

# Fish On!

*using art as a springboard into the fascinating world of fish*



## The Wildlife Forever® State-Fish Art™ Project Lesson Plan

Open to Grades 4-12

### INTERDISCIPLINARY ~ MULTIMEDIA ENVIRONMENTAL EDUCATION

-  Bringing aquatic conservation into classrooms
-  Learn about **fish** species, their **habitat** and **conservation** needs
-  Draw, paint, and sketch your way to free prizes, fishing gear, and national recognition!



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# The Wildlife Forever® State-Fish Art™ Project

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***“It takes the outdoors into the class room, teaches life skills and conservation ... what’s not to love about the State Fish Art Contest!”***  
~ Steve Pennaz, Executive Director, North American Fishing Club

Foreword:

# The ART of Conservation®

by Douglas H. Grann



Wildlife Forever's State-Fish Art™ (SFA) Contest started out as a homework assignment and became an annual nationwide art competition teaching aquatic conservation through the arts. Back in 1998, Sal DiLeo and his young daughter, Katie, had a big idea, a state fish art idea. Sal sought out the advice of Bud Grant, Minnesota Viking Coach & NFL Hall of Famer and came to Wildlife Forever with their vision. The rest of the story is history.

Over the years sports and fishing legions like Bud Grant, Bill Dance, Steve Pennaz, Ron Schara and Babe Winkelman have served as National Spokesmen and ambassadors for the State-Fish Art® Contest.

The contest is open to all students in Grades 4 through 12. Three categories of winners, from each state, are invited to attend the annual State-Fish Art Expo. We have received thousands of entries from all 50 states plus art from Russia. The best part is always the children's artwork. It is absolutely amazing! Our staff and the panel of judges marvel at the creativity of these young artists.

Throughout the many years of the SFA Contest & Expo we have come to know that the measure of success is more than in the number of students involved and the conservation lessons learned. We have seen communities rally to support winners by giving them airline tickets to attend the Expo. We have seen lives enriched and lives changed.

A few years ago, a grandmother from New Jersey called and told me her grandson was headed to college. Great, but somehow I knew there had to be more to the story. She said he had fallen into the "wrong crowd" and was in a failing pattern. Winning the State-Fish Art contest in his home state lifted his confidence and his self worth. Today he is pursuing a Graphic Art degree in college. Now, that is success!

At Wildlife Forever, we believe conservation education is the key that will ultimately determine the very future of our country's fish and wildlife heritage. When you start on your journey and enter the State-Fish Art contest you will put paint and color to paper. You will have decided to not do something else but to learn, study and create with your skills and imagination a state fish. In doing so, you will join the ranks of one of America's great movements. You will become a conservationist and a steward of our fish, lakes and streams.

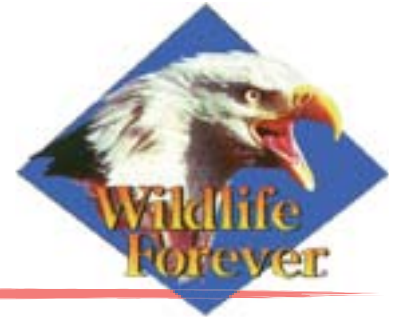
Your efforts, talents and decisions may well lead you to the winner's circle. Remember the deadline for entry is March 31<sup>st</sup>. Join us in the Art of Conservation!

Good luck!

A handwritten signature in black ink, appearing to read "Doug Grann", is written over a thin, light-colored line that extends from the signature down to the text below.

Douglas H. Grann  
President & CEO

# About Wildlife Forever®



Wildlife Forever is America's leading multi-species nonprofit conservation organization. Working with state game and fish departments, federal agencies, and private conservation groups, our projects benefit habitat, fish and wildlife management, research, and conservation education nationwide.

Wildlife Forever has a long history of getting the job done. Thanks to our members and donors, America has . . .

- ◆ over 130,000 new trees planted
- ◆ 34,000,000 fish raised and stocked
- ◆ more than 1,000,000 kids involved in conservation education
- ◆ 9,000 waterfowl nesting structures placed
- ◆ 230 miles of improved and repaired streams
- ◆ and many hundreds of thousands of habitat acres protected or restored

Developing elementary and secondary school programs that foster knowledgeable, responsible and thoughtful stewardship, Wildlife Forever works to produce innovative, high-quality, inexpensive materials for use in traditional and non-traditional settings alike.



The [Wildlife Forever State-Fish Art™ Project](#) is an exciting multimedia education program designed to increase awareness of and respect for aquatic resources using art as an extension tool into the fascinating world of fish.

In addition, *Sport Fish of North America*, in Wildlife Forever's handy [Critters Pocket Field Guide Series](#), is a perfect compliment to the State-Fish Art Project. High quality photographs of fifty fish with in-depth details and fun facts provide a tool enjoyed by both young and old!

Wildlife Forever's educational *Threat Campaign* targets non-native invasive species that have recently entered our lakes, rivers, and streams forcing out native fish and wildlife thereby greatly altering our natural resources. Visit [Invasive Species Central](#) to learn more.

The good news is you can help stop their spread by doing a few simple things each time you go fishing or boating. Additional resources are now available in this lesson plan to help students learn about these unwanted visitors and their part in halting the invasion.

***“ We strongly believe education will ultimately determine the future of our wildlife heritage. As the driving force behind our most successful conservation projects, our education mission is to teach future generations stewardship of America's fish, wildlife and habitats.”***

*~Douglas H. Grann, President & CEO, Wildlife Forever*

# About the Wildlife Forever® State-Fish Art™ Project



The Wildlife Forever State-Fish Art Project is an exciting, multimedia education program designed to increase awareness of and respect for aquatic resources. Interdisciplinary in nature, the program uses art as a springboard into the fascinating world of fish. The project has two primary components:

## THE LESSON PLAN: Fish On!

**Fish On!** has been written for educators teaching grades four through twelve. The lesson plan includes extensive background information, procedure and assessment options, extension activities, student worksheets, quiz questions, sample compositions, and a thorough glossary. It has been designed for use as a stand-alone unit or as a supplement to the [Wildlife Forever CD-ROM Curriculum for Elementary Grades](#).

A unique [species identification section](#) includes a profile of each state-fish, containing a beautifully illustrated physical description, reproductive and feeding behaviors, and habitat requirements.

*“Thank you for providing such a wonderful opportunity for my science and art students to learn about their state fish!”*  
~ Kathleen Chapman, Toltec Elementary School,  
Eloy, Arizona

## THE STATE-FISH ART CONTEST

The Wildlife Forever State-Fish Art Project culminates in a national art contest for children who have actively participated in the **Fish On!** lesson. Students use their newly acquired knowledge to create a learning portfolio, which includes an original state-fish art illustration and a related composition/essay about their chosen state-fish. The deadline for entry is always MARCH 31<sup>st</sup>.

