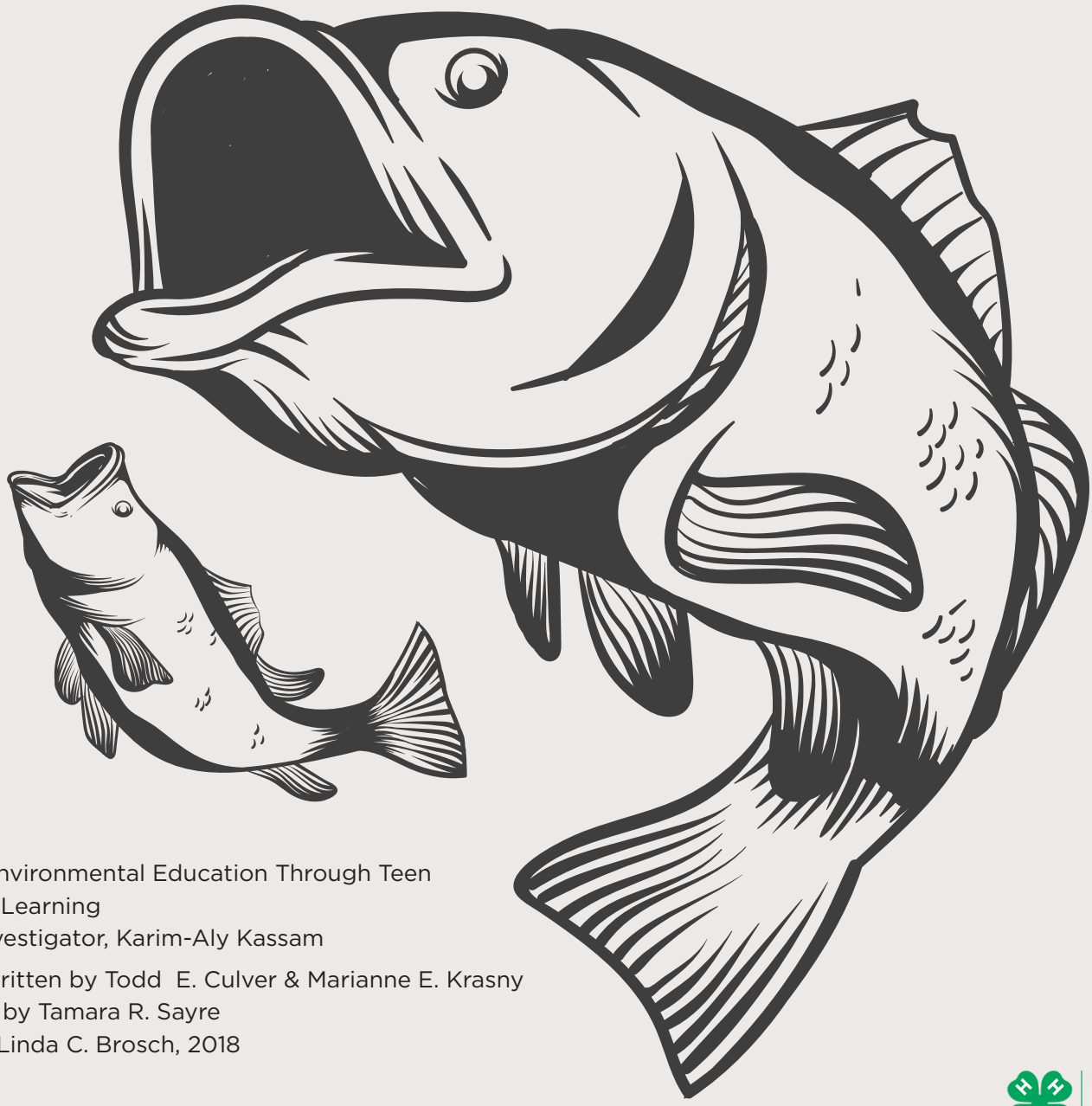
New York State 4-H

SPORT FISHING PROJECT

Fishing FUNdamentals

Activity 1

Leader Guide

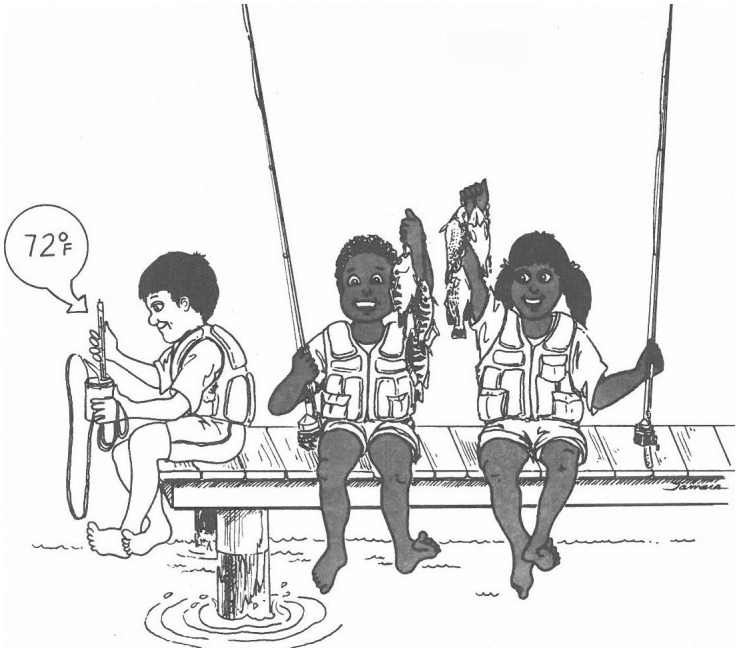


Engaging Environmental Education Through Teen Experiental Learning
Principal Investigator, Karim-Aly Kassam

Originally written by Todd E. Culver & Marianne E. Krasny
Illustrations by Tamara R. Sayre
Revised by Linda C. Brosch, 2018

Cornell University Cooperative Extension

NEW YORK STATE 4-H



Revised by Linda Brosch, Oswego County Cooperative Extension, 2018

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— Lucinda A. Noble, Director

Project Team:
Karim-Aly Kassam, P.I. Department of Natural Resources
and American Indian and Indigenous Studies Program;
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PREFACE

Ethic of Stewardship through Environmental Education

To whom much is given, much is expected! It is with this outlook; young people are asked to engage in both the learning objectives and activities of environmental education. This curriculum for ***Fishing FUNdamentals*** opens a window of curiosity and wonder into the habitat for the 4-H youth.

We do not exist outside of "nature" because it is all around us and we, ourselves, are fundamentally "natural"! We breathe, feed, live, reproduce, and die like other beings. In other words, the habitat consists of communities of living beings all around us. The word 'animal' derived from the Latin root animus meaning that which is endowed with will, spirit, or mind carries with it the understanding that we are part a larger community of beings. The world around us is animate, a source of deep wonder through observation and reflection, and through direct engagement with it, the basis of boundless insight. By mindfully participating in our habitat, we learn as much about it as we do about each other and ourselves.

The Greek word oikos, "household," is the root of the prefix 'eco' in both ecology and economics. In the twenty-first century, we grasp the complex connectivity of geophysical, biological and sociocultural systems, in which the planet is truly our oikos: it is the dwelling place of humanity. However, to understand it, we must begin locally with our habitat, our home.

The objectives of this revised and updated curriculum for the 4-H youth are:

- to generate an appreciation for their natural habitat;
- to provide knowledge about specific aspects of that habitat;
- to directly engage the habitat through guided activity; and
- to develop an ethic of stewardship through responsibility, recognizing that one's community includes the living habitat.

These objectives, while distinct, are not mutually exclusive because they work in tandem to achieve environmental education among youth. For instance, appreciation of ones habitat occurs only when a young person acquires knowledge about it. This knowledge creates wonder and curiosity that act to widen a youth's perception and understanding of their natural environment – to create a wider sense of community. Furthermore, knowledge is firmly grounded among the youth through guided experiential learning by undertaking activities outside. Book learning is not sufficient, as it must be accompanied by direct experience. This engagement, in turn, creates appreciation. Only when one appreciates, does a young person develop a sense of responsibility to care for ones habitat. At its core, this process creates informed and committed youth to environmental stewardship.

Responsibility for ones habitat is at the core of the ethic of stewardship. The word 'steward' combines the two active roles: of being 'in charge' on the one hand; and 'to serve' on the other. Humanity and by extension the 4-H youth are both 'guardians of' and 'servants to' life on this planet. Both ideas are commensurate, equally relevant, neither can be compromised. For 4-H youth, this means inculcating through this curriculum the value of responsibility by demonstrating how a human being is simultaneously in charge of their habitat and by knowledgeable action serves its wellbeing. The specific activities should engender a sense of mutual relationship where the youth benefits from and conserves their habitat.

A human ecological perspective informed by the ethic of stewardship is not only desirable, rather it is a necessary value in the twenty-first century. As a result of engaging (Place the name of the specific curriculum here), over the lifetime of the 4-H youth we should expect:

- An expanded ethic of stewardship encompassing all lands and waters whether they are urban or rural;
- A desire to work collaboratively with employers and employees, educators, artists, clergy and laypeople, young and old alike – to achieve a future that is sustainable;
- An understanding that economic and ecological matters relating to their habitat or home (oikos) are not unrelated, but are profoundly interconnected;
- Valuing of local place-based and indigenous knowledge about landscapes and natural resources; and
- An embrace of the ethic of stewardship throughout their adult life.

In short, it is important that the 4-H youth understands that: once you know about ***Fishing FUNdamentals***, you become responsible for your habitat!

Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

INTRODUCTION

Fishing for panfish can be a great way to introduce your group to the fun of fishing. Nothing turns a kid onto fishing as quickly as catching panfish with simple equipment. Panfish are ideal; they're fun and easy to catch, good eating, and nearby. There's no need to spend a lot of time learning knots, casting techniques, or lure presentations (that will come later). To get your group started with lots of enthusiasm, get the kids out fishing and enjoying it!

As part of this activity, have the participants make a weighted thermometer to measure the water temperature at various depths. Knowing the water temperature and depth of different locations within a body of water can help anglers predict what sorts of fish may be present and where they may be located. For example, coldwater species such as trout and salmon are most likely be found in deep, cool water during the summer. Bullheads and carp on the other hand prefer warm water, and can be found at shallower depths.

Since many small ponds are privately owned, you will probably need to ask the landowner for permission to fish. You can help the participants understand the concerns landowners have about letting people fish in their ponds. While the youth are fishing, remind them to act responsibly and safely. After the trip, make sure they thank the landowner for the privilege of fishing on his or her property.

Before the meeting and fishing trip, find a suitable pond and contact the landowner. Explain the goals of New York State 4-H Sport Fishing Project along with this particular activity, and ask permission for the club to fish. Hopefully the landowner will agree to let your group fish, and will even give you important information about fishing in his or her pond. Arrange a specific time for the trip that is convenient for the landowner.

