

The Wildlife Forever State-Fish Art Project Lesson Plan

Something's Fishy



The *Wildlife Forever State-Fish Art Project* is an interdisciplinary, multi-media, environmental education program that uses art as a springboard into the fascinating world of fish.

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The Wildlife Forever State-Fish Art Project

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Contents

Foreword	Page 5
About Wildlife Forever	Page 6
About The <i>Wildlife Forever State-Fish Art Project</i>	Page 7
Lesson Plan: Something's Fishy	Page 8
• Background Information	
• Procedure Options	
• Extension Activities	
• Assessment Options	
• Student Worksheets	
• Worksheet Answers	
Glossary of Terms	Page 23
Species Identification Section	Page 26
Wildlife Forever State-Fish Art Contest Rules and Regulations	Page 62
Official Wildlife Forever State-Fish Art Contest Entry Form	Page 63



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
1999 South Carolina winner, Justin Coker

Foreword:
The Cry of the Wild

by Douglas H. Grann



The “cry of the wild” can still be heard across this great land. I have heard the bugle of an elk amid the foothills of the western plains...the shrill of a bald eagle along the banks of the mighty Mississippi...the roar of a brown bear on windswept tundra ...the thunder of migrating waterfowl on coastal shores...the crow of a pheasant on Midwestern farm fields...the gobble of a wild turkey among western foothills and the haunting call of a sandhill crane within the wetlands of the Central Flyway.

Amazing beauty can still be found in the natural landscapes of this great land. I have seen towering forests... pristine waters... rich wetlands... wide-open prairies... majestic mountains... and vast deserts alive with color. I am awed and inspired by the complexity and wonder of the natural world. It is where I find solace and peace.

America is truly blessed. A land rich in natural resources, much of our identity and culture can be attributed to the natural world—our sense of adventure, pioneering spirit, and tenacity. Irving Berlin’s *God Bless America*, Woody Guthrie’s *This Land is Your Land*, and Samuel Smith’s *America* all declare a love and respect for this land we call “home.” It is imperative we regain a love and respect for the land, its beauty, and its life-sustaining capability.

The legacy of our natural resource heritage must be preserved. Education is the answer. At Wildlife Forever, we are committed to preserving America’s wildlife heritage. The Wildlife Forever State-Fish Art Project is a powerful tool that will help accomplish this aim. To us, Wildlife Forever is more than a name; it is a mission in-and-of-itself, a mission to preserve wildlife...forever.

Welcome, and thank you for your time, dedication, enthusiasm, expertise, and belief.

Yours in conservation,

A handwritten signature in blue ink that reads "Doug Grann". The signature is fluid and cursive, with a large initial "D" and "G".

Douglas H. Grann
Executive Director

About Wildlife Forever



Wildlife Forever is a non-profit conservation organization dedicated to preserving America's wildlife heritage. Working at the grassroots level, Wildlife Forever has completed conservation projects in all 50 states including research, habitat restoration and enhancement, management, and land acquisition. However, we strongly believe education will ultimately determine the future of our wildlife heritage.

Our education mission is to teach future generations stewardship of America's wildlife heritage through the development of elementary and secondary school programs which foster knowledgeable, responsible, and thoughtful conservation.

Wildlife Forever works to produce innovative, high-quality, inexpensive educational materials for use in traditional and non-traditional education settings alike.

We believe:

- Environmental education and conservation education have evolved and will continue to evolve, and only through diverse strategies, methods, and delivery systems will we create an ecologically literate citizenry.
- Education, in general, is an enormous endeavor that requires vast amounts of knowledge, experience, time, commitment, enthusiasm, and financial resources.
- Internet technology is a valuable, effective and economical education tool. Nationwide, 100,000 schools have Internet access.
- *The Wildlife Forever State-Fish Art Project* will complement any materials currently utilized by classroom teachers, environmental education centers, or state agencies.
- *The Wildlife Forever State-Fish Art Project* will bridge-the-gap, leading to natural partnerships between the conservation community, industry, corporate America, and education.
- *The Wildlife Forever State-Fish Art Project* will provide children with a wonderful introduction to the value of aquatic resources.