*“Several big success stories involve the arts with conservation. As a past judge of the State-Fish Art Contest, the students learn about fish and fishing and the best part is the art is amazing!”*  
~Joseph Hautman, Wildlife Artist  
Federal Duck Stamp winner 1992, 2002, 2008

On Earth Day, a committee composed of wildlife artists, outdoor writers, fisheries specialists, and national celebrities, selects three winners from each state to be honored at the annual [State-Fish Art Expo](#) each summer.

The State-Fish Art Expo is hosted annually in states that organize and promote the competition at the state level. Current participating states include [Arkansas](#), [Minnesota](#), and [Texas](#). Please follow the links above to these individual states’ contest information.

If you are interested in organizing and promoting the Wildlife Forever State-Fish Art Contest in your state, please let us know and we’ll get you started! [Contact State-Fish Art Contest](#)

# Fish On!

## Subjects

- Language Arts
- Art

## Skills

- Identify
- Research
- Write
- Illustrate

## Time

- 2 to 4 class periods

## Objectives

Students will:

- 1) Label the parts of a fish and describe their function.
- 2) Outline a simple aquatic food chain.
- 3) Explain several characteristics associated with fish adaptation including gills, fins, and scales.
- 4) Describe specific examples of fish behavior including feeding and spawning.
- 5) Identify their state-fish, its physical appearance, and its habitat requirements.

## Vocabulary

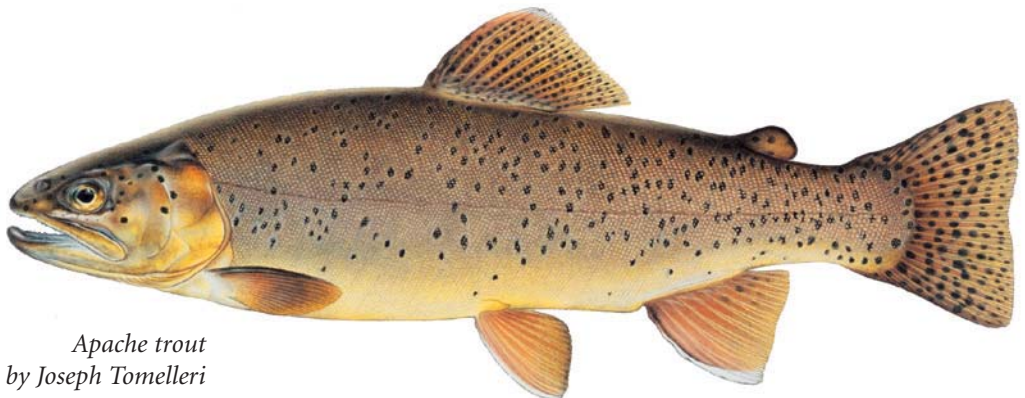
Anadromous	Lateral line	Prey
Camouflage	Milt	Redd
Carnivore	Omnivore	Salt water
Cold-blooded	Plankton	Vertebrate
Fresh water	Predatory	

## Background

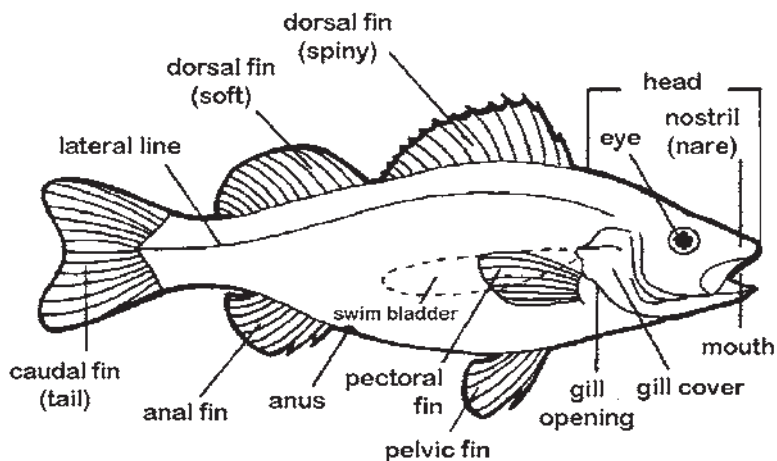
How many different species of fish are there? How are fish adapted to life under water? How do fish reproduce? How can you determine the age of a fish? What do fish eat? What kind of defense mechanisms do fish have? What is a group of fish called?

(Note: the answers to these questions are found throughout the text. However, for quick reference turn to the procedure section.)

There are over 25,000 different species of fish in the world and roughly 2,000 in North America. In fact, fish represent more



*Apache trout*  
Illustration by Joseph Tomelleri



than half of all **vertebrate** animals. There are flat fish, skinny fish, and fish that crawl on land. There are flying fish, electric fish, and fish that live in schools.

Fish vary greatly in size and color. Some are tiny, measuring only two inches in length like the Naked Goby. Others are giants. The Whale Shark measures some 50 feet. That's longer than a school bus! Some fish are drab and mottled. Some are patterned with stripes, bars, and spots. While others are aglow with brilliant color: red, yellow, orange, green, pink, silver, and blue. The tremendous diversity among fish is a result of 400 million years of evolution and unique environmental conditions associated with life in the water.

### **Adapting to life in the water: Gills, fins, scales**

The oldest group of vertebrates, fish can be found wherever there's water. Three quarters of the Earth's surface is covered by water, including **salt water** (oceans, tidal pools, and coral reefs) and **fresh water** (lakes, cold mountain streams, and slow-moving rivers). Fish are specially adapted to life in the water, they have permanent gills, and most have fins and scales.

#### *GILLS*

Gills are thin, feathery-like membranes located inside slit-shaped openings behind the head. Fish get oxygen from the water by passing it through their mouths and over their gills. Oxygen is absorbed through the gill membranes and carbon dioxide is removed.

#### *FINS*

Fins aid in maneuverability. Each fin has a particular function.

- The pectoral fin is found at the side behind the gills. It helps with diving, swimming to the surface, and remaining stationary.
- The dorsal fin is vertical from the back. It helps keep the fish from rolling.
- The pelvic fin is a stabilizer. It helps with balance.
- The caudal fin or tail helps to propel and steer. A forked tail allows for increased speed, whereas a broad tail allows for increased maneuverability.
- The anal fin is located near the rear of the belly. It helps with balance.

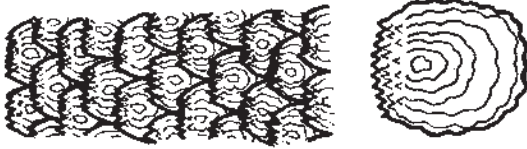




Placoid scale (shark)



Ganoid scale (gar)



Ctenoid scale (perch)



Cycloid scale (salmon)

### SCALES

Most fish have a flexible armor of protective scales covering their bodies. There are four kinds of scales: placoid, ganoid, ctenoid, and cycloid. Placoid are tooth-like. Ganoid are diamond shaped. Ctenoid are comb-like, and cycloid have a rounded appearance. Ctenoid and cycloid are the two most common scale types.