New York State P-12 Science Learning Standards*

2-LS-2-1, 2-LS2-2
3-LS4-3, 3-LS4-4
5-ESS3-1
MS-LS2-1, MS-LS2-2, MS-LS2-5

*Effective July 1, 2017

Objectives

Angling Skills

Youth will:

- Learn to use simple fishing equipment.
- Be able to tie the Palomar knot.
- Learn to use live bait to catch panfish.

Fish Biology & Ecology

Youth will:

- Learn to use the *New York State Fishing Regulations* Guide to find the regulations pertaining to the fishing trip.
- Learn about carrying capacity and overpopulation.
- Learn about the importance of water temperature to fish.

Handling Fish

Youth will:

- Learn how to handle fish safely.
- Observe the proper method of caring for fish.

Aquatic Sampling

Youth will:

- Build a weighted thermometer.
- Learn to use a weighted thermometer properly.

Safety

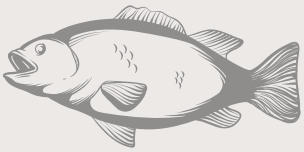
Youth will:

- Demonstrate how to fish safely from a stream bank or lake shore.

Environmental Stewardship

Youth will:

- Learn some of the concerns landowners have over letting anglers fish ponds.
- Show respect for the landowner's property rights, other resource users, and the environment while demonstrating responsible fishing behavior.



MATERIALS AND EQUIPMENT

Pre-Trip Meeting

- Weighted thermometer
- Empty soda can
- Sand or small pebbles
- Short piece of wire or string (10 inches [25 cm])
- Laboratory thermometer with an open loop at one end (must be able to read temperatures as low as 32º F [0ºC])
- Can opener
- Long piece of sturdy string (depending on depth to which you plan to sample)
- Waterproof markers, 2 different colors
- Tape measure or yardstick
- *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app
- *New York State Fishing Regulations Guide*
- Pencil for each member
- One 4-foot (1.2 m) section of nylon cord and an eye-bolt for each member

Fishing Trip

- *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app
- *New York State Fishing Regulations Guide*
- One fishing pole for each youth with 4-8 lb (1.8-3.6 kg) test monofilament line (spin-casting or bamboo rods are easiest to use)
- Worms, grubs, small insects, very small minnows, or crayfish
- Small (#6 to #8) snelled hooks, enough for everyone to use 3 or 4 "rigs"
- Small pinch-on lead sinkers, enough for everyone to use 3 or 4 "rigs"
- Small floats or bobbers, enough for everyone to use 3 or 4 "rigs"
- Needle-nosed pliers or hook remover
- Stringers or buckets, if you plan to keep some of the fish
- Measuring board or tape
- Cutting board
- Sharp knife
- Ice and cooler, if you plan to keep some fish
- Camera (optional)
- Weighted thermometer
- First aid kit (including emergency telephone numbers)
- Permission slip

Website Resources for Fish Identification

NYS DEC Fish:
http://www.dec.ny.gov/animals/269.html
Inland Fishes of New York Directory by Cornell University:
http://www2.dnr.cornell.edu/cek7/nyfish/index.html

WHAT TO DO

This New York State 4-H Sport Fishing Project activity should be divided in two: a pre-trip meeting followed by a fishing trip. The pre-trip meeting allows you to teach and prepare your club for the fishing experience without a lot of distractions. During the meeting, the club will also build a weighted thermometer which they will use to explore the aquatic environment during the fishing trip. Once out in the field, the club members can put what they've learned to use and concentrate on the fishing and sampling activities.

Keep the fishing trip simple. It is not necessary to teach any fishing techniques other than what will be needed by your club members to catch panfish on this trip. Panfish will usually bite at any time of day, especially in the early summer, so it is not necessary to go out early or to stay out for more than a couple of hours. Most of all, this activity should be fun. Enjoying the sport of fishing is the first step towards valuing the environmental conditions that make fishing possible as well as fostering a sense of connection to fishing locales.

Pre-Trip Meeting

1. Introduce the activity by describing the pond, including who owns it, and the need to ask permission of the landowner before a fishing trip.

2. If possible, invite the landowner to the pre-trip meeting. The group should ask the landowner if he or she has any special concerns about them fishing on his or her property. They should also ask what types of fish they are likely to catch and whether they can keep the fish or not. If the youth are not able to meet the landowner, remind them about an angler's responsibilities to landowners, the pond, and their own safety. Discuss the types of behaviors that would likely result in anglers not being invited back to fish in a landowner's pond or lake.

3. On any fishing trip, anglers should know the fishing regulations and be able to identify the fish species they're likely to catch. Have half of the club members look up the panfish species they may catch in *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app, and the other half look up the regulations regarding those species in the *New York State Fishing Regulations Guide.*

4. Have the individuals who looked up the regulations share what they find out about the size restrictions, length limits, and daily limits for the species they may catch. Have the members who looked up the fish species tell the others what to look for to identify these fish.

5. Pass out a section of nylon cord and a small eye-bolt to each person and have them follow along in their activity handout as you show them how to tie a Palomar knot using the nylon cord and eye-bolt (you may want to explain that "normal" knots won't hold in monofilament line). Let the participants practice while the leaders check to see if anyone needs help.

6. Demonstrate the fishing equipment that will be used. Explain enough about the spin-cast rod and reel so that the youths will feel comfortable using them, but don't get too technical. Have the youth learn how to rig the line for this fishing trip including attaching the float, adding a sinker, and how to hook the bait.

7. Explain the importance of water temperature to fish. Water temperature influences the amount of dissolved oxygen in the water, affects feeding behavior, and triggers spawning in many fish. Understanding how physical and chemical characteristics of water affect fish can make you a better angler. Water temperature is not the same everywhere in a pond. Ask the youth where they would expect to find the warmest water. Why? Where is the coldest water? Discuss the preferred temperature ranges of the fish you are likely to encounter.

8. Divide your group into smaller groups of three to four members. Have each group build a weighted thermometer by following the directions in Activity 1: Measuring Water Temperature.

9. If there is time, the group may want to practice casting on a lawn or parking lot.

10. Before everyone leaves, be sure they know when and where to meet and what to bring for the fishing trip. Remind each person to bring his or her permission slip. Discuss any other items they need to bring on the trip such as clothing, proper footwear, insect repellent, sunscreen, hat, fishing equipment, water and lunch.

Fishing Trip

1. Remind the group about safety precautions and responsible angling behavior.

2. Show the participants the food items they will be using for bait (worms, grubs, grasshoppers, insects, crickets, or very small minnows) and how these items should be hooked. You could have the members try a variety of baits, at least until one bait proves to be most effective.

3. Knowledge of the life habits of fish makes an angler more successful. Point out areas such as weed beds, docks, or sunken logs where fish may prefer to hang around.

4. Help the novice anglers get their lines rigged and in the water. Tell them you'll show them how to unhook fish after they have made their first catch.
5. As the group start catching fish, move around and show them how to grasp a fish without injuring it or getting "spined," how to remove the hook have needle-nosed pliers handy), and how to release the fish without injury. Explain that fish that are handled properly and quickly released are very likely to survive and reproduce to keep fish populations steady, which benefits wildlife and anglers around the pond.

6. Help everyone to identify the fish they catch using the *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app

7. Have each participant measure the length of each fish they catch, using a measuring board or tape, and record the information the *Fishing Journal*.

8. If the group has permission from the pond owner, you may want to keep some of the fish for eating. If you do keep some of the fish to eat, demonstrate how to scale and pan dress the fish. Explain what you're doing as you work, but don't go into too much detail. Cleaning and preparing fish will be covered in-depth later. Show that immediately icing down fish ensures the best eating.

9. Discuss what it means for a fish pond to become "over- populated" and how overpopulation can cause fish to grow slowly and become stunted in size. Explain to the group that the panfish reproduce quickly and that if the pond is overpopulated, it may benefit from removing some of the fish. Removing fish from an overpopulated pond allows the remaining fish to grow faster and larger. Ask the participants what would happen to the fish population if more and more fish were added to the pond. Discuss "carrying capacity" as the amount of fish that a pond is capable of supporting.

10. After everyone has fished for a while, have them gather together so you can demonstrate how to measure water temperature and depth.

11. Complete Measuring Water Temperature Activity Sheet

12. While waiting to bring the thermometer out of the water, have the club members record the depth at which the temperature is being taken in the *Fishing Journal.*

13. Have the club members record temperature of the water on the record sheet in the *Fishing Journal*.

14. Have the individuals take the water temperature atWater Temperature Activity Record Sheet.

15. Discuss with your group the relationship of water temperature to oxygen content, fish habits, and to angling success.

Fishing Trip Wrap-Up

1. Have the group thank the landowner or a member of the landowner's family for a wonderful day of fishing. If some of the fish were kept, offer to share some of the catch. Ask the club members to send a thank-you letter to the landowner.

2. Discuss some of the landowner's concerns over letting people fish his or her pond and what responsible anglers can do to keep the landowner happy and the pond open for fishing.

3. Preview the next meeting with the members. Discuss what the activities will be and how they can prepare for the meeting. Always try to end a club meeting with the members more excited and enthusiastic about New York State 4-H Sport Fishing Project than before the meeting started.

ACTIVITY 1: Background Materials

Pan Dressing

Pan dressing is the technique most often used when cleaning small fish such as bluegills, catfish, butterfish, and scup. Pan dressing is very similar to field dressing. However, pan dressed fish also have their scales, fins, and heads removed.

To scale a fish, hold it by the tail and scrape the scales from its body using a scaler or knife blade. Short strokes from the tail toward the head work best. To remove the dorsal and anal fins, make 1/2 to 3/4 inch (1.3 to 3 cm) deep cuts along each side of the fin, and then use pliers to pull the fin out in a tail to head motion. The head, pectoral, and pelvic fins can be removed by cutting behind the pectoral fins and across the back. Break the spine behind the head and cut the head, fins, and entrails free from the rest of the body. The tail can also be removed if desired. The remaining fish contains all of the edible meat, as well as the backbone and ribs.

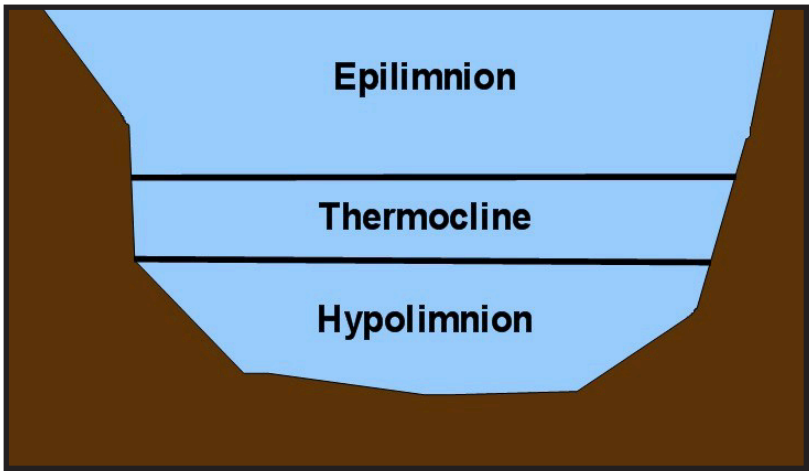
Some fish, such as catfish, do not have scales and therefore must be skinned rather than scaled. This is done by cutting the skin, but not the flesh, entirely around the head. Holding the head securely in place with a clamp or spike on the cleaning board, grasp the skin along the cut with pliers and peel it back along the length of the of the fish. Remove the heads, fins, entrails, and tail as described above.