About The Wildlife Forever State-Fish Art Project



The Wildlife Forever State-Fish Art Project was inspired by a bright fifth-grader from Minnesota named Kate Di Leo and her father Sal in March of 1996.

The Wildlife Forever State-Fish Art Project is an exciting, multi-media 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: 1) an education piece, and 2) a national art contest. Children in grades four through twelve will learn all about their state fish and its habitat, then have the opportunity to participate in the Wildlife Forever State-Fish Art Contest.

THE LESSON PLAN: *SOMETHING'S FISHY*

Information contained in the lesson plan, *Something's Fishy*, has been written for educators who teach grades four through twelve. The lesson plan includes extensive background information, diverse procedures and extensions, a thorough glossary, a comprehensive species identification section, student worksheets, and suggested quiz questions. 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*.

The unique species identification section includes a profile of each state-fish, containing such information as physical description, reproductive and feeding behavior, and habitat requirements. Each profile also contains a segment titled "Did You Know" highlighting interesting facts such as speed, defense mechanisms, population trends, and status.

THE STATE-FISH ART CONTEST

The Wildlife Forever State-Fish Art Project is unique in that it culminates with a national art contest for children who have actively participated in the *Something's Fishy* lesson. Children will use their newly acquired knowledge to create a learning portfolio, which includes an original state-fish illustration and a related composition or theme about their state-fish. Portfolios will be judged on Earth Day by a committee composed of wildlife artists, outdoor writers, wildlife specialists, corporate and industry representatives, and national celebrities. Three winners from each state will be selected and honored at the annual State Fish Expo each summer.

The Wildlife Forever State-Fish Art Project will help to spread the message of conservation and to foster a connection to the natural world.

Something's Fishy

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

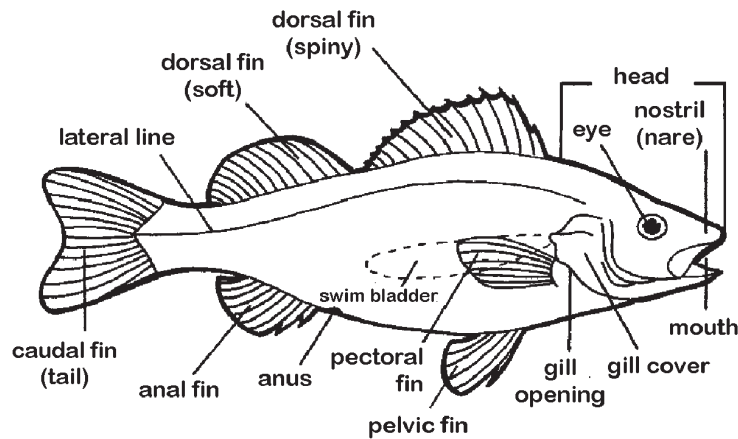
How many different species of fish are there? How are fish adapted to life under water? How do fish reproduce? How can you determine the age of a fish? What do fish eat? What kind of defense mechanisms do fish have? What is a group of fish called?

(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.

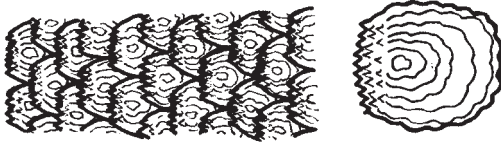
- The pectoral fin is found at the side behind the gills. It helps with diving, swimming to the surface, and remaining stationary.
- The dorsal fin is vertical from the back. It helps keep the fish from rolling.
- The pelvic fin is a stabilizer. It helps with balance.
- The caudal fin or tail helps to 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

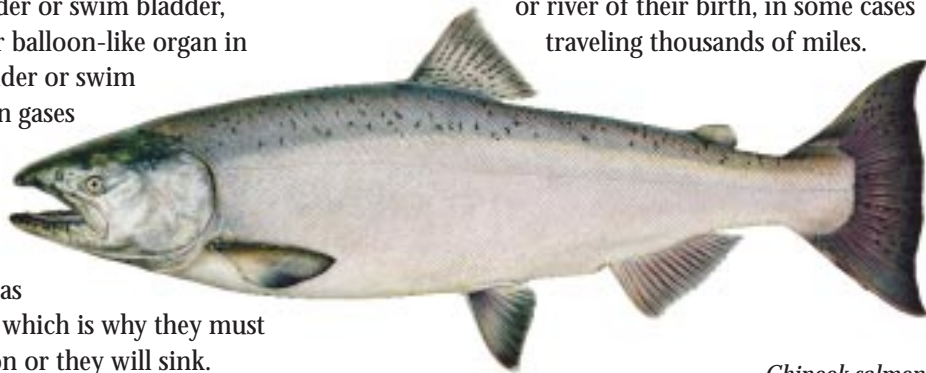
Most fish have a gas bladder or swim bladder, which is an airtight sac or balloon-like organ in the gut area. The gas bladder or swim bladder selectively takes in gases from the bloodstream to regulate floatation and buoyancy. Some fish, including the shark and tuna, do not have a gas bladder or swim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