Scales vary in size from one species to another and may be as large as a silver dollar. Scales do not increase in number but grow as an animal grows. Scales grow faster during the summer months when food is abundant. Each year, an “annual ring” is laid down within each scale. Counting the consecutive annual rings will provide an estimate of the age of the animal. The scales are coated with a slimy layer of mucous that has antiseptic properties, which protect the animal against disease and parasites.

### GAS BLADDER OR SWIM BLADDER

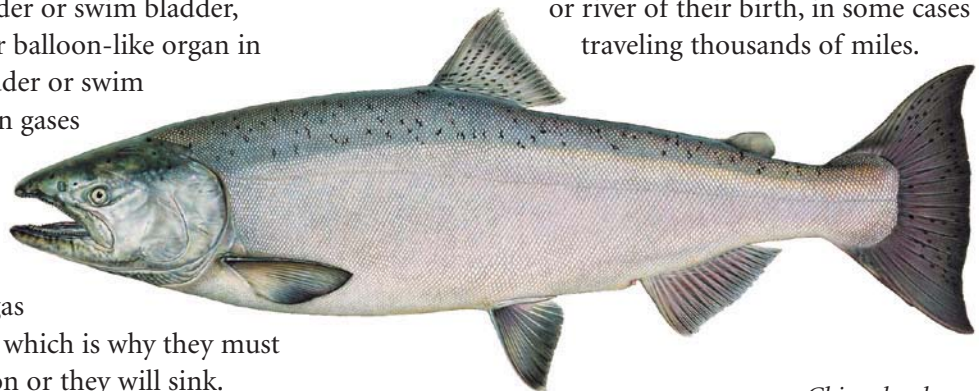
Most fish have a gas bladder or swim bladder, which is an airtight sac or balloon-like organ in the gut area. The gas bladder or swim bladder selectively takes in gases from the bloodstream to regulate floatation and buoyancy. Some fish, including the shark and tuna, do not have a gas bladder or swim bladder, which is why they must remain in constant motion or they will sink.

### SIGHTS, SMELLS, AND SOUNDS

The underwater world is often murky or cloudy, which limits visibility to about 100 feet or less. Although fish have good peripheral vision due to the position of their eyes and many scientists believe that they can see color, they rely predominantly on their senses of smell and sound. In fact, most fish use smell to find food, locate a spawning site, and avoid danger. Nostrils, called “nares,” are prominently located on the snout.

Many fish are carnivores and use smell to locate their prey. They feed on other fish, marine invertebrates such as squid, amphibians such as frogs, and zooplankton, which are tiny, microscopic animals.

Some fish use smell to locate a preferred spawning site. **Anadromous** species such as salmon begin their lives in fresh water but migrate to salt water where they live until they reach maturity. At spawning time, they use their sense of smell to guide them back to the freshwater stream or river of their birth, in some cases traveling thousands of miles.



Chinook salmon  
Illustration by Joseph Tomelleri

*Channel catfish*  
Illustration by Joseph Tomelleri



Fish also use smell to communicate, secreting chemical scents called “pheromones,” which serve as a means of communication between members of the same species. For example, some species, such as tuna, live together in a large protective group called a “school.” When a member of the school is attacked by a predator, it secretes a pheromone to warn the others of danger.

Fish have ear-like openings on either side of their head, which provide for excellent hearing. And some fish, such as catfish, have whisker-like appendages with taste buds called “barbels,” which provide added sensory capability as they probe the bottom for food.

#### *LATERAL LINE: “A SIXTH SENSE”*

Fish have a unique system of sensory nerves located in the skin called the **lateral line**, which in many ways serves as their sense of touch. The lateral line extends from just behind the head along to the tail on either side of the fish. The lateral line detects the slightest movement of water, which helps a fish to avoid danger or to capture food in otherwise dark or cloudy water.

#### *CAMOUFLAGE: PROTECTIVE COLORING*

Most fish have some kind of protective coloring called **camouflage**. Camouflage is an adaptation that enables fish to disguise themselves or to blend-in with their surroundings. Camouflage can take many forms. It can be a color that allows an animal to blend in with its environment or an appearance that allows an animal’s shape to mimic its environment. Muskellunge and northern pike are mottled and greenish in color, allowing them

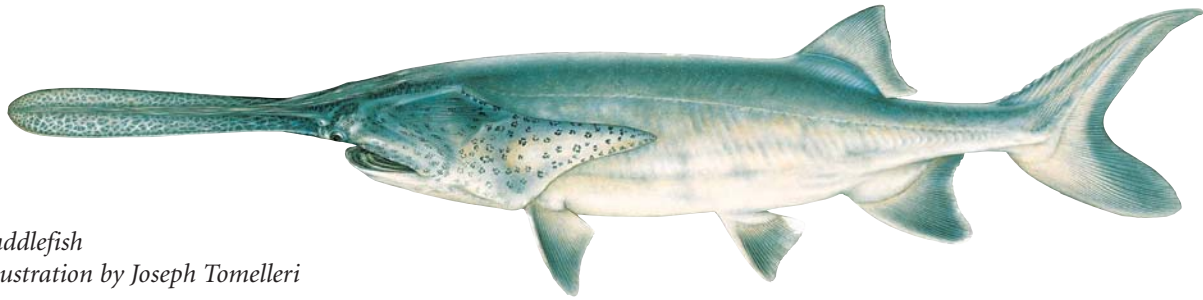
to blend in with their weedy environment. Sole are flatfish with coloration that resembles pebbles or sand allowing them to virtually mimic their environment. Further, most fish are patterned with bars, stripes, or spots, which provide additional camouflage by breaking up an otherwise distinctive silhouette.

Some fish can actually change color during the spawning season (breeding season) or as they age. Color can also vary according to water temperature, sex, and even location. Generally, brightly colored fish are found in the tropics, fish that live near the surface are bluish-green, and fish that live near the bottom are brownish.

Counter shading, also called “obliterative camouflage,” is a very common type of protective coloring. Counter shading refers to fish that have darker-colored backs and lighter-colored undersides such as sharks, rays, billfish, trout, and cod. Counter shading provides a certain amount of protection and concealment from predators above such as bald eagles and osprey and predators below such as other fish and otters.