ACTIVITY 1: Background Materials

Water Temperature and Oxygen

Assuming there is adequate oxygen, water temperature is the most important factor determining where fish will be within a body of water. Like all cold-blooded animals, fish have preferred temperatures in which their bodies function most effectively. Most anglers are aware of the difference between warmwater species such as smallmouth bass and bluegills, and coldwater species such as trout and salmon. In addition to variations in temperature between different bodies of water, there are important temperature variations within a single lake, pond, or stream, both seasonally and from one spot to another. Anglers who know the preferred water temperature of the fish they seek can measure the water temperature during different times of year and at different locations to determine the most likely location for those fish.

In the summertime, the sun warms the surface of lakes, ponds, rivers and oceans. In smaller bodies of water, the waters are mixed by wind so temperatures remain fairly constant throughout. In larger bodies of water, the water becomes stratified into three different layers. The warm surface layer is called the epilimnion. The deeper water remains cool, forming a layer called the hypolimnion. In between the layers of warm surface water deep cool water is a layer characterized by a rapid drop in temperature. This layer is called the thermocline. Anglers can locate a thermocline by taking temperature readings at various depths until a rapid change (0.5 °F [0.3°C] every foot of depth) is noted.



Summertime Stratification of a Lake

During the wintertime in areas covered in ice, the surface water is actually the *coolest* layer instead of the warmest. This occurs because of a property of water that is unique among liquids. Similar to other liquids, water becomes heavier and more dense as it cools. However, unlike other liquids which are heaviest at their freezing point, water is heaviest at 39°F (4°C), a temperature just above its freezing point. Because water at 39°F is heavier than frozen water or ice, it will sink below water that is freezing. This causes ice to form from the surface of lakes downwards. Except for very small ponds, the water will not freeze all the way down to the bottom, since warmer water sits at the bottom. Therefore fish live in the bottom of lakes during the winter.

During the spring and fall, the stratified cold and warm layers mix together as the surface layer changes temperature. Because the water is not separated into layers of different temperature, fish tend to be more scattered throughout the lake during these times of year.

Similar to water temperature, oxygen content has an important influence on the location of fish. During the summer, fish may move to the deeper cool water which holds more oxygen. However, towards the end of the summer, oxygen may become depleted in the deep water, causing fish to move up to the thermocline.

Towards the end of the winter, oxygen may also become depleted. Lack of oxygen in late-thaw years may cause significant fish mortality. Fortunately, the spring and fall mixing of water helps restore oxygen to deeper waters every year.

ACTIVITY 1: Background Materials

Measuring Water Temperature

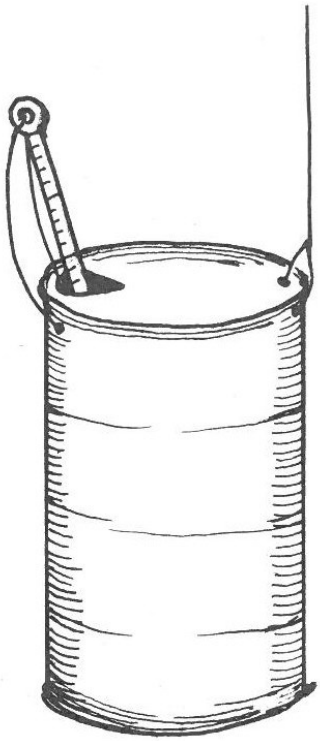
Introduction

You can measure water temperature easily in shallow water or at the surface simply by using a weather thermometer tied to a string. However, water temperature in deep water generally differs from that of surface water. Therefore, it will be fun to measure the temperature of deep water and compare it to the temperature of shallower water. To take water temperature at a depth, you will need to make a weighted thermometer.

Materials & Equipment

- Empty soda can
- Sand or pebbles
- Short piece of wire or string (10 inches [25 cm])
- Laboratory thermometer with an open loop at one end (must be able to read temperatures as low as 32°F [0°C])
- Can opener
- Long piece of sturdy string (length depends on the depth to which you plan to sample)
- Waterproof markers, 2 different colors
- Tape measure or yardstick

Building the Weighted Thermometer



1. Put some sand or pebbles into the empty soda can so it will sink.
2. Make a hole on side of can near the hole where the can was originally opened.
3. Pass the short piece of string or wire through the loop of the thermometer.
4. Place the thermometer in the can and tie or wire it securely to the can by passing the short piece of string or wire through the holes.
5. Make two small holes in the can with the can opener. One hole should be on the top opposite the thermometer. The other hole should be just below that hole, on the side of the can.
6. Tie the long string securely to the can through the holes. Starting at the can, mark off the long string every foot (or every 25 cm) with waterproof markers. This will help you to determine the depth at which the temperature is taken.

Using the Weighted Thermometer

1. Lower the weighted thermometer into the water and let it remain there for 5 min.
2. While waiting to bring the weighted thermometer out of the water, one of the club members can record the depth at which the temperature is being taken.
3. Bring the can to the surface quickly and read the thermometer. Make sure the tip of the thermometer remains in the water in the can.
4. Record the temperature of the water on your Measuring the Physical Environment Activity Record Sheet.
5. Take the water temperature at several different depths and places in the water, and record the temperatures on your Activity Record Sheet.

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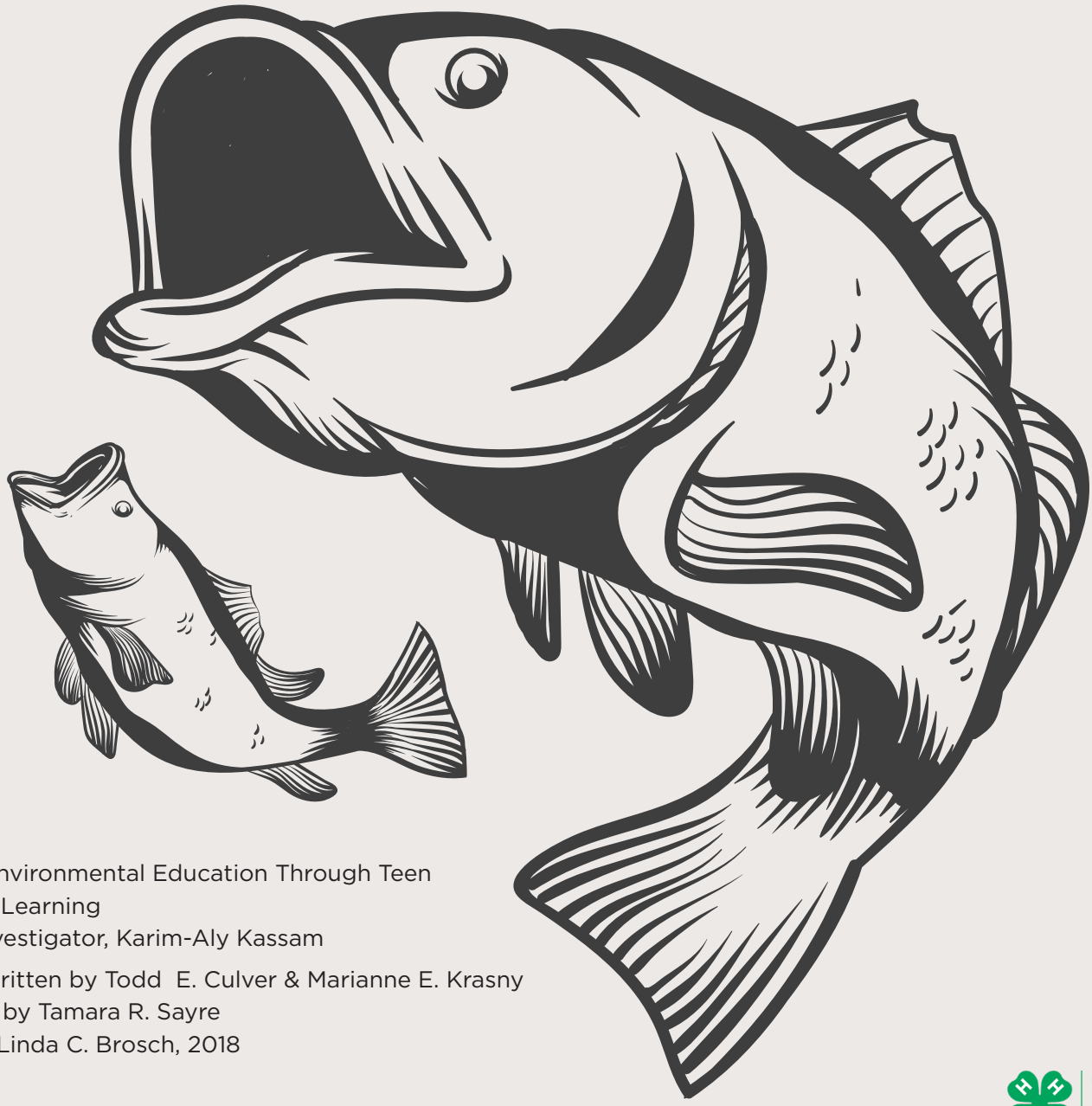
Member Guide



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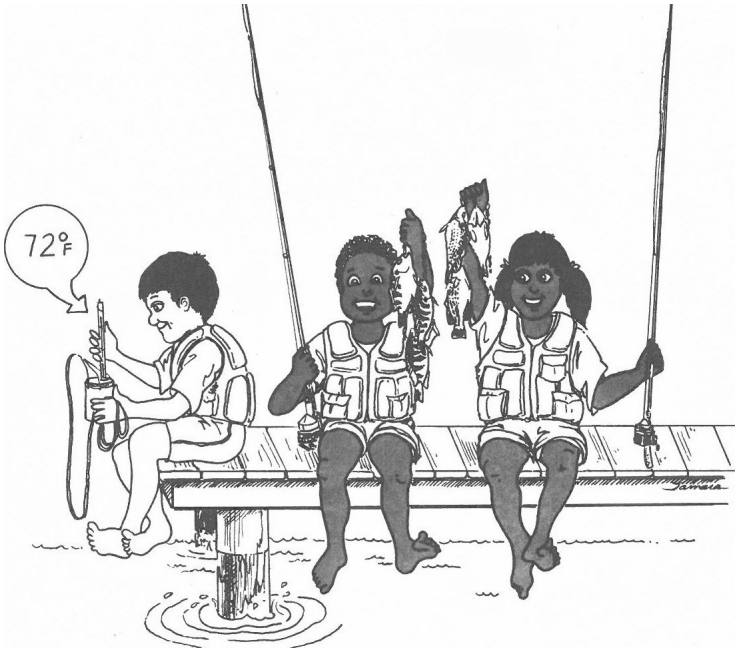

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- to generate an appreciation for their natural habitat;
- to provide knowledge about specific aspects of that habitat;
- to directly engage the habitat through guided activity; and
- to develop an ethic of stewardship through responsibility, recognizing that one's community includes the living habitat.