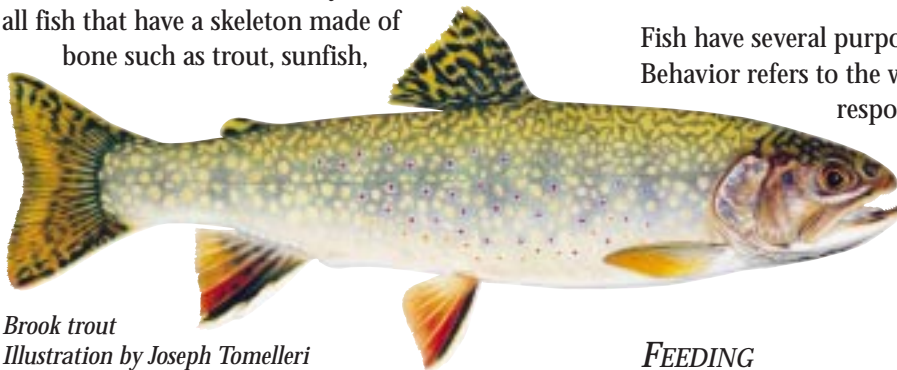


Paddlefish

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

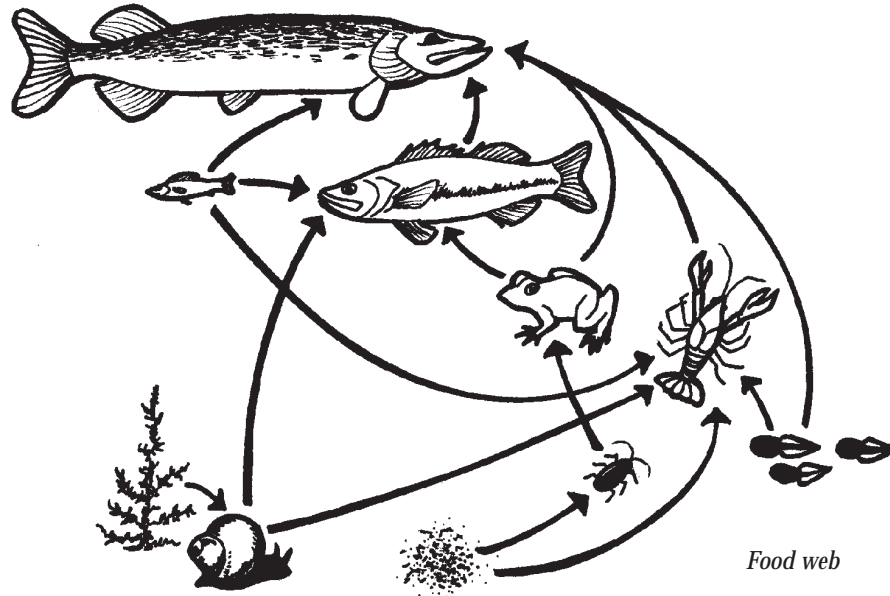
Fish have several purposeful patterns of behavior. Behavior refers to the way in which an animal responds to its environment.

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

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 63.

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 63.

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 $\frac{1}{2}$ 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.