#### *COLD-BLOODED*

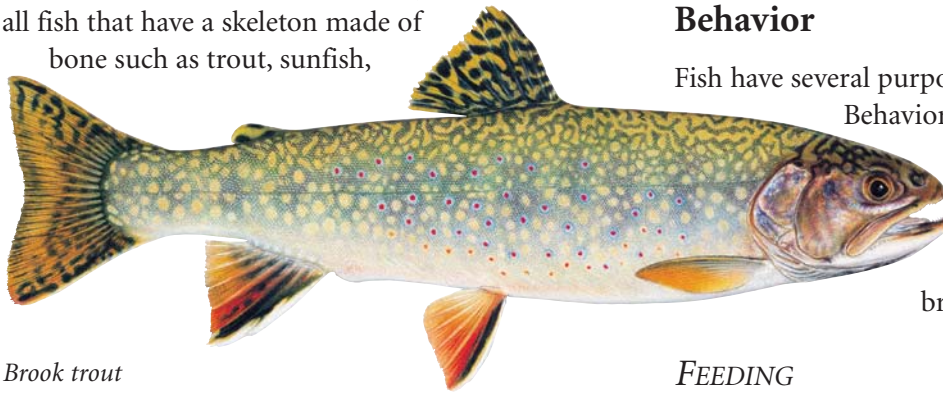
Fish are cold-blooded or ectothermic animals, which means their body temperature depends on their environment. As such, water temperature greatly affects distribution. Most fish are found in temperate areas. Amphibians and reptiles are also cold-blooded animals. In contrast, warm-blooded or endothermic animals such as mammals and birds are able to maintain a constant body temperature even when the temperature around them changes.



Paddlefish  
Illustration by Joseph Tomelleri

## Types of fish

There are paddlefish, porcupine fish, sunfish, parrot fish, dogfish, goat fish, and even butterfly fish. Generally, fish are divided into two groups: those that have a skeleton made of cartilage (*Chondrichthyes*) and those that have a skeleton made of bone (*Osteichthyes*). *Chondrichthyes* consist primarily of marine species and include sharks, skates, and rays. *Chondrichthyes* have a skeleton made of cartilage rather than bone, and their mouths and gill openings are on the underside of their bodies. *Osteichthyes* include all fish that have a skeleton made of bone such as trout, sunfish,



Brook trout  
Illustration by Joseph Tomelleri

perch, salmon, tuna, cod, walleye, bass, flounder, halibut, and sole. By far the most dominant group, *Osteichthyes* are characterized by two sets of paired fins, a set of vertical fins, and a swim bladder. Scientists recognize another group of fish called "*Agnatha*" to classify a few primitive species including the lamprey. *Agnatha* have poorly developed skeletons. They lack jawbones and paired fins.

## The name game

Although fish have many distinguishing characteristics such as shape, size, and color, species identification can be tricky, especially since species identification can vary from region to region. For example, "largemouth bass," "bigmouth bass," "black bass," "green bass," and "bayou bass" are all names used to identify one species of fish, the *Micropterus salmoides*. As such, all fish have one scientific name, which is always italicized.

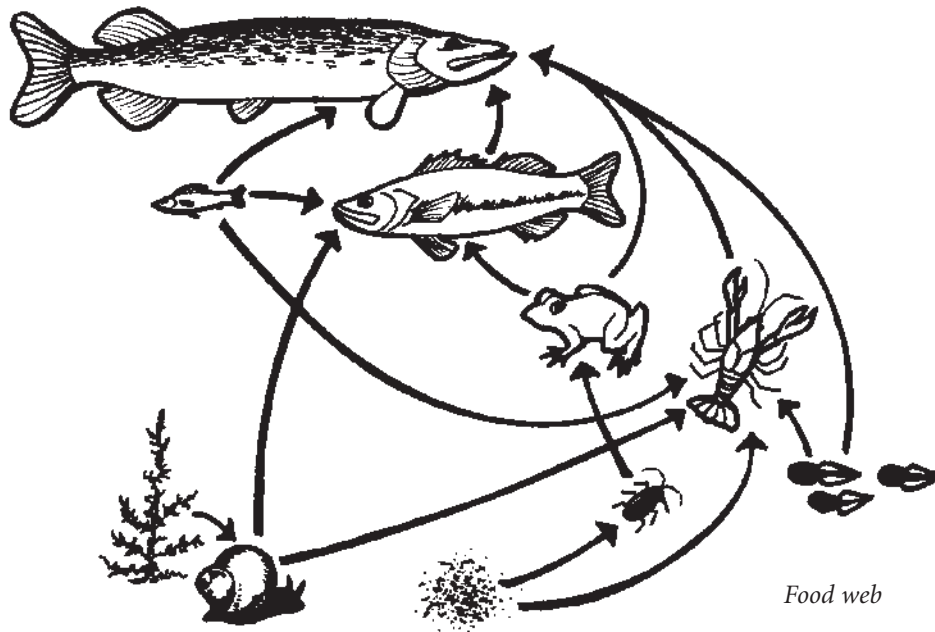
## Behavior

Fish have several purposeful patterns of behavior. Behavior refers to the way in which an animal responds to its environment. Behavior takes many forms including feeding and breeding.

### FEEDING

Fish spend much of their time feeding. They are most active at dawn and dusk. Many fish are meat eaters, called **carnivores**. Others, called **omnivores**, eat both plants and animals.

**Predatory** fish such as trout feed on insects, crayfish, fish eggs, and small fish. Northern pike eat mostly fish, but also eat frogs, crayfish, mice, muskrats, and ducklings. Predators usually swallow their **prey** whole. Humuhumunukunukuapua'a feed on seaweed and insects, and bluegill feed on aquatic plants, insects, and small fish. Fish equipped with sieve-like gill rakers feed on



plankton, which is the generic term used for microscopic plants and animals.

All fish are members of a food chain, which is a group of plants and animals linked together as sources and consumers of food. Food chains linked together form a larger, more complex food web.

Fish distribution, health, and population size is largely due to the quality and quantity of available food. Increased variety in available food leads to increased diversification among species of fish in a given area.

### SPAWNING

In most fish, fertilization is external. The female produces an amazing number of eggs that usually appear as a long, jelly-like strand or blob. Eggs vary in size depending on species from one-fifth

of an inch to seven-eighths of an inch. Some eggs attach to rocks or plants, others free-float. Several species of fish, including the largemouth bass, construct a nest-like depression called a **redd** where the eggs are deposited. The male's **milt** later fertilizes the eggs. In most cases the fertilized eggs are left unprotected, and the majority do not survive as fry (young fish).

As previously mentioned, some species migrate to distant spawning grounds. Anadromous species including salmon begin their lives in fresh water but migrate to salt water where they live until they reach maturity. At spawning time, they use their sense of smell to guide them back to the freshwater stream or river of their birth, in some cases traveling thousands of miles. The Pacific salmon, Atlantic salmon, king salmon, and sockeye salmon die after spawning.