These objectives, while distinct, are not mutually exclusive because they work in tandem to achieve environmental education among youth. For instance, appreciation of ones habitat occurs only when a young person acquires knowledge about it. This knowledge creates wonder and curiosity that act to widen a youth's perception and understanding of their natural environment – to create a wider sense of community. Furthermore, knowledge is firmly grounded among the youth through guided experiential learning by undertaking activities outside. Book learning is not sufficient, as it must be accompanied by direct experience. This engagement, in turn, creates appreciation. Only when one appreciates, does a young person develop a sense of responsibility to care for ones habitat. At its core, this process creates informed and committed youth to environmental stewardship.

Responsibility for ones habitat is at the core of the ethic of stewardship. The word 'steward' combines the two active roles: of being 'in charge' on the one hand; and 'to serve' on the other. Humanity and by extension the 4-H youth are both 'guardians of' and 'servants to' life on this planet. Both ideas are commensurate, equally relevant, neither can be compromised. For 4-H youth, this means inculcating through this curriculum the value of responsibility by demonstrating how a human being is simultaneously in charge of their habitat and by knowledgeable action serves its wellbeing. The specific activities should engender a sense of mutual relationship where the youth benefits from and conserves their habitat.

A human ecological perspective informed by the ethic of stewardship is not only desirable, rather it is a necessary value in the twenty-first century. As a result of engaging (Place the name of the specific curriculum here), over the lifetime of the 4-H youth we should expect:

- An expanded ethic of stewardship encompassing all lands and waters whether they are urban or rural;
- A desire to work collaboratively with employers and employees, educators, artists, clergy and laypeople, young and old alike – to achieve a future that is sustainable;
- An understanding that economic and ecological matters relating to their habitat or home (oikos) are not unrelated, but are profoundly interconnected;
- Valuing of local place-based and indigenous knowledge about landscapes and natural resources; and
- An embrace of the ethic of stewardship throughout their adult life.

In short, it is important that the 4-H youth understands that: once you know about ***Fishing FUNdamentals***, you become responsible for your habitat!

Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

INTRODUCTION

Fishing is fun! Whether kicking back with a cane pole or using the latest fly fishing theory to catch trout, you can get in on some serious fun by participating in this New York State 4-H Sport Fishing Project.

The fact that fishing is loads of fun is no secret. In fact, 60 million fishermen and women in the United States rate fishing as one of their favorite things to do. That's a lot of people!

In New York State alone there was an increase of 40,000 licensed anglers from 2010 to 2017. Lots of people think there are too many anglers already, but New York's population is sure to continue growing, and it's likely that people will continue to have more and more free time. This means there will be more people going fishing in the future, even more than are fishing now. Will there be enough fish and fishing opportunities to go around for all?

The answer can be yes. And that is why New York's 4-H program has developed New York State 4-H Sport Fishing Project. To preserve the sport of fishing, anglers need to learn all they can about fish--their habits, food and where they like to live. A good angler also knows the importance of acting responsibly, of respecting and obeying conservation laws, of being considerate and getting permission to fish on private property. Fishing is a whole lot more than just catching fish!

And you know, the best fishermen and women tend to be the ones most involved in conservation. They are the ones who care enough to pick up the litter that a less thoughtful angler left behind, or to fight to protect a lake from pollution. They are the ones who want to be sure there is enough good fishing for all, not only for now but in the future as well.

So let's go fishing! This project will open your eyes to a wonderful new world. Who knows where it will lead--perhaps to a lifetime of wholesome sport, or maybe even a career in environmental conservation. No matter what, there's bound to be loads of fun!

ACTIVITY 1: Fishing FUNdamentals

Well what are we waiting for? Let's go get 'em! After all, this is a fishing project!

In this first 4-H fishing activity, you will start out with the basic and most popular type of fishing: panfishing. The fish you will catch are called panfish because they usually fit in a frying pan. Plus, they make up for what they might lack in size with that great frying pan taste!

Panfish include rock bass, sunfish, bluegills, yellow perch, crappie, and bullheads. They are found in most warm-water ponds and in many lakes and rivers throughout New York. Chances are there's some great panfishing within biking distance of where you live.

If the water where you will be fishing is on private property, you will need to get permission before you go. You will find that courtesy and respect are very important in this 4-H project. By practicing courtesy and respect you will open doors for yourself that are closed to those who fail to appreciate the privilege of using another's land. Be sure to thank the pond owner when you are done fishing. Anglers are like detectives looking for clues. Instead of trying to solve a crime, anglers use clues to figure out where the fish are and how to catch them. One of the most important clues for an angler to understand is the water temperature. Since fish are cold-blooded, they are very picky about what water temperatures they inhabit. The smart angler knows how to find a location where the water temperature is just right for the desired fish. At a just-right temperature, the fish are most active and most likely to take your bait. The challenge is that different kinds of fish like different temperatures. Another challenge is that in any pond, lake or stream, the temperature may vary with the water depth or current. This will greatly influence where you find fish, since a temperature difference of just a few degrees in between a few feet of depth can spell success or failure.

So how do angling detectives find these temperature clues? By building a weighted thermometer and taking the water temperature at different depths in the water. In this activity, you will be doing just that.

The most successful anglers also keep good records. They not only write down the numbers and types of fish they catch, but also all of the environmental conditions present that might influence the fishing. Things like water and air temperature, weather, time of day, wind, and clearness of the water are all important parts of a fishing journal. Anglers who keep good records are at a big advantage the next time they fish a similar spot. They can look back in their journals and see what worked the last time, saving themselves valuable time and catching more fish in the process!

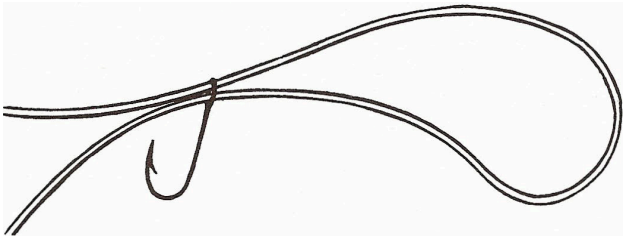
Successful anglers also respect the environment. They practice environmental stewardship, which is the **responsible use and protection of the environment** through conservation and sustainable practices both at home and while fishing. It is with the help of such caring and mindful practices that fish population will continue to thrive and grow.

In your Fishing FUNdamentals activity, you will:

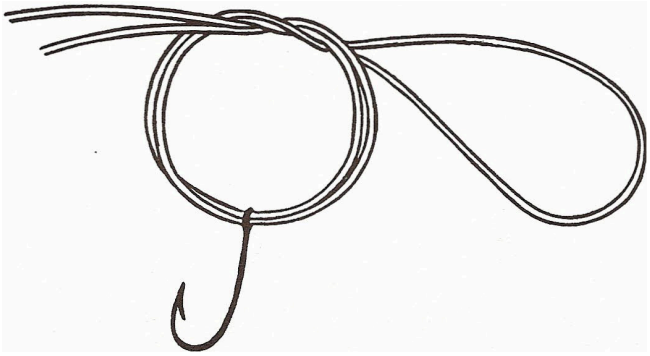
- Learn to tie a Palomar knot.
- Build a weighted thermometer to measure water temperature.
- Use the Water Temperature and Depth Activity Record Sheet to record temperature and depth for the waters you fish.
- Use the Pond Mapping Activity Record Sheet to note where important features are located in your pond and where the fish were caught
- Record your fishing experience, including the fish caught with each bait, in your *Fishing Journal*.
- Write a thank you note to the pond owner. Offer to share your catch with him or her.

ACTIVITY 1: Background Materials

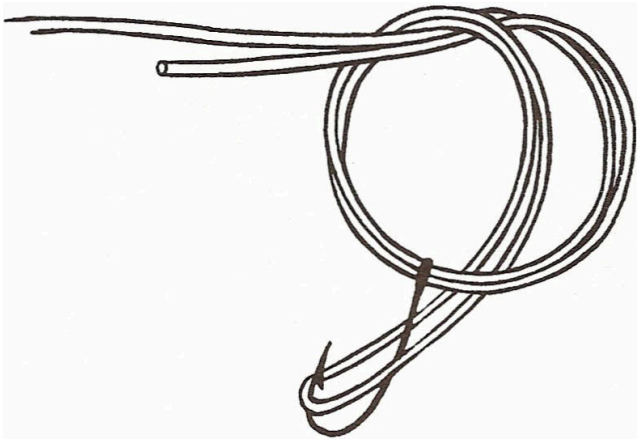
Tying a Palomar Knot



1. Double about 4 inches of line and pass loop through the eye.

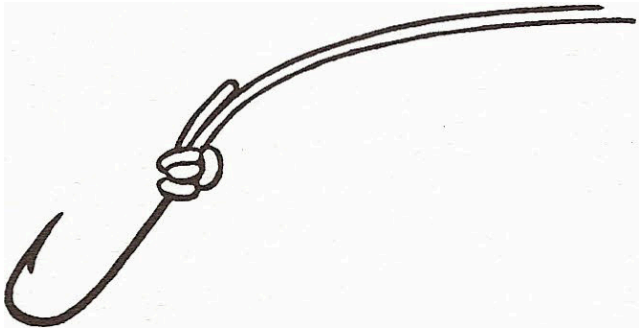


2. Let the hook hang loose and tie in an overhand knot in the double line



3. Pull loop of line far enough to pass over hook, swivel or lure

4. Pull both ends of the line tight. Moisten before fully tightening. Clip off extra line.



SOURCE

Aquatic Resources Education Curriculum
by C. Boyd Pfeiffer and Mark Sosin,
AFTMA Sportfishing Education Foundation

ACTIVITY 1: Background Materials

Measuring Water Temperature

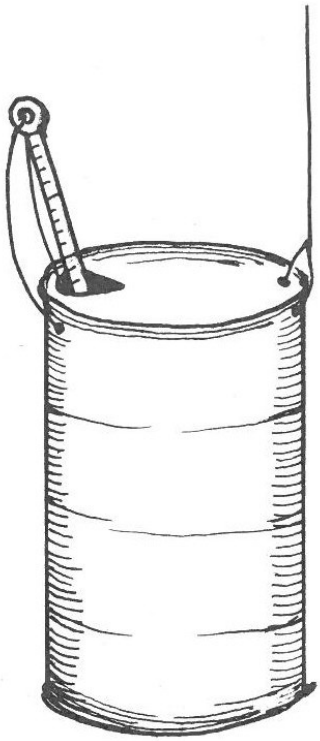
Introduction

You can measure water temperature easily in shallow water or at the surface using a weather thermometer tied to a string. However, water temperature in deep water generally differs from that of surface water. Therefore, it will be fun to measure the temperature of deep water and compare it to the temperature of shallower water. To take water temperature at a depth, you will need to make a weighted thermometer.