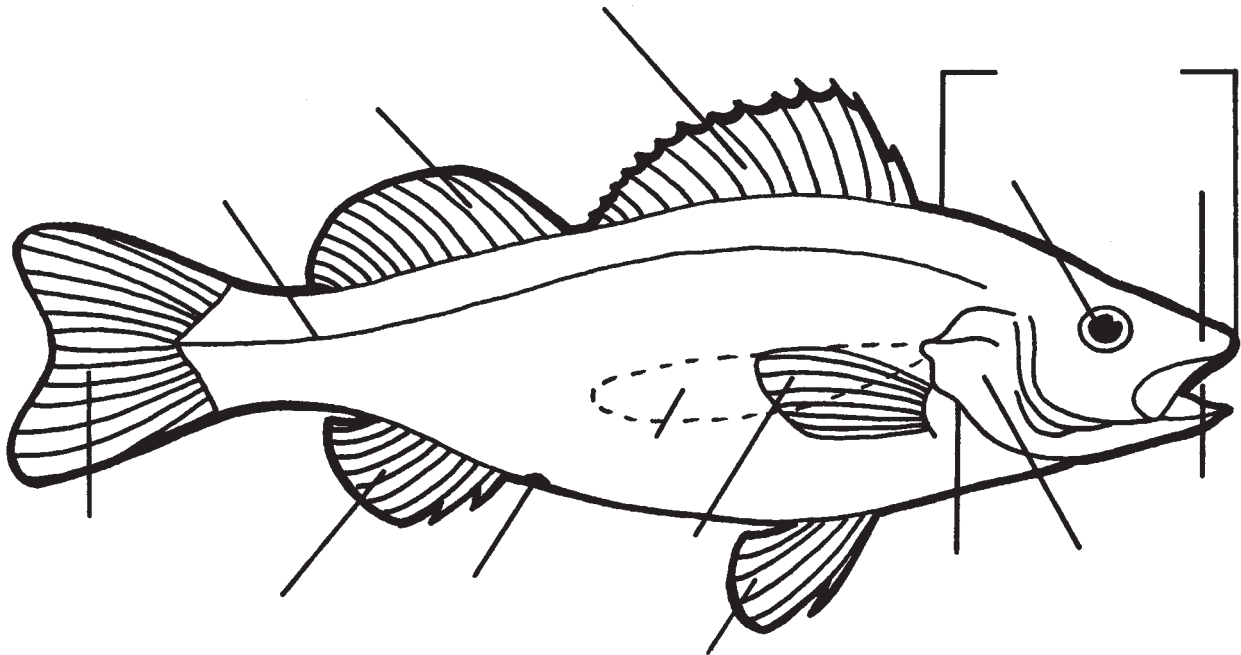
Briefly describe how gills function.

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

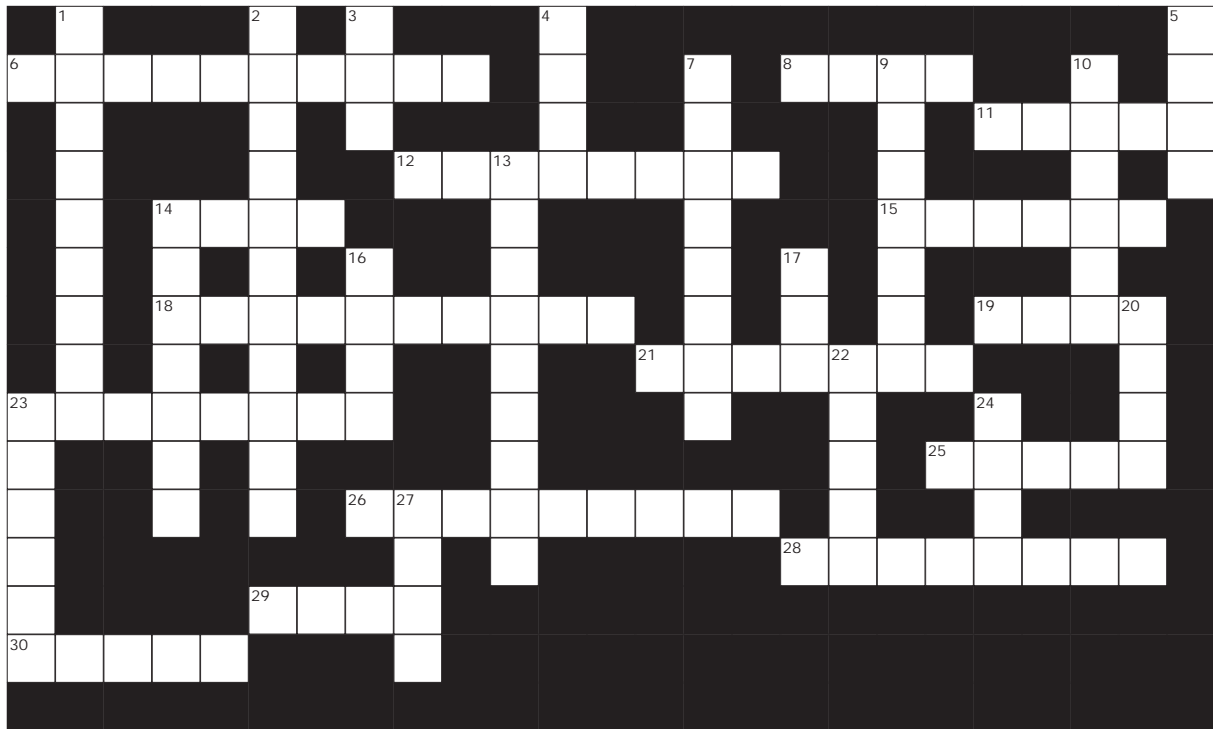
Channel Catfish
Chinook Salmon
Cutthroat Trout
Garibaldi
Golden Trout
King Salmon