Species	Number of eggs	Hatching time
Largemouth Bass	2,000 to 7,000	8 to 10 days
Bluegill	12,000 to 15,000	2 to 5 days
Salmon	2,000 to 10,000	3 months



### **Striped Bass**

The Striped Bass is South Carolina's state fish. The Striped Bass is silvery blue with seven horizontal black stripes. You mostly find the Striped Bass in fresh water like Lake Murray. The Striped Bass swims in schools of 20 fish to a school. The Striped Bass spawns in spring. The Striped Bass lays up to 25,000 eggs at each spawn. Only 50% of the fry lives. The average weight of the adult Striped Bass is 15 to 35 pounds.

Originally the Striped Bass was only found in the Santee Cooper Lakes. The South Carolina Wildlife and Marine Resources Department has stocked every public reservoir and lake with Striped Bass. In Lake Murray, the SCWMRD has made fish attractors out of red cedars and discarded Christmas trees. Most of the sports fishermen that have fished these spots have reported good fishing.

Striped Bass like to live in shallow water near vegetation. They prefer lakes better than fast moving rivers. Striped Bass are found in fast moving water and also found in deep holes or near the edge of the water.

**Example from Grades 4–6**  
South Carolina winner

## Procedure Options

### 1) Anticipatory setting questions or pre-test

Approximate time: 15 minutes

- 1) *How many different species of fish are there?*
- 2) *How are fish adapted to life under water?*
- 3) *How do fish reproduce?*
- 4) *How can you determine the age of a fish?*
- 5) *What do fish eat?*
- 6) *What kind of defense mechanisms do fish have?*
- 7) *What is a group of fish called?*

#### ANSWERS

1. *How many different species of fish are there?*

There are approximately 25,000 different species of fish in the world and roughly 2,000 in North America.

2. *How are fish adapted to life under water?*

Fish are well adapted to life under water. They have gills, fins, scales, and a gas bladder.

3. *How do fish reproduce?*

In most fish, fertilization is external. The female deposits the eggs, and the male fertilizes them later with its milt.

4. *How can you determine the age of a fish?*

One way to determine the age of a fish is by counting the annual rings on its scales.

5. *What do fish eat?*

Different species of fish eat different things. Many fish are carnivorous, meaning that they eat meat including other fish and insects. Others eat plant material as well.

6. *What kind of defense mechanisms do fish have?*

Different species of fish have different defense mechanisms. Some live in large groups called schools. Some have protective coloring called camouflage, which allows them to blend in with their surroundings.

7. *What is a group of fish called?*

A group of fish is called a “school.”

### 2) Composition

Approximate time: 2 to 3 class periods

Assign a composition or theme paper as part of *The Wildlife Forever State-Fish Art Contest*. Compositions should not to exceed one page in length. Students should research their state fish including its physical description, habitat, behavior, and anything else they find interesting. For more information on contest rules and regulations, see page 62.

### 3) Illustration

Approximate time: 1 to 2 class periods

Assign an art project as part of *The Wildlife Forever State-Fish Art Contest*. Art techniques may include scratchboard, pointillism, chalk, charcoal, dry brush, watercolor, crosshatch, lead, collage, linoleum printing, or crayon. All entries must be horizontal, on an 8½” x 11” standard piece of paper without a mat, frame, cover sheet, or border. Photographs and computer-generated artwork will not be accepted. (Please note: if the students use chalk or lead they will have to seal it with an adhesive.) For more information on contest rules and regulations, see page 62.

### Reflection opportunity or post-test

- Revisit anticipatory setting questions.
- Identify several examples of how fish are adapted to life under water.
- Ask students what they will remember most from the procedure-related activity.

### Extension Activities

#### SHARE AND SHARE ALIKE

Ask students to share their artwork with their classmates in the form of a brief presentation. Students could also be encouraged to share one or two nuggets of information about their state fish that they found especially interesting.

### WORD WEB

Write the word “fish” on the chalkboard or whiteboard. Ask students to brainstorm all the words they can think of related to fish. Record their responses. Then draw lines to connect related words and ideas.

### AGING

Divide students up into small groups. Provide each of them with a microscope and a scale from a fish. Ask students to determine the age of the fish by counting the number of annual rings in the scale.

### GUEST SPEAKER

Invite a fisheries biologist in for the day.

### POETRY

Ask students to write a poem about fish. They could use diamanti or picture poetry.

### Diamanti poetry

Noun

Adjective, adjective

Participle, participle, participle

Noun, noun, noun, noun

Participle, participle, participle

Adjective, adjective

Noun

### FIELD TRIP

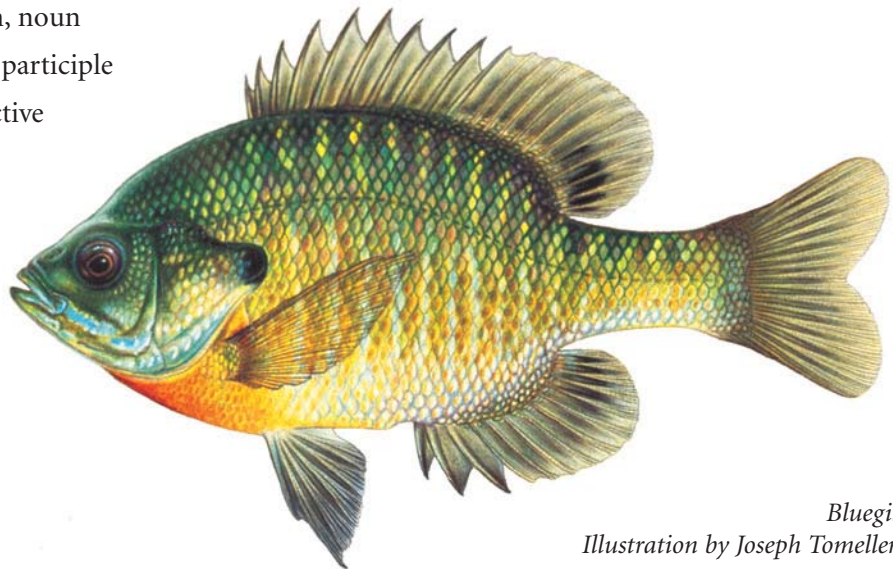
Visit an aquarium or fish hatchery in your area.

### GET INVOLVED

Organize a lakeshore or stream-bank clean-up effort.

### Assessment Options

- Assign student workbook pages.
- Observe and assess student participation in procedure(s).
- Observe and assess student participation in selected extension activities.
- Select appropriate questions from quiz provided.



*Bluegill*  
Illustration by Joseph Tomelleri

## À la Carte Quiz

NAME \_\_\_\_\_

Select the appropriate questions for grade levels 4-12.

SHORT ANSWER

1) Define vertebrate.

TRUE OR FALSE

- 1) There are approximately 2,000 different species of fish in North America. T or F
- 2) Fish represent more than ½ of all vertebrates. T or F
- 3) Most fertilized fish eggs do not live to maturity. T or F

2) Define plankton.

