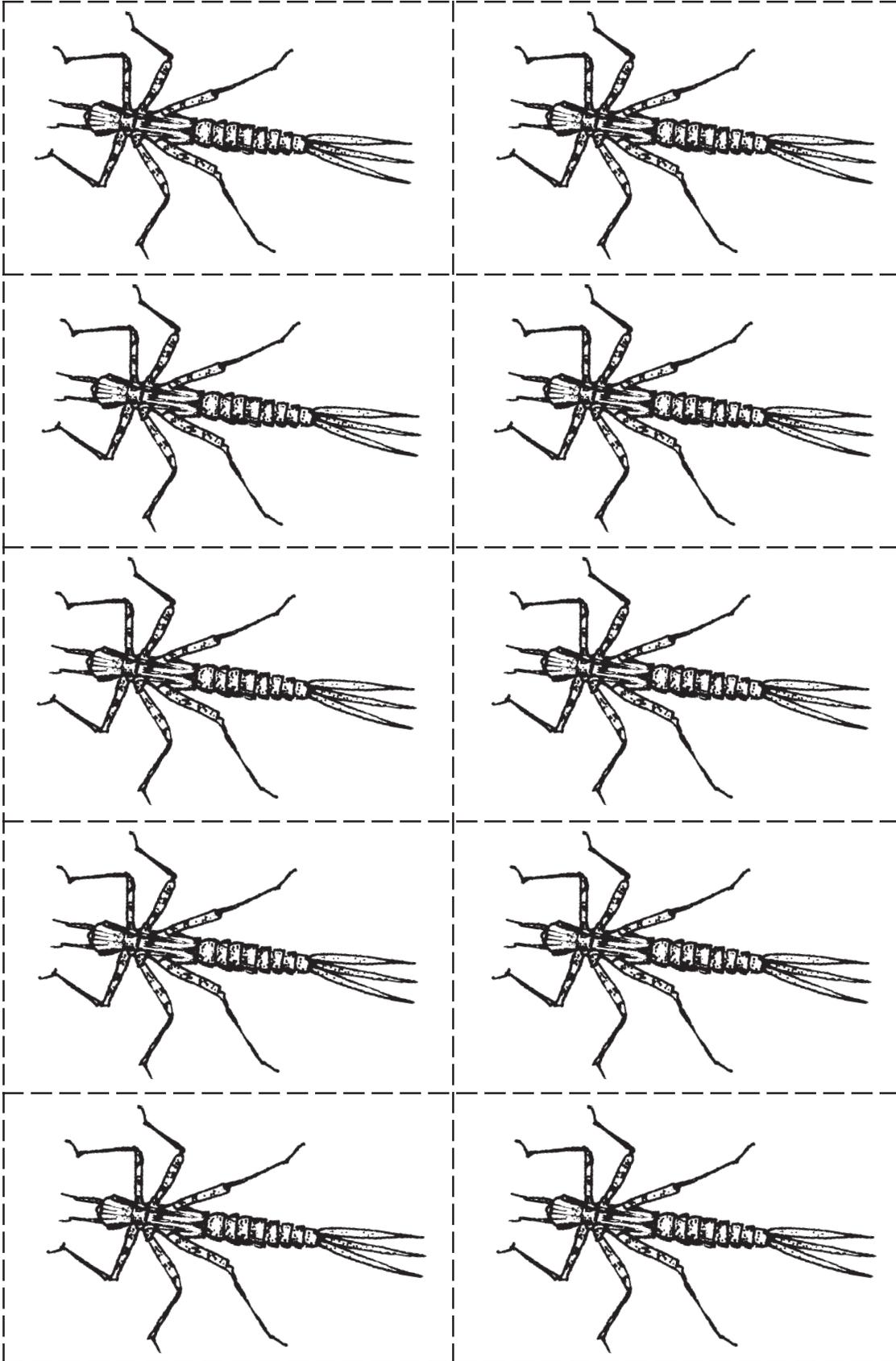
DIVIDE COLUMN B BY COLUMN A:

INDEX SCORE =

HOW HEALTHY IS THE STREAM?

Excellent 3.6+
 Good 2.6 - 3.5
 Fair 2.1 - 2.5
 Poor 1.0 - 2.0

Cut apart these damselfly nymphs and use them to practice the Key to Macroinvertebrate Life in the River.



WILDCARDS DECKS

These lists include all cards printed as of 2005. Be aware that some of the cards may be out of print or discontinued. Activities and games in this guide use many different groupings of cards. The following lists will help you find the cards you need.

NATIVES

This deck of Wisconsin Wildcards (or multiples of this deck) is used for many activities in the guide.

REPTILES & AMPHIBIANS

Black Rat Snake
 Bullsake
 Butler's Gartersnake
 Eastern Hognose Snake
 Eastern Massasauga Rattlesnake
 Eastern Milk Snake
 Eastern Racer
 Northern Ribbon Snake
 Queen Snake
 Timber Rattlesnake
 Western Fox Snake
 Western Ribbon Snake
 Western Slender Glass Lizard
 Blanding's Turtle
 Ornate Box Turtle
 Wood Turtle
 Blanchard's Cricket Frog

FURBEARERS

Beaver
 Bobcat
 Canada Lynx
 Coyote
 Fisher
 Gray Fox
 Gray Wolf
 Muskrat
 Opossum
 Raccoon
 Red Fox
 Striped Skunk