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 humuhumunukunukuapua'a
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.

Code	$\begin{array}{r} 57 \\ \div 3 \end{array}$	$\begin{array}{r} 92 \\ \div 23 \end{array}$		$\begin{array}{r} 121 \\ \div 11 \end{array}$	$\begin{array}{r} 500 \\ \div 20 \end{array}$	$\begin{array}{r} 91 \\ \div 7 \\ - 3 \end{array}$	$\begin{array}{r} 246 \\ \div 82 \\ + 17 \end{array}$			
	1 = B									
	2 = V									
	3 = P									
	4 = E	$\begin{array}{r} 192 \\ \div 24 \end{array}$	$\begin{array}{r} 7 \\ \times 4 \\ - 4 \end{array}$	$\begin{array}{r} 147 \\ \div 7 \end{array}$	$\begin{array}{r} 85 \\ \div 5 \\ - 7 \end{array}$	$\begin{array}{r} 42 \\ \div 7 \\ - 2 \end{array}$	$\begin{array}{r} 126 \\ \div 18 \end{array}$	$\begin{array}{r} 96 \\ \div 6 \\ - 14 \end{array}$	$\begin{array}{r} 76 \\ \div 19 \end{array}$	
	5 = I									
	6 = K									
	7 = R									
	8 = C	$\begin{array}{r} 288 \\ \div 12 \end{array}$	$\begin{array}{r} 1025 \\ \div 41 \end{array}$	$\begin{array}{r} 98 \\ \div 14 \end{array}$						
	9 = A									
	10 = S									
	11 = M									
	12 = G	$\begin{array}{r} 115 \\ \div 5 \\ - 14 \end{array}$	$\begin{array}{r} 324 \\ \div 18 \end{array}$	$\begin{array}{r} 216 \\ \div 8 \\ - 2 \end{array}$	$\begin{array}{r} 54 \\ \div 6 \end{array}$	$\begin{array}{r} 133 \\ \div 7 \\ + 1 \end{array}$	$\begin{array}{r} 465 \\ \div 93 \end{array}$	$\begin{array}{r} 728 \\ \div 91 \end{array}$		
	13 = Y									
	14 = F									
	15 = L									
	16 = J									
	17 = D	$\begin{array}{r} 427 \\ \div 61 \end{array}$	$\begin{array}{r} 126 \\ \div 42 \\ + 1 \end{array}$	$\begin{array}{r} 182 \\ \div 14 \\ - 3 \end{array}$	$\begin{array}{r} 9 \\ \times 8 \\ - 48 \end{array}$	$\begin{array}{r} 203 \\ \div 7 \\ - 4 \end{array}$	$\begin{array}{r} 255 \\ \div 15 \\ - 10 \end{array}$	$\begin{array}{r} 648 \\ \div 81 \end{array}$	$\begin{array}{r} 819 \\ \div 91 \\ - 5 \end{array}$	$\begin{array}{r} 209 \\ \div 11 \\ - 9 \end{array}$
	18 = Q									
	19 = W									
	20 = T									
	21 = N									
	22 = Z	Answer: _____								
	23 = H	_____								
	24 = O	_____								
	25 = U	_____								
26 = X	_____									

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 13.