FILL IN THE BLANK

- 1) \_\_\_\_\_ fin serves as a propeller and helps to steer.
- 2) \_\_\_\_\_ fin is vertical or upright from the back and helps fish to avoid rolling.
- 3) \_\_\_\_\_ fins are found on either side of the fish just behind the head.
- 4) \_\_\_\_\_ is an internal balloon-like organ that helps to regulate floatation.
- 5) \_\_\_\_\_ serve as a flexible, protective armor.
- 6) \_\_\_\_\_ is a unique system of sensory nerves located in the skin that senses movement.
- 7) \_\_\_\_\_ is an adaptation that enables fish to disguise themselves.
- 8) \_\_\_\_\_ are chemical scents used to communicate.

ESSAY

Draw an aquatic food chain.

Briefly describe how gills function.

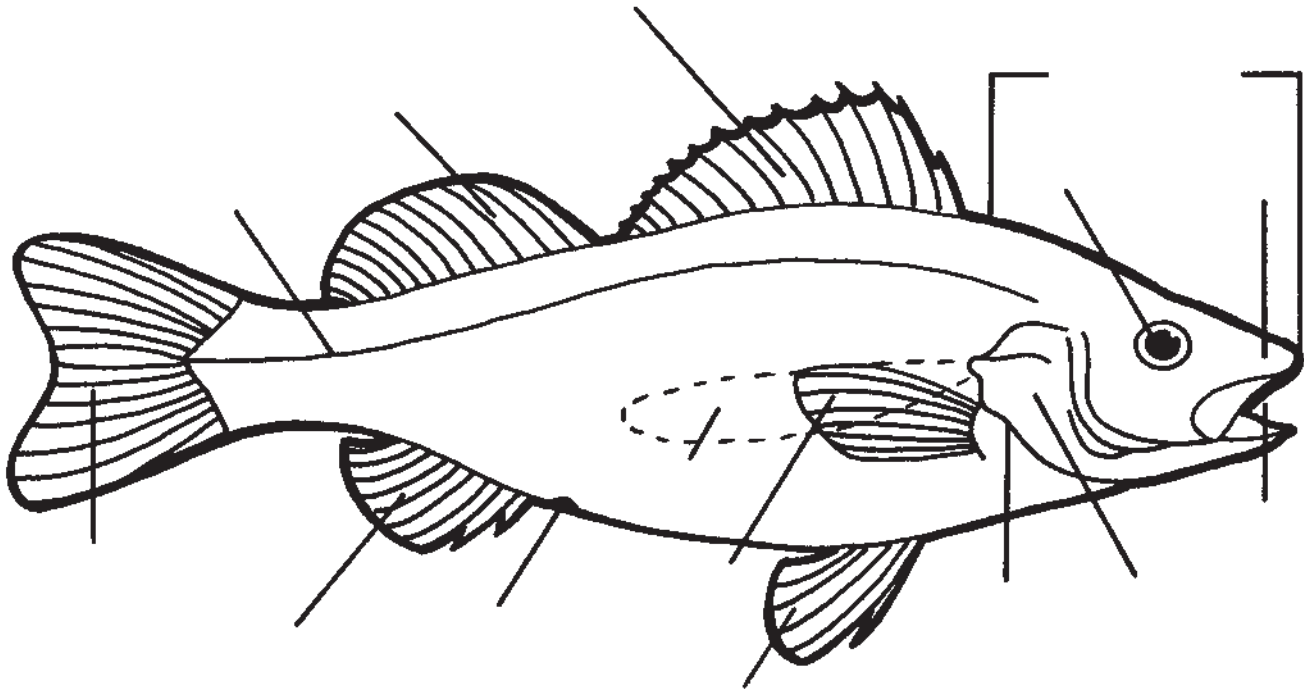


# STUDENT WORKSHEET

## Fill in the Blanks

NAME \_\_\_\_\_

Directions: Label the parts of the fish and briefly describe their function.



# STUDENT WORKSHEET

## Word Search

NAME \_\_\_\_\_

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

Apache Trout  
Atlantic Cod  
Atlantic Sailfish  
Bluegill  
Brook Trout  
Channel Bass

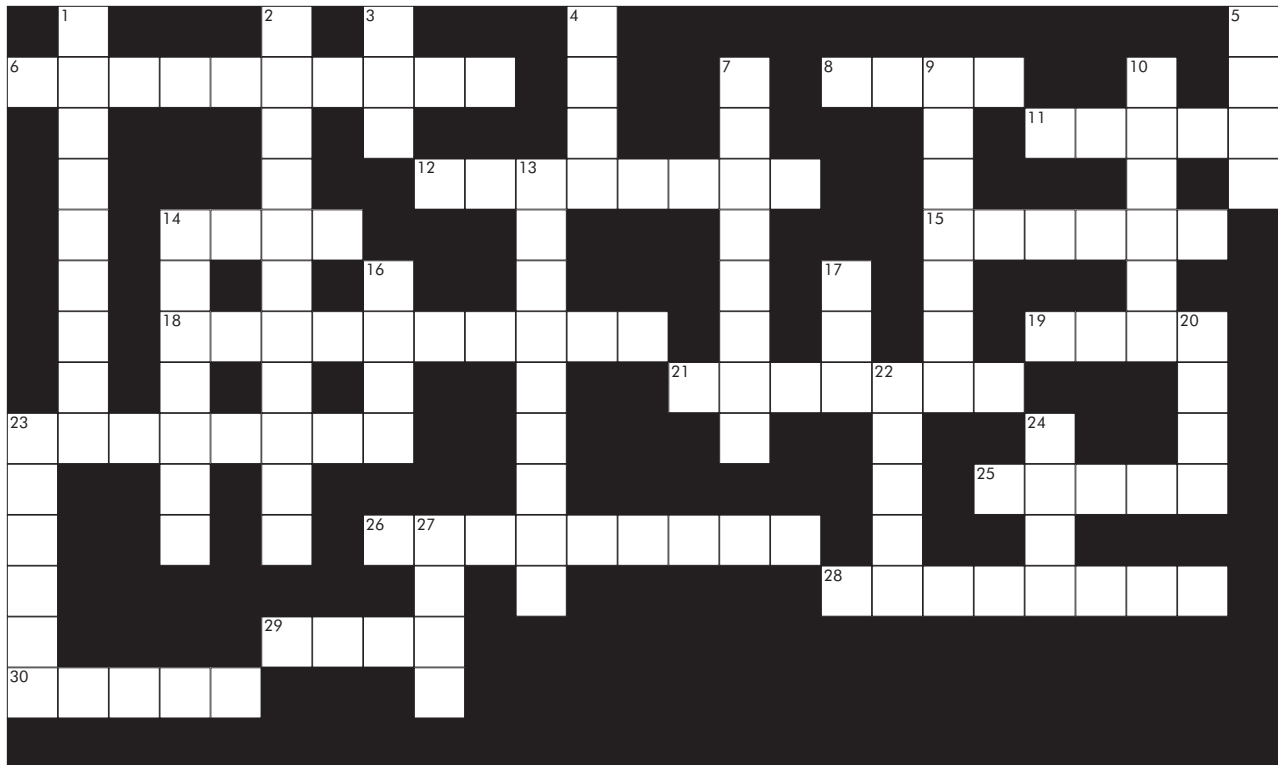
Channel Catfish  
Chinook Salmon  
Cutthroat Trout  
Garibaldi  
Golden Trout  
King Salmon