Materials & Equipment

- Empty soda can
- Sand or pebbles
- Short piece of wire or string (10 inches [25 cm])
- Laboratory thermometer with an open loop at one end (must be able to read temperatures as low as 32°F [0°C])
- Can opener
- Long piece of sturdy string (length depends on the depth to which you plan to sample)
- Waterproof markers, 2 different colors
- Tape measure or yardstick

Building the Weighted Thermometer



1. Put some sand or pebbles into the empty soda can so it will sink.
2. Make a hole on side of can near the hole where the can was originally opened.
3. Pass the short piece of string or wire through the loop of the thermometer.
4. Place the thermometer in the can and tie or wire it securely to the can by passing the short piece of string or wire through the holes.
5. Make two small holes in the can with the can opener. One hole should be on the top opposite the thermometer. The other hole should be just below that hole, on the side of the can.
6. Tie the long string securely to the can through the holes. Starting at the can, mark off the long string every foot (or every 25 cm) with waterproof markers. This will help you to determine the depth at which the temperature is taken.

Using the Weighted Thermometer

1. Lower the weighted thermometer into the water and let it remain there for 5 min.
2. While waiting to bring the weighted thermometer out of the water, one of the club members can record the depth at which the temperature is being taken.
3. Bring the can to the surface quickly and read the thermometer. Make sure the tip of the thermometer remains in the water in the can.
4. Record the temperature of the water on your Measuring the Physical Environment Activity Record Sheet.
5. Take the water temperature at several different depths and places in the water, and record the temperatures on your Activity Record Sheet.

ACTIVITY RECORD SHEET: Activity 1, Fishing FUNdamentals

Water Temperature & Depth

Start by measuring the depth and temperature on the pond's bottom. Work you way toward the surface, measuring the depth and temperature at regular distances.

WATER DEPTH (ft or m)	WATER TEMPERATURE (°F or °C)	
_____	_____	**Pond Bottom**
_____	_____	
_____	_____	
_____	_____	
_____	_____	
_____	_____	
_____	_____	**Pond Surface**

Will some or all of these temperatures change if they are taken at different times of the year?

How might your knowing about water temperature help you catch fish?

ACTIVITY RECORD SHEET: Activity 1, Fishing FUNdamentals

Pond Mapping

1. Draw an outline of the pond in the box below. Note all the features, including springs, inlets and outlets, swampy areas, docks, dams, overhanging trees, plants and branches in the water or boulders.

2. After you complete your temperature and depth survey, mark on your map where you measured the temperatures and their depths.

3. Plot on the map where each fish is caught. If more than one species is taken, assign a code to the species (LB– largemouth bass, SF=sunfish, etc.)

4. Look for patterns. Are more fish caught in certain areas?
Do temperature and depth appear to make a difference? In what ways?

5. Make a large map for the entire group. Plot all fish that were caught on it. Do this each time the group fishes this pond and compare with previ-ous trips. Do the best locations for catching fish change from season to season?

NOTES

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NEW YORK STATE 4-H

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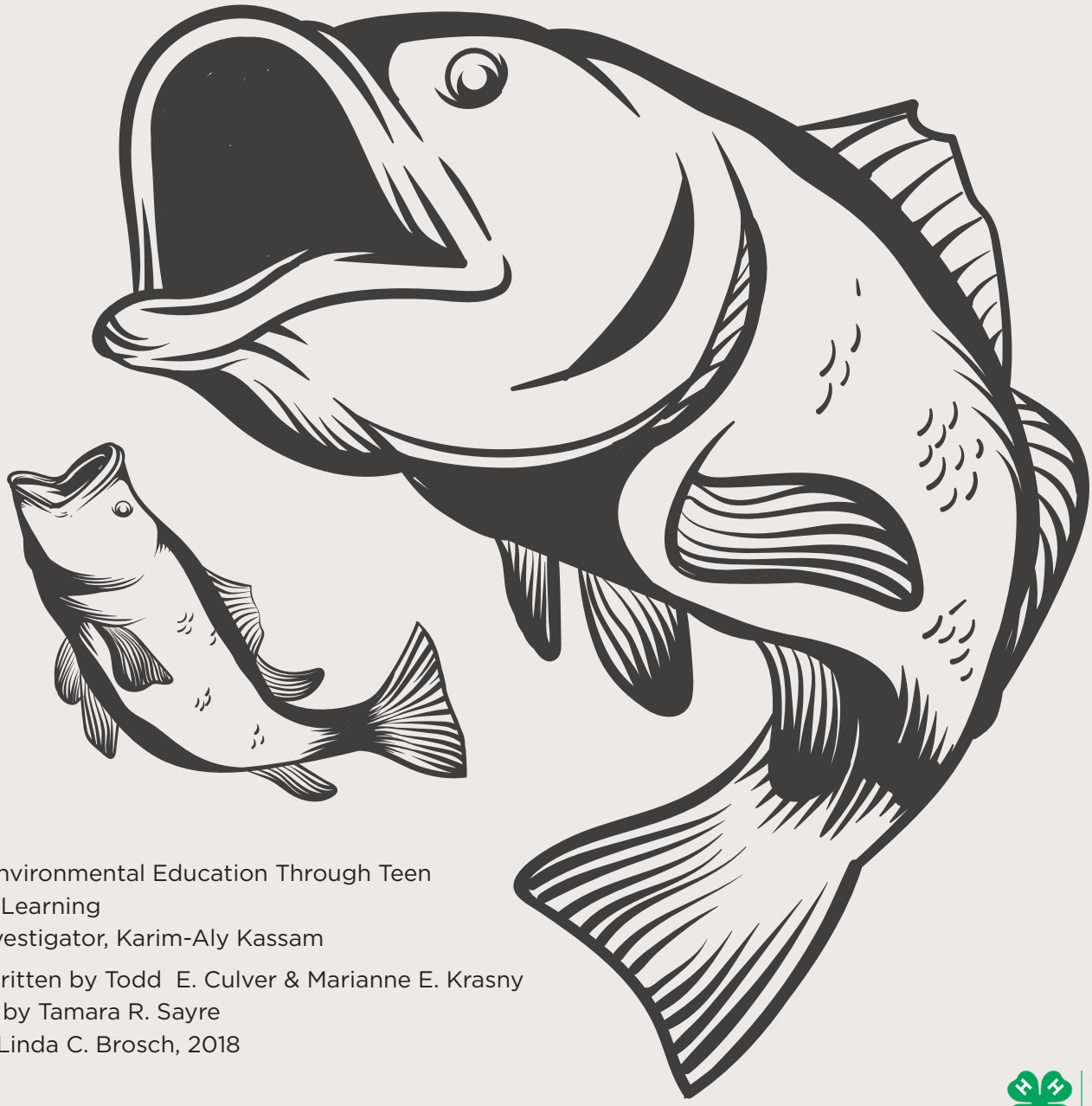
New York State 4-H
SPORT FISHING PROJECT

Fishing Warmwater Ponds

Activity 2

Leader Guide

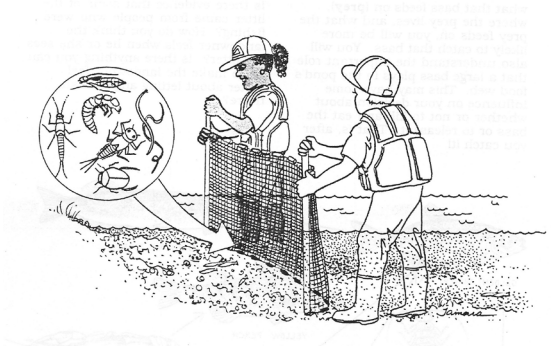


Engaging Environmental Education Through Teen Experiental Learning
Principal Investigator, Karim-Aly Kassam

Originally written by Todd E. Culver & Marianne E. Krasny
Illustrations by Tamara R. Sayre
Revised by Linda C. Brosch, 2018

Cornell University Cooperative Extension

NEW YORK STATE 4-H



Revised by Linda Brosch, Oswego County Cooperative Extension, 2018

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Designed, edited and produced by Karen L. Edelstein and Roslyn E. Scheib
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— Lucinda A. Noble, Director

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PREFACE

Ethic of Stewardship through Environmental Education

To whom much is given, much is expected! It is with this outlook; young people are asked to engage in both the learning objectives and activities of environmental education. This curriculum for ***Fishing Warmwater Ponds*** opens a window of curiosity and wonder into the habitat for the 4-H youth.

We do not exist outside of "nature" because it is all around us and we, ourselves, are fundamentally "natural"! We breathe, feed, live, reproduce, and die like other beings. In other words, the habitat consists of communities of living beings all around us. The word 'animal' derived from the Latin root animus meaning that which is endowed with will, spirit, or mind carries with it the understanding that we are part a larger community of beings. The world around us is animate, a source of deep wonder through observation and reflection, and through direct engagement with it, the basis of boundless insight. By mindfully participating in our habitat, we learn as much about it as we do about each other and ourselves.

The Greek word oikos, "household," is the root of the prefix 'eco' in both ecology and economics. In the twenty-first century, we grasp the complex connectivity of geophysical, biological and sociocultural systems, in which the planet is truly our oikos: it is the dwelling place of humanity. However, to understand it, we must begin locally with our habitat, our home.

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These objectives, while distinct, are not mutually exclusive because they work in tandem to achieve environmental education among youth. For instance, appreciation of ones habitat occurs only when a young person acquires knowledge about it. This knowledge creates wonder and curiosity that act to widen a youth's perception and understanding of their natural environment – to create a wider sense of community. Furthermore, knowledge is firmly grounded among the youth through guided experiential learning by undertaking activities outside. Book learning is not sufficient, as it must be accompanied by direct experience. This engagement, in turn, creates appreciation. Only when one appreciates, does a young person develop a sense of responsibility to care for ones habitat. At its core, this process creates informed and committed youth to environmental stewardship.

Responsibility for ones habitat is at the core of the ethic of stewardship. The word 'steward' combines the two active roles: of being 'in charge' on the one hand; and 'to serve' on the other. Humanity and by extension the 4-H youth are both 'guardians of' and 'servants to' life on this planet. Both ideas are commensurate, equally relevant, neither can be compromised. For 4-H youth, this means inculcating through this curriculum the value of responsibility by demonstrating how a human being is simultaneously in charge of their habitat and by knowledgeable action serves its wellbeing. The specific activities should engender a sense of mutual relationship where the youth benefits from and conserves their habitat.

A human ecological perspective informed by the ethic of stewardship is not only desirable, rather it is a necessary value in the twenty-first century. As a result of engaging (Place the name of the specific curriculum here), over the lifetime of the 4-H youth we should expect:

- An expanded ethic of stewardship encompassing all lands and waters whether they are urban or rural;
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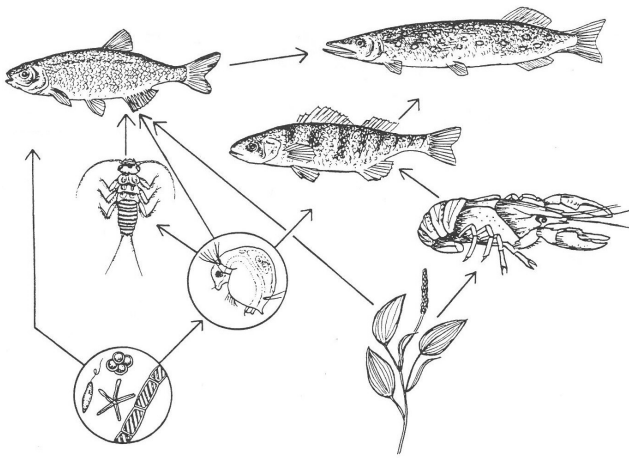
In short, it is important that the 4-H youth understands that: once you know about ***Fishing Warmwater Ponds***, you become responsible for your habitat!

Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

INTRODUCTION

One of the best New York State 4-H Sport Fishing Project experiences is to go fishing for panfish: bluegills, pumpkinseeds, yellow perch, crappie, bullhead and the like. As in the *Fishing FUNdamentals* activity, this trip takes the new anglers out to the pond or small lake. But this time the basic lessons of tying knots, casting, and pan dressing fish are mastered. In addition, the youth are beginning to relate their fishing experiences to the ecology of the pond, in particular, the food chains and food web present in the water. If this fishing trip is conducted in the spring, individuals may be able to observe some interesting spawning behaviors.



New York State P-12 Science Learning Standards*

K-LS1-1, K-ESS3-1
2-LS2-2, 2-LS4-1
MS-LS2-1, MS-LS2-2

*Effective July 1, 2017

Objectives

Angling Skills

Youth will:

- Increase their casting skills and confidence using spin casting or spinning equipment.
- Be able to tie a Palomer and improved cinched knots.
- Learn to use several types of live bait to catch panfish.

Fish Biology & Ecology

Youth will:

- Observe the spawning behavior of warmwater fish.
- Be able to relate the concepts of food chains and food webs to a fishing experience.

Handling Fish

Youth will:

- Be able to pan dress a fish.

Aquatic Sampling

Youth will:

- Build a seine net to sample aquatic animals and plants in pond habitats.
- Learn to use a seine net properly.

Safety

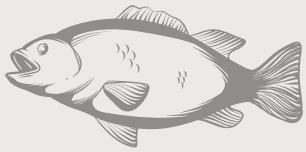
Youth will:

- Demonstrate safe knife handling.

Environmental Stewardship

Youth will:

- Show respect for the landowner's property rights, other resource users, and the environment while demonstrating responsible fishing behavior



MATERIALS AND EQUIPMENT

Pre-Trip Meeting

- *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app
- *New York State Fishing Regulations Guide*
- Pencil for each member
- One 4-foot section of nylon cord and an eye-bolt for each member

Siene Net

- Piece of fiberglass netting or screening, 2 feet (60 cm) tall and 4 to 6 feet (1.2-2 m) wide
- Two sturdy sticks or wooden poles about 30 inches (75 cm) long
- Staple gun or string
- Four 1-ounce (30 gram) clamp-on sinkers for each 2 feet (60 cm) of netting (a 4-foot [1.2 m] net requires 16 sinkers, a 6-foot [1.8 m] net requires 24)
- Lemon floats (from pool supply store) 1 for every 3 feet (1 m) of netting

Fishing Trip

- *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app
- *New York State Fishing Regulations Guide*
- One 4-foot (1.2 m) piece of clothesline and an eye-bolt for each member
- One spin casting or bamboo pole for each youth with a 4-8 lb (1.8-3.6 kg) test monofilament line
- Worms, grubs, small insects, very small minnows, or crayfish
- Small (#6 to #8) snelled hooks, enough for everyone to use 3 or 4 “rigs”
- Small pinch-on lead sinkers, enough for everyone to use 3 or 4 “rigs”
- Small floats or bobbers, enough for everyone to use 3 or 4 “rigs”
- Needle-nosed pliers or hook remover
- Stringers or buckets, if you plan to keep some of the fish
- Measuring board or tape
- Cutting board
- Fillet knife with sheath
- Garbage bags
- Ice and cooler, if you plan to keep some fish
- Camera (optional)
- Seine net, no longer than 36 square feet (6 feet x 6 feet, or 1.8 meters x 1.8 meters)
- Old clothes, non-slip footwear that ties onto the feet, water shoes or waders for each person who will be using the seine net
- Personal floatation devices for seine net users
- Small aquarium dip nets
- Scale for weighing litter
- White or light colored containers or buckets
- Guide to New York’s Common Aquatic Organisms and other field guides or keys
- First aid kit (including emergency telephone numbers)
- Permission slip

Website Resources for Fish Identification

NYS DEC Fish:
http://www.dec.ny.gov/animals/269.html
Inland Fishes of New York Directory by Cornell University:
http://www2.dnr.cornell.edu/cek7/nyfish/index.html

WHAT TO DO

This New York State 4-H Sport Fishing Project activity should be divided in two: a pre-trip meeting followed by a fishing trip. It works well to have a pre-trip meeting on a weekday evening and the fishing trip on the weekend. The pre-trip meeting allows the instructor to teach and to prepare the youth for the fishing experience without a lot of distractions. During the meeting, the youth will also build a seine net which they can use to explore the aquatic environment during the fishing trip. Once out in the field, the youth can put what they have learned to use and concentrate on the fishing and sampling activities.

Keep this activity fun. Now that the you had an introduction to fishing in Fishing FUNdamentals, the instructor can start to teach more involved fishing techniques. By the end of this activity, the participants should have enough angling skills to fish by themselves. It is also time that youth learn more than just how to fish. Learning how to pan dress fish and about food chains and food webs in central to this activity.

Because youth will be handling knives in this activity, it is strongly recommended that at least one other adult volunteer be present to assist and supervise. This is the perfect opportunity to involve some parents, sport fishermen, limnologists, fishery biologists, or other natural resource professionals. Be sure to choose a suitable site, and, if the water is on private land, gain permission from the landowner before planning the fishing trip. Also check New York State Fishing Regulations Guide for restrictions on netting minnow for bait. Call the local NYS DEC Environmental Conservation Officer (ECO) and inform him or her about what the group will be doing. Under law, it is illegal to collect and kill gamefish. Checking with the ECO before the activity will avoid any problems. Keep sanitation and invasive species in mind when visiting warmwater ponds, since inter-pond contamination is a dangerous possibility. Washing off boots and gear with a bleach solution is a sure way to prevent contamination.

Pre-Trip Meeting

1. Introduce the activity by describing where the group will be fishing, including who owns the property and the types of fish the group is likely to catch. Reemphasize the importance of good landowner relations and explain to the group that you obtained permission to fish from the landowner. Explain that they will be fishing for panfish using several types of live bait.

2. If going to a private pond, remind the groups about the importance of respecting the landowner rights. Explain any concerns or rules of the pond owner, including whether the youth can keep the fish that they catch. Be sure the group understand that they are invited guests of the landowner– and might not be invited back if the landowner has any problems. If the group is going to be fishing public waters, explain the rights of other users. The instructor may want to explain how litter lessens the quality of a fishing trip and challenge the youth to pick up any trash and litter they find. Always take along plastic trash bags so the group can “take out more than they took in.” Emphasize that being clean is a way to respect the earth.

3. On any fishing trip, anglers should know the fishing regulations and be able to identify the fish species they’re likely to catch. Have half of the group look up the panfish species they may catch in *Guide to Freshwater Fishes* or New York Fishing, Hunting & Wildlife app, and the other half look up the regulations regarding those species in the *New York State Fishing Regulations Guide*.

4. Have the youth who looked up the regulations share what they find out about the size restrictions, length limits, and daily limits for the species they may catch. Have those who looked up the fish

species tell the others what to look for to identify these fish. Discuss why there are regulations about size restrictions, thinking about the fish's life cycle and how being a fisherman means being a conservationist.

5. Pass out a section of nylon cord and a small eye-bolt to each participant and have them demonstrate that they can to tie a Palomar knot. Help anyone having problems. Show them how to tie the improved clinch knot using the same cording. Let the youth practice while the instructors check to see if anyone needs help.practice while the leaders check to see if anyone needs help.

6. If the group is unfamiliar with the type of fishing equipment that will be used, demonstrate its proper use. Explain enough about the spin-cast rod and reel so that the youth will feel comfortable using them, but don't get too technical. Explain how to rig the line for this fishing trip including attaching the float, adding a sinker, and hooking the baits that will be used.

7. Introduce the concept of sampling and how biologists learn about aquatic environments by sampling. Remind the youth that knowing the ecology of the waters you fish can make you a better angler.

8. Have the group build the seine net by following the directions. Allow the youth to figure out the steps; provide help only if they have questions.

9. Once the seine net is completed, demonstrate how to use it properly. If the youth will be wearing waders while they sample, review wading safely with them.

10. Before the group leaves, be sure they know when and where to meet and what to bring for the fishing trip. Remind everyone to bring his or her permission slip. Discuss any other items people need to bring on the trip such as clothing, proper footwear, insect repellent, sunscreen, hat, fishing equipment, water, and lunch.

Fishing Trip

1. Remind the group about safety precautions and responsible angling behavior.

2. Explain that the most effective live bait is an organism the fish eat in their pond. Show the group a variety of food items that will be used for bait such as worms, grubs, grasshoppers, insects, crickets, or very small minnows. Have the youth try a variety of bait. Challenge them to find out which bait is most effective. This information should be recorded in their Fishing Journals.

3. Help the novice anglers get their lines rigged and in the water. If they do not already know, show them how to grasp a fish without injuring it or getting "spined," how to remove the hook, release the fish without injury, keep fish alive once caught, and how dead fish should be stored prior to cleaning.

4. If the fishing trip is in the early spring while the fish are spawning, the instructor will have a unique opportunity to teach the group about spawning behavior. If nests are discovered in the lake or pond, point them out to the entire group. Many fish species such as sunfish, bass and bullheads, aggressively defend their nest. Casting practically anywhere near an active nest will produce immediate strikes.

5. Once the youth have caught some fish, the instructor can teach how to pan dress the catch.

6. Prior to issuing knives to youth, instruct safe knife use. Emphasize that knives are angler's tools, not toys. In order to clean fish quickly, easily, and safely, knives must be kept sharp. Demonstrate the proper techniques for touching up the edge of your fillet knife, explaining what you are doing as you go. All knives used by the youth should be kept sharp, covered with a sheath when not in use, and used in an appropriate working space with extreme caution under adult supervision.

7. Demonstrate how to pan dress a fish and explain when it is appropriate to do so. While cleaning the fish, identify the fish's stomach, then remove it and set it aside. The stomachs will be used later in the activity to teach the youth about food chains.

8. Divide the groups into smaller pairings. Give each subgroup a cutting board, some newspapers,

a sharp fillet knife, garbage bag, pliers (if cleaning catfish or bullheads), and 2 or more fish. Have the youth take turns cleaning the fish. Ensure that the youth are using their knives correctly. Assist those that need help. Have the youth save the fishes' stomachs.

9. Once the fish are cleaned, show the group how to pack the dressed fish on ice. Then have the group pack their own fish.

10. Have the youth slit open the stomachs they have set aside and try to identify what the fish have been feeding on.

Fishing Trip Wrap-Up

1. Have the youth complete the Activity 2: Food Chains and Food Webs Activity Record Sheet by following the steps outlined below.