BIRDS

Common Loon
 Peregrine Falcon
 Trumpeter Swan

AQUATIC INVERTEBRATES

Alderfly Larva
 Black Fly Larva
 Caddisfly Larva
 Crane Fly Larva
 Damselfly Larva
 Dobsonfly Larva
 Dragonfly Larva
 Leech
 Mayfly Larva
 Midge Larva (Non-Biting)
 Planarian/Flatworm
 Riffle Beetle
 Sideswimmer/Scud
 Snipe Fly Larva
 Sowbug
 Stonefly Larva
 Tubifex Worm
 Water Penny Larva
 Whirligig Beetle

PLANTS

Black Ash
 Green Ash
 White Ash
 Dune Thistle
 Dwarf Lake Iris
 Poison Ivy
 Prairie Bush Clover
 Wild Lupine

INSECTS

Eastern Tent Caterpillar (Native Pests)
 Forest Tent Caterpillar (Native Pests)
 Friendly Fly (Native Pests)
 Giant Silkworm
 Giant Silkworm Caterpillar
 Karner Blue Butterfly
 Web Worm (Native Pests)

MATCH YOUR CATCH! (NATIVES)

American Brook Lamprey
 Black Crappie/White Crappie
 Bluegill
 Bowfin
 Brook Trout
 Burbot
 Channel Catfish/Flathead Catfish
 Common Shiner
 Freshwater Drum
 Grass Pickerel
 Green Sunfish
 Iowa Darter
 Lake Sturgeon
 Lake Trout
 Lake Whitefish
 Largemouth Bass
 Longnose Gar
 Mottled Sculpin
 Muskellunge
 Northern Pike
 Paddlefish
 Pumpkinseed
 Quillback
 Rock Bass
 Sauger
 Shorthead Redhorse
 Shortnose Gar
 Shovelnose Sturgeon
 Smallmouth Bass
 Smallmouth Buffalo
 Walleye
 White Bass
 White Sucker
 Yellow Bullhead/Brown Bullhead
 Yellow Perch

ALIEN INVADERS SET

Alewife	Exotic Bush Honeysuckles	Rainbow Smelt
Asian Lady Beetle	Garlic Mustard	Reed Canary Grass
Asian Longhorned Beetle	Gypsy Moth Adult	Round Goby
Autumn Olive	Gypsy Moth Egg	Ruffe
Cat-tails	Gypsy Moth Larva	Rusty Crayfish
Common Buckthorn & Glossy Buckthorn	Hemlock Woolly Adelgid	Sea Lamprey
Common Reed	Japanese Knotweed	Spiny & Fishhook Waterfleas
Crown Vetch	Leafy Spurge	Spotted Knapweed
Curly-leaf Pondweed	Moving Firewood	Three-spine Stickleback
Dame's Rocket	Multiflora Rose	Wild Parsnip
Emerald Ash Borer	Poison Ivy (native)	White Perch
Eurasian Water-milfoil	Purple Loosestrife	Zebra Mussel

ALIEN INVADERS: AQUATICS SUBSET

Alewife	Round Goby
Cat-tails	Ruffe
Common Reed	Rusty Crayfish
Curly-leaf Pondweed	Sea Lamprey
Eurasian Water-milfoil	Spiny & Fishhook Waterfleas
Purple Loosestrife	Three-spine Stickleback
Rainbow Smelt	White Perch
Reed Canary Grass	Zebra Mussel

ALIEN INVADERS: PLANTS SUBSET

Autumn Olive	Exotic Bush Honeysuckles
Cat-tails	Japanese Knotweed
Common Buckthorn & Glossy Buckthorn	Leafy Spurge
Common Reed	Multiflora Rose
Crown Vetch	Poison Ivy (native)
Curly-leaf Pondweed	Purple Loosestrife
Dame's Rocket	Reed Canary Grass
Eurasian Watermilfoil	Spotted Knapweed
Garlic Mustard	Wild Parsnip

MATCH YOUR CATCH! (NON-NATIVE FISH)

Brown Trout
Chinook Salmon
Coho Salmon
Common Carp
Rainbow Smelt
Rainbow Trout
Yellow Bass

SPECIAL PLACES

Barrier Beach Trail
Buckhorn State Park
Elroy-Sparta State Trail
Ice Age National Scenic Trail
Kettle Moraine State Forest - Pike Lake Unit
Kohler-Andrae Dunes Cordwalk
North Country Trail
Red Cedar State Trail
Roche-a-Cri State Park

STATE FORESTS

Black River State Forest
Brule River State Forest
Flambeau River State Forest
Governor Knowles State Forest
Havenwoods State Forest
Northern Highland - American Legion State Forest
Northern Unit of Kettle Moraine State Forest
Peshtigo State Forest
Point Beach State Forest
Southern Unit of Kettle Moraine State Forest

WILDFIRE PREVENTORS SET

Campfires
Debris Burning
Fire Department Truck
Firefighting Equipment
Forester and Forester/Ranger
Forestry Technician
Marsh Rig - Muskeg Low Ground Unit
Prescribed Fire
Single Engine Air Tanker
Smokey Bear
Tractor - Plow Unit
Type 4 (3-Ton Pumper/Tanker) Engine
Type 7X (4x4 Initial Attack) Engine
Wildland Urban Interface

FURBEARERS - EXTRA CARDS

Best Management Practices (BMPs) for Trapping
Furbearer Trapping -- Yesterday and Today
Trapper Education

MATCH YOUR CATCH! - EXTRA CARDS

Black Spot (Fish Health)
Boys camping and fishing for trout (card games)
Fish Inside...and Out!
Knots (fishing knots)
Vintage photo of women flyfishing (species list)