Largemouth Bass  
Muskellunge  
Northern Pike  
Rainbow Darter  
Spotted Bass  
Steelhead Trout

Striped Bass  
Tarpon  
Walleye  
Weakfish  
White Bass  
White Crappie

## Crossword

NAME \_\_\_\_\_



### Across

6. Name for an immature fish
8. Fish and reptiles are \_\_\_\_\_-blooded
11. Thin plate on fish
12. Fins on side of a fish
14. Fish deposit these into a redd
15. A foreign species introduced to an area from another region
18. Fish species whose population is in great decline
19. Walleyes are named for their milky \_\_\_\_\_
21. A brook trout that migrates up to the Great Lakes
23. The way a fish or animal responds to its environment
25. The number of fish legally allowed to be taken
26. Area a fish will defend during breeding season
28. Nickname for steelhead trout
29. Nest-like depression made by fish to contain eggs
30. Cutthroat trout do not successfully spawn in \_\_\_\_\_

### Down

1. Southernmost species of cutthroat trout
2. Another name for humuhumunukunua'ā
3. Dorsal \_\_\_\_\_
4. A redd is a \_\_\_\_\_-like depression where fish deposit eggs
5. A fish hunted by other fish for food
7. Microscopic plants and animals eaten by fish
9. State permit that allows a person to fish
10. Naturally occurring species of fish
13. Fish that eats other animals
14. Area where fresh water and salt water meet
16. Name for dark oval marks on fish
17. A \_\_\_\_\_ bladder affects flotation of fish
20. Oceans have a high concentration of it
22. Cutthroat \_\_\_\_\_
23. Whisker-like appendage
24. Breathing organ of fish
27. Place where two streams come together

# STUDENT WORKSHEET

## Mystery Math

NAME \_\_\_\_\_

Directions: Solve these math problems and then use the code to get a message about conservation.

<b>Code</b>
1 = B
2 = V
3 = P
4 = E
5 = I
6 = K
7 = R
8 = C
9 = A
10 = S
11 = M
12 = G
13 = Y
14 = F
15 = L
16 = J
17 = D
18 = Q
19 = W
20 = T
21 = N
22 = Z
23 = H
24 = O
25 = U
26 = X

$\frac{57}{\div 3}$	$\frac{92}{\div 23}$	$\frac{121}{\div 11}$	$\frac{500}{\div 20}$	$\frac{91}{\div 7}$	$\frac{246}{\div 82}$
				$\frac{-3}{-3}$	$\frac{+17}{+17}$

$\frac{192}{\div 24}$	$\frac{7}{\times 4}$	$\frac{147}{\div 7}$	$\frac{85}{\div 5}$	$\frac{42}{\div 7}$	$\frac{126}{\div 18}$	$\frac{96}{\div 6}$	$\frac{76}{\div 19}$
	$\frac{-4}{-4}$		$\frac{-7}{-7}$	$\frac{-2}{-2}$		$\frac{-14}{-14}$	

$\frac{288}{\div 12}$	$\frac{1025}{\div 41}$	$\frac{98}{\div 14}$
-----------------------	------------------------	----------------------

$\frac{115}{\div 5}$	$\frac{324}{\div 18}$	$\frac{216}{\div 8}$	$\frac{54}{\div 6}$	$\frac{133}{\div 7}$	$\frac{465}{\div 93}$	$\frac{728}{\div 91}$
$\frac{-14}{-14}$		$\frac{-2}{-2}$		$\frac{+1}{+1}$		

$\frac{427}{\div 61}$	$\frac{126}{\div 42}$	$\frac{182}{\div 14}$	$\frac{9}{\times 8}$	$\frac{203}{\div 7}$	$\frac{255}{\div 15}$	$\frac{648}{\div 81}$	$\frac{819}{\div 91}$	$\frac{209}{\div 11}$
	$\frac{+1}{+1}$	$\frac{-3}{-3}$	$\frac{-48}{-48}$	$\frac{-4}{-4}$	$\frac{-10}{-10}$		$\frac{-5}{-5}$	$\frac{-9}{-9}$

Answer: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## à la Carte Quiz

### TRUE OR FALSE

- 1) There are approximately 2,000 different species of fish in North America. T or F
- 2) Fish represent more than ½ of all vertebrates. T or F
- 3) Most fertilized fish eggs do not live to maturity. T or F

### FILL IN THE BLANK

- 1) Caudal or tail fin serves as a propeller and helps to steer.
- 2) Dorsal fin is vertical or upright from the back and helps fish to avoid rolling.
- 3) Pectoral fins are found on either side of the fish just behind the head.
- 4) Gas bladder or swim bladder is an internal balloon-like organ that helps to regulate floatation.
- 5) Scales serve as a flexible, protective armor.
- 6) Lateral line is a unique system of sensory nerves located in the skin that senses movement.
- 7) Camouflage is an adaptation that enables fish to disguise themselves.
- 8) Pheromones are chemical scents used to communicate.

### SHORT ANSWER

- 1) *Define vertebrate.*  
An animal with a backbone.
- 2) *Define plankton.*  
Microscopic plants and animals.

### ESSAY

*Draw an aquatic food chain.*  
See illustration on page 12.

*Briefly describe how gills function.*  
Gills are thin, feathery-like membranes located inside slit-shaped openings behind the head. Fish get oxygen from the water by passing it through their mouths and over their gills. Oxygen is absorbed through the gill membranes and carbon dioxide is removed.

## Fill In the Blanks

Answers can be found on page 8.

## Word Search

See page 22 for answers.

## Crossword

See page 22 for answers.

## Mystery Math

19-4    11-25-10-20  
8-24-21-10-4-7-2-4    24-25-7  
9-18-25-9-20-5-8    7-4-10-24-25-7-8-4-10  
We must conserve our aquatic resources.

# STUDENT WORKSHEET/ANSWERS

## Word Search

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

## Crossword

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

# Glossary of Terms

---

## A

**Adaptation:** a particular characteristic of a plant or animal that makes it better suited to its environment.

**Amphibians:** cold-blooded, smooth skinned, vertebrate wildlife species including frogs, toads, newts, and salamanders. Amphibians spend part of their life on land and part of in water.