2. As the group identifies the food items the fish feed on from dissecting the stomachs, have them write the food items below the panfish on their diagrams (Figure 1).

3. Ask the youth "What animals might eat panfish?" and have them add their answers on the diagram around the name of their fish. The diagram shows that energy and nutrients from food are transferred from prey to predator (Figure 2).

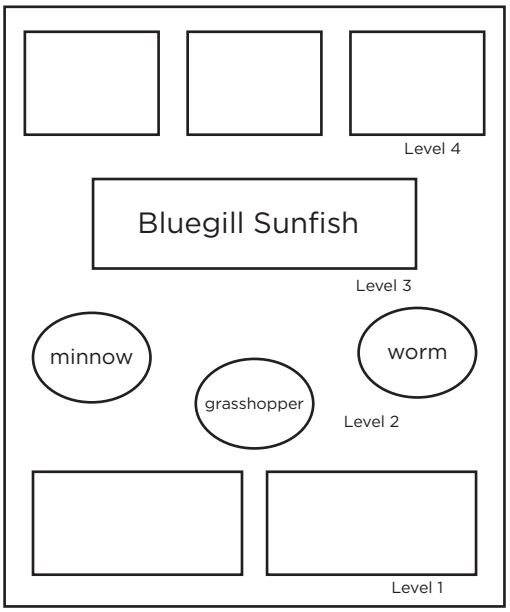


FIGURE 1

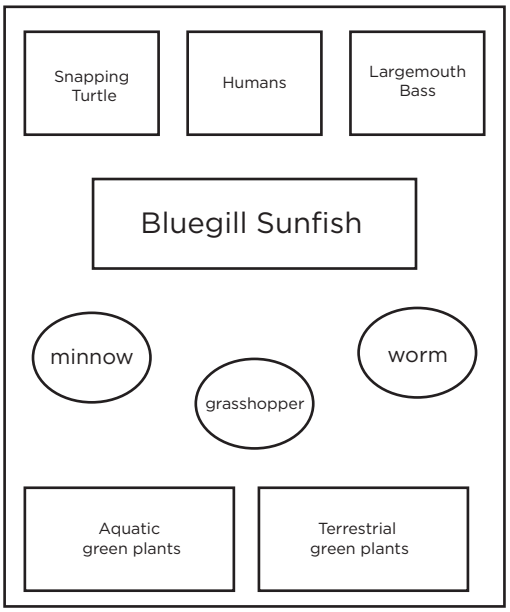


FIGURE 2

4. Have the youth label the diagram: Food Web of " name of pond where fish was caught," and explain that the actual food web is probably much more complex.

5. Try to identify other members of their food webs by sampling the pond using the seine net.

6. Select an area to seine. Avoid areas with deep, fast-moving, or dangerous currents and with a mucky or muddy bottom. A pool with a sand or gravel bottom and aquatic vegetation is an ideal place to seine. Two people wearing personal flotation devices (PFDs), proper clothing, and appropriate footwear can wade into the water and operate the seine.

7. To use the seine net, hold the two poles apart and upright so the net is open but not tightly stretched. With the poles upright, drag the seine through the water; be careful to keep the weighted edge of the net on the bottom so animals cannot escape underneath the seine. Walk the net back to the water's edge and lift the net and its catch out of the water. Transfer the catch to a container of water for observation.

8. The group can take turns working the seine through several areas.

9. Using the *Guide to Freshwater Fishes of New York or* New York Fishing, Hunting & Wildlife app, and other appropriate field guides and keys, the youth can identify what was caught.

10. Add these organisms to the food chain diagram.

11. If there are other kinds of aquatic habitats nearby try sampling them. Are there differences in the types of aquatic organisms caught in these different habitats?

12. Ask the group how the information in the diagram and the concept of food chain is useful to the angler. Where does the angler fit into the food chain?

13. When the youth have finished fishing and seining, have them estimate the amount of trash left along a 100-yard section shoreline.

14. Using the measuring tape or the rope from the depth gauge, have each individual figure out his or her pace. A pace is the distance of a normal stride measured from the right foot to the right foot (or left foot to left foot) on level ground.

15. Have the youth pace off a 100 yard section of the shoreline. The group will pick up all the litter along the sample section of the shore line. If possible, separate the trash that may have been left by anglers from trash left by other users. Weigh each separately and record the results on the Activity 2: Things Others Left Behind Activity Record Sheet.

ACTIVITY 2: Background Materials

Pan Dressing

Pan dressing is the technique most often used when cleaning small fish such as bluegills, catfish, butterfish, and scup. Pan dressing is very similar to field dressing. However, pan dressed fish also have their scales, fins, and heads removed.

To scale a fish, hold it by the tail and scrape the scales from its body using a scaler or knife blade. Short strokes from the tail toward the head work best. To remove the dorsal and anal fins, make 1/2 to 3/4 inch (1.3 to 3 cm) deep cuts along each side of the fin, and then use pliers to pull the fin out in a tail to head motion. The head, pectoral, and pelvic fins can be removed by cutting behind the pectoral fins and across the back. Break the spine behind the head and cut the head, fins, and entrails free from the rest of the body. The tail can also be removed if desired. The remaining fish contains all of the edible meat, as well as the backbone and ribs.

Some fish, such as catfish, do not have scales and therefore must be skinned rather than scaled. This is done by cutting the skin, but not the flesh, entirely around the head. Holding the head securely in place with a clamp or spike on the cleaning board, grasp the skin along the cut with pliers and peel it back along the length of the of the fish. Remove the heads, fins, entrails, and tail as described above.

ACTIVITY 2: Background Materials

Seine Netting

Introduction

Large seine nets have been used in commercial fishing for centuries. Smaller versions are often used by fisheries biologists to sample young gamefish, minnows, and aquatic insects. Seine nets under 36 square feet are legal for catching minnows in "non-trout" waters. Small seine nets can be safely handled by two people, are easy to build, and fun to use, especially on a hot summer day.

Materials & Equipment

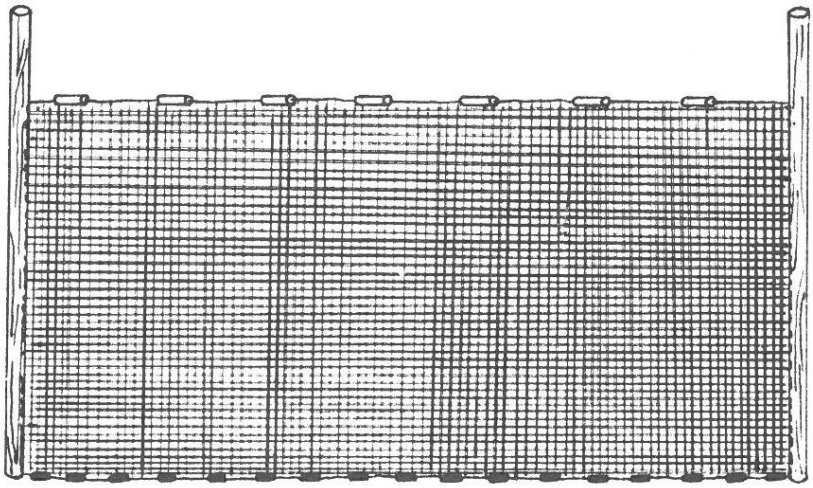
- Piece of cloth or fiberglass netting or screening, 2 feet (60 cm) tall and 4-6 feet (1.2-2 m) wide
- 2 sturdy sticks or wooden poles, about 30 inches (75 cm) long
- Staple gun or string
- Four 1-ounce (30 grams) clamp-on type sinkers for each 2 feet (60 cm) of netting (a 4 foot [1.2 m] net requires 16 sinkers, a 6 foot [1.8 m] net requires 24)
- Lemon floats (from pool supply store) 1 for every 3 feet (1 m) of netting

Building the Seine Net

1. Connect opposite ends of the netting to each pole with staples or string. Make sure bottom of the netting is even with the bottom of the poles.
2. Attach the weights a few inches apart along the netting bottom.
3. Attach the floats to the top of the net to keep it from collapsing in the water.

Using the Seine Net

1. Select an area to seine. Avoid areas with deep, fast-moving, or dangerous currents and with a mucky or muddy bottom. A pool with a sand or gravel bottom and aquatic vegetation is an ideal place to seine. Two people wearing personal flotation devices (PFDs), proper clothing, and appropriate footwear can wade into the water and operate the seine.
2. To use the seine net, hold the 2 poles apart and upright so the net is open but not tightly stretched. With the poles upright, drag the seine net through the water. Be careful to keep the weighted edge of the net on the bottom so animals can not escape underneath the seine net. Walk the net back to the water's edge and lift the net and your catch out of the water. Transfer the catch to a container of water for observation.
3. Take turns, working the seine net through several likely areas.
4. Using the identification resources, identify what you caught.
5. Try sampling a different area, such as a shallow riffle, with the seine net. Are there differences in what you catch in these areas?



NOTES

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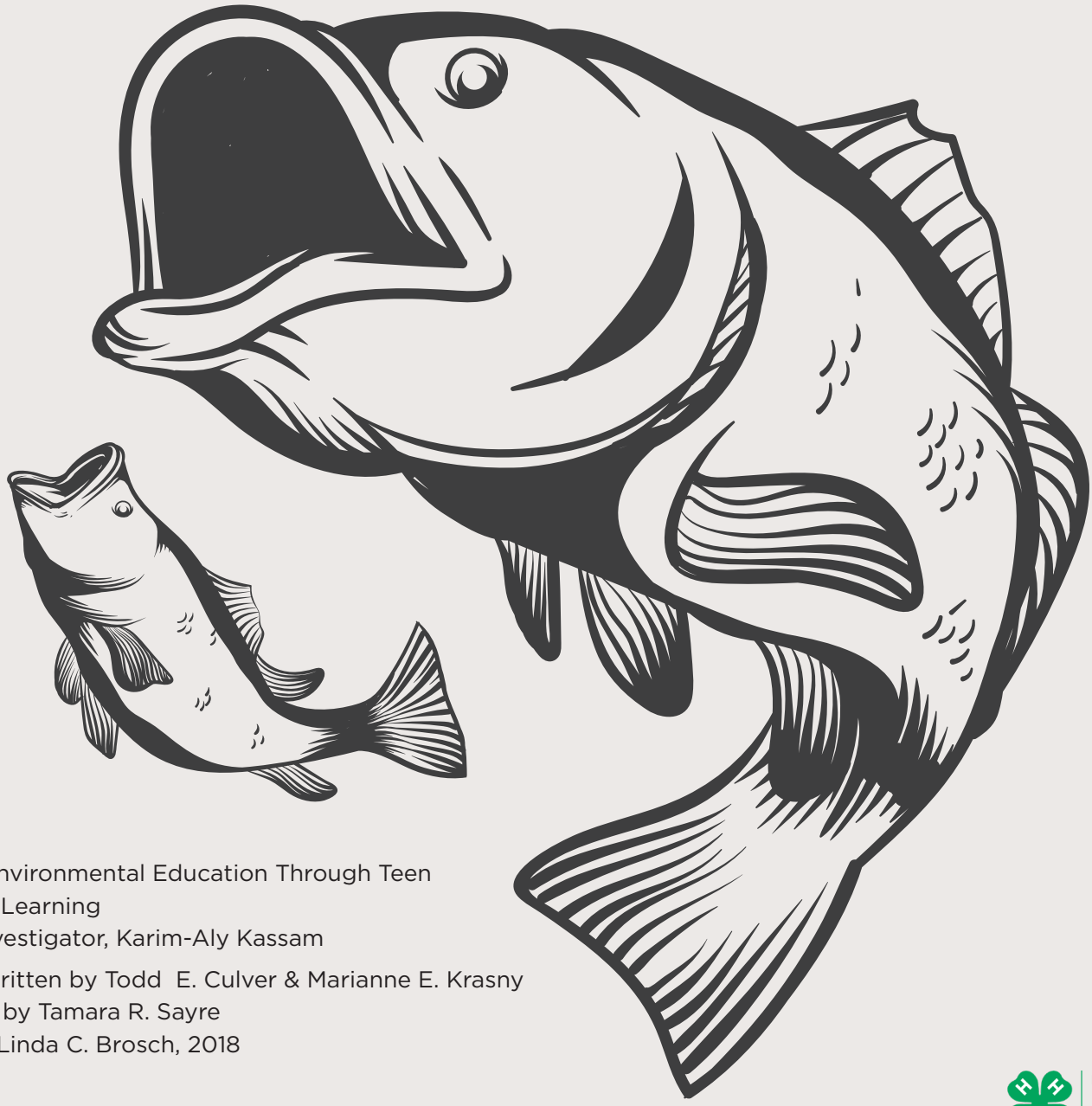
New York State 4-H