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 9.

Word Search

See page 22 for answers.

Crossword

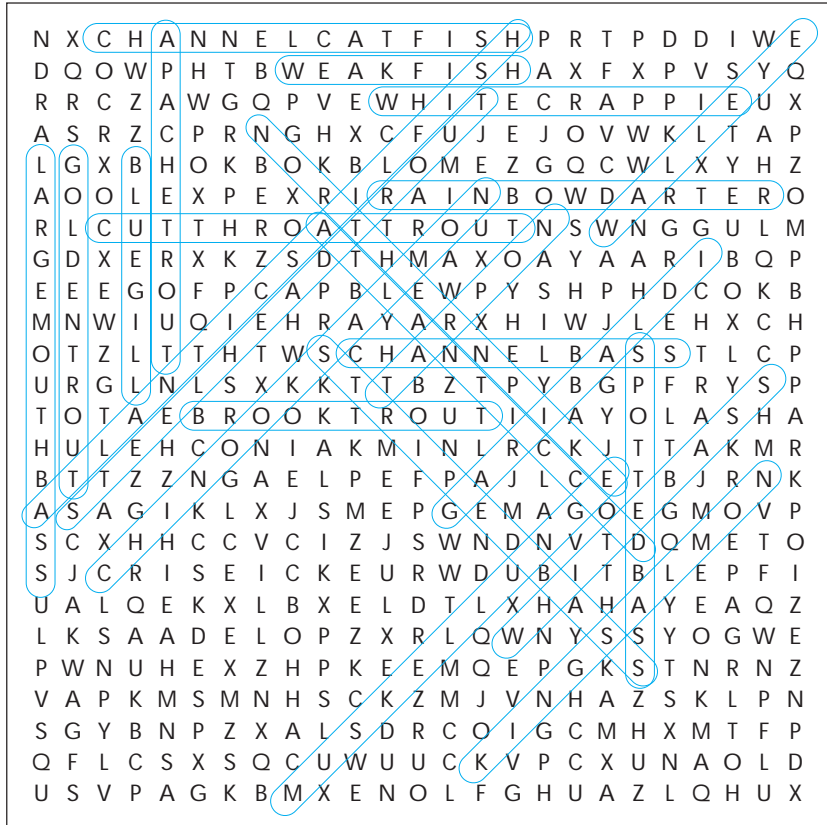
See page 22 for answers.

Mystery Math

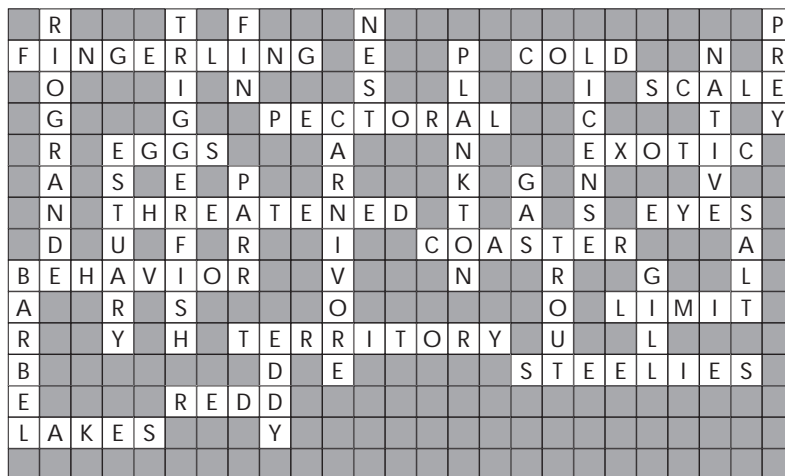
19-4 11-25-10-20
8-24-21-10-4-7-2-4 24-25-7
9-18-25-9-20-5-8 7-4-10-24-25-7-8-4-10
We must conserve our aquatic resources.

STUDENT WORKSHEET/ANSWERS

Word Search



Crossword



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
1999 Montana winner, Tristan Vukasin