**Amphidromous:** migrating between freshwater and saltwater for reasons other than spawning (breeding).

**Anadromous:** migrating from an ocean into a freshwater river to spawn.

**Arthropod:** an animal without an internal backbone, including insects and crayfish.

## B

**Barbels:** whisker-like appendages with sensory capabilities.

**Behavior:** the way an animal responds to its environment.

## C

**Camouflage:** a protective adaptation that enables a fish to disguise itself or blend with its surroundings.

**Carnivore:** a fish that eats other animals, a meat eater.

**Carrion:** the body of a dead animal in the natural state of decay, which serves as a food source for some animals.

**Cold-blooded (ectothermic):** an animal whose body temperature is dependent upon and varies with the temperature of its environment, i.e. fish, amphibians, and reptiles.

**Communication:** any sound, scent, or behavior recognized by members of the same species.

**Competition:** the result of different species of animals that use the same source for food or shelter.

**Conservation:** the care, wise-use, and management of a resource.

**Consumer:** a fish that gets its food from producers (plants).

**Courtship:** behavior that attracts a mate in the state of reproductive readiness.

**Cover:** naturally occurring sheltered areas, which provide concealment shelter, i.e. a submerged tree, log, or rock outcroppings.

## E

**Ecosystem:** an interacting system of plants, animals, soil, and climactic conditions in a self-contained environment, i.e. pond, marsh, swamp, lake, or stream.

**Endangered:** a species in danger of becoming extinct due to declining population numbers.

**Environment:** the entire surroundings of an organism (plant or animal) or group of organisms.

**Estuary:** area where fresh water and salt water meet.

**Extinct:** a species that no longer exists or has died out.

## F

**Fingerling:** an immature fish.

**Food chain:** a group of plants and animals linked together as sources and consumers of food.

**Food web:** the many possible feeding relationships found within a given ecosystem.

**Fresh water:** a body of water that contains little salt in it, i.e. pond, lake, or stream.

**Fry:** an immature fish.

## G

**Gas bladder or swim bladder:** an internal balloon-like organ, which affects floatation by selectively taking in gases from the blood stream.

---

## H

**Habitat:** the local environment in which an animal lives. Components of habitat include an arrangement of food, water, cover (shelter), and space.

**Herbivore:** a fish that eats only plant material.

## I

**Invertebrates:** animals without backbones, including insects (*Arthropoda*), earthworms (*Annelida*), and jellyfish (*Coelenterata*).

## L

**Lateral line:** a system of sensory nerves in the skin, which detects the movement of water and other fish. The lateral line extends from head to tail on either side of the fish.

## M

**Migration:** the seasonal movements of fish and wildlife from one area to another; usually triggered by the length of daylight hours.

**Milt:** the semen of a male fish.

## O

**Obliterative camouflage:** a protective color pattern of dark on top and light underneath.

**Omnivore:** an animal that eats both plants and animals (meat).

## P

**Pheromone:** a chemical scent secreted as a means of communication between members of the same species.

**Photosynthesis:** a series of chemical changes in which plants combine sunlight, gasses, and water to form sugar or food.

**Plankton:** microscopic plants and animals that are eaten by fish and other aquatic life.

**Predator:** an animal that hunts and feeds on other animals.

**Prey:** an animal hunted or killed for food by other animals (predators).

**Producer:** plant that obtains energy from the sun and produces food through the process of photosynthesis.

## R

**Redd:** a nest-like depression made by a male or female fish to contain eggs.

## S

**Salt water:** a body of water with a high concentration of salt in it, i.e. oceans and seas.

**School:** a group of fish.

## T

**Territory:** the area a fish will defend, usually during breeding season, against intruders of its own species.

**Threatened:** a classification used to describe a species whose population is in great decline and approaching the “endangered” classification.

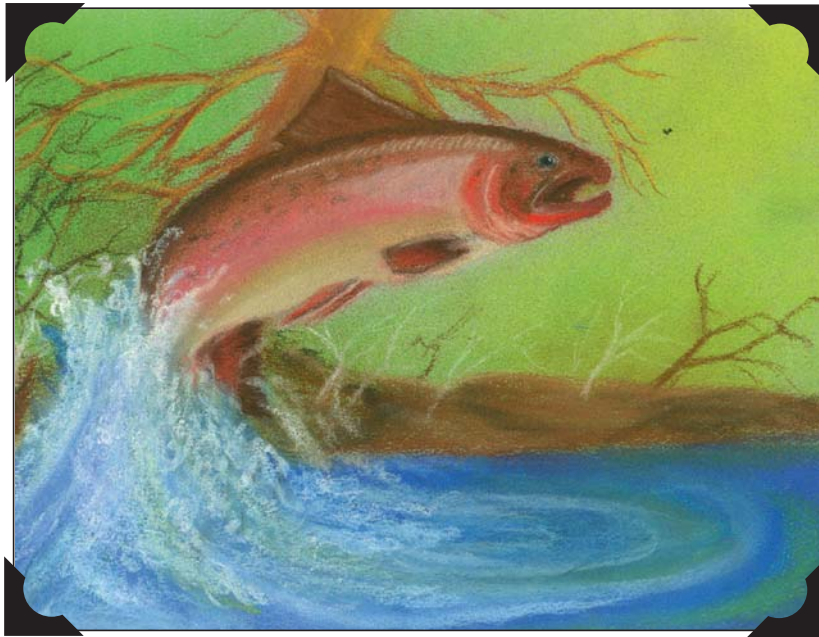
## V

**Vertebrate:** an animal with a backbone; includes fish, birds, mammals, and reptiles.

## W

**Warm-blooded (endothermic):** an animal whose body temperature is unrelated to its environment, i.e. mammals and birds.





### Montana's Pride

On February 10, 1977, Governor Thomas Judge signed the law designating the Black Spotted Cutthroat Trout as Montana's state fish. The cutthroat trout has a scientific name, *salmo clarkii*, also known as *oncorhynchus clarkii*. It bears the name because it was first identified by William Clark, of the Lewis and Clark expedition, at the Great Falls of the Missouri in 1805.

The State Fish bill was introduced in the 45th Montana Legislature and passed by wide margins in both houses. The other main competitor for the honor was the Montana Grayling. Both of these fish were on the Threatened Species List. It was hoped that by this increased attention both fish would benefit.

The people in favor of designating a state fish set six criteria. These were: 1) native to Montana, 2) not already adopted by another state, 3) well accepted by the people, 4) a game fish, 5) distinctive in appearance, and 6) found in more than one area of the state. The cutthroat met these criteria and was also claimed to be a "fighting, good-eating, and beautiful fish." Montana has taken steps to preserve this special fish and its residents are proud to have the cutthroat represent our state.

**Example from Grades 7-9**  
Montana winner