SPORT FISHING PROJECT

Fishing Warmwater Ponds

Activity 2

Member Guide



Engaging Environmental Education Through Teen Experiental Learning
Principal Investigator, Karim-Aly Kassam

Originally written by Todd E. Culver & Marianne E. Krasny
Illustrations by Tamara R. Sayre
Revised by Linda C. Brosch, 2018

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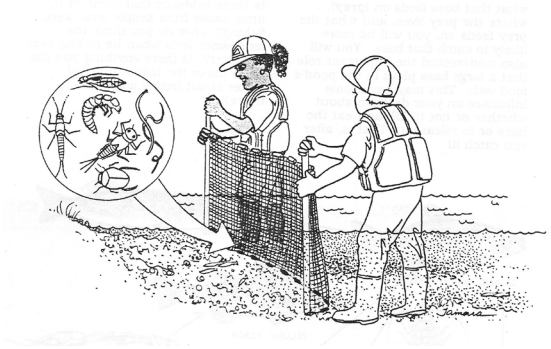
NEW YORK STATE 4-H



Revised by Linda Brosch, Oswego County Cooperative Extension, 2018

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Written by Todd A. Culver and Marianne Krasny
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— Lucinda A. Noble, Director

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PREFACE

Ethic of Stewardship through Environmental Education

To whom much is given, much is expected! It is with this outlook; young people are asked to engage in both the learning objectives and activities of environmental education. This curriculum for ***Fishing Warmwater Ponds*** opens a window of curiosity and wonder into the habitat for the 4-H youth.

We do not exist outside of "nature" because it is all around us and we, ourselves, are fundamentally "natural"! We breathe, feed, live, reproduce, and die like other beings. In other words, the habitat consists of communities of living beings all around us. The word 'animal' derived from the Latin root animus meaning that which is endowed with will, spirit, or mind carries with it the understanding that we are part a larger community of beings. The world around us is animate, a source of deep wonder through observation and reflection, and through direct engagement with it, the basis of boundless insight. By mindfully participating in our habitat, we learn as much about it as we do about each other and ourselves.

The Greek word oikos, "household," is the root of the prefix 'eco' in both ecology and economics. In the twenty-first century, we grasp the complex connectivity of geophysical, biological and sociocultural systems, in which the planet is truly our oikos: it is the dwelling place of humanity. However, to understand it, we must begin locally with our habitat, our home.

The objectives of this revised and updated curriculum for the 4-H youth are:

- to generate an appreciation for their natural habitat;
- to provide knowledge about specific aspects of that habitat;
- to directly engage the habitat through guided activity; and
- to develop an ethic of stewardship through responsibility, recognizing that one's community includes the living habitat.

These objectives, while distinct, are not mutually exclusive because they work in tandem to achieve environmental education among youth. For instance, appreciation of ones habitat occurs only when a young person acquires knowledge about it. This knowledge creates wonder and curiosity that act to widen a youth's perception and understanding of their natural environment – to create a wider sense of community. Furthermore, knowledge is firmly grounded among the youth through guided experiential learning by undertaking activities outside. Book learning is not sufficient, as it must be accompanied by direct experience. This engagement, in turn, creates appreciation. Only when one appreciates, does a young person develop a sense of responsibility to care for ones habitat. At its core, this process creates informed and committed youth to environmental stewardship.

Responsibility for ones habitat is at the core of the ethic of stewardship. The word 'steward' combines the two active roles: of being 'in charge' on the one hand; and 'to serve' on the other. Humanity and by extension the 4-H youth are both 'guardians of' and 'servants to' life on this planet. Both ideas are commensurate, equally relevant, neither can be compromised. For 4-H youth, this means inculcating through this curriculum the value of responsibility by demonstrating how a human being is simultaneously in charge of their habitat and by knowledgeable action serves its wellbeing. The specific activities should engender a sense of mutual relationship where the youth benefits from and conserves their habitat.

A human ecological perspective informed by the ethic of stewardship is not only desirable, rather it is a necessary value in the twenty-first century. As a result of engaging (Place the name of the specific curriculum here), over the lifetime of the 4-H youth we should expect:

- An expanded ethic of stewardship encompassing all lands and waters whether they are urban or rural;
- A desire to work collaboratively with employers and employees, educators, artists, clergy and laypeople, young and old alike – to achieve a future that is sustainable;
- An understanding that economic and ecological matters relating to their habitat or home (oikos) are not unrelated, but are profoundly interconnected;
- Valuing of local place-based and indigenous knowledge about landscapes and natural resources; and
- An embrace of the ethic of stewardship throughout their adult life.

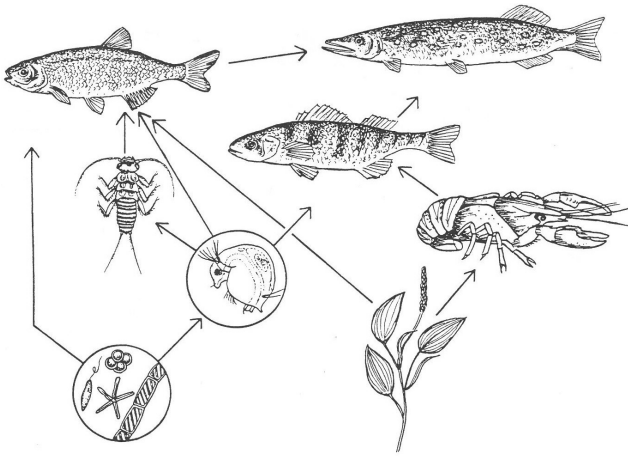
In short, it is important that the 4-H youth understands that: once you know about ***Fishing Warmwater Ponds***, you become responsible for your habitat!

Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

INTRODUCTION

Most first-time anglers need a trip or two just to get the hang of things. If you spent more time during your first fishing trip untangling, unhooking, untying, and unsnagging than you did fishing you are not alone! So, for this activity, you are going fishing again, perhaps to the same spot or a similar one nearby. This will be another chance for your leaders to help you get those knots and rigs straightened out and practice those important casting skills.

Remember how important it is to be a detective with the fish you are trying to catch? In warmwater ponds you are going to look for clues by exploring food chains and food webs. First you will build and use a seine net. Then you will use the seine net to sample the pond or lake to see what kinds of plants or animals (such as insects) live there. You will see if there are different kinds of plants and animals in different locations in the pond. You will figure out some relationships between these plants, animals, and the fish you are trying to catch. You can be sure that they depend on each other for something.



An understanding of how plants, small animals, and fish depend on each other is part of a science known as ecology. As an angler, you are most interested in how this affects those big bass you are after! When you find clues about what bass feeds on (their prey), where the prey lives, and what the prey feeds on you will be more likely to catch that bass. You will also understand the important role that a large bass plays in the pond's food web. This may have some influence on your decision about whether or not to kill and eat the bass or to release it — that is, after you catch it!

While fishing warmwater ponds, look around for evidence that other people have used the area. Is there litter? What does the litter tell you about what the people were doing? Is there evidence that some of the litter came from people who were fishing? How do you think the landowner feels when he or she sees the litter? Is there anything you can do to make the landowner feel better about letting anglers fish there?

Successful anglers also respect the environment. They practice environmental stewardship, which is the responsible use and protection of the environment through conservation and sustainable practices both at home and while fishing. It is with the help of such caring and mindful practices that fish population will continue to thrive and grow.

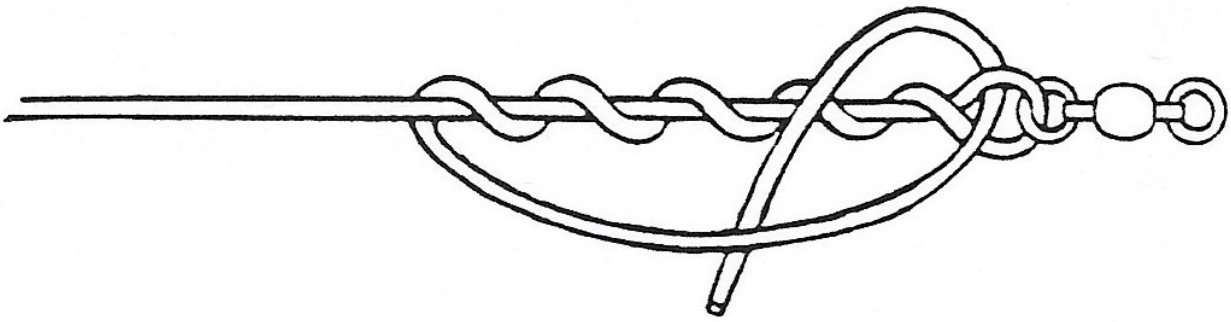
In your Fishing Warmwater Ponds activity, you will:

- Learn to tie an improved clinch knot.
- Build a seine net.
- Use the seine net to sample different areas of the pond for plants and small animals. Use care when seining any plants or animals. Some may be rare. Return them to the pond when you are done.
- Complete the Things Others Left Behind Activity Record Sheet.
- Complete the Food Chains and Food Webs Activity Record Sheet.
- Record your fishing experience, including drawing of the small animal you caught in the seine net in your Fishing Journal.
- Write a thank you note to the pond owner.

ACTIVITY 2: Background Materials

Tying an Improved Clinch Knot

1. Holding the hook securely, put the end of the line through the eye of the hook.
2. Still holding the hook, twist the free end of the line around the standing end of the line about six to eight times.
3. Put the free end through the loop formed between the eye of the hook and first twist (the one closest to the hook).
4. Bring the free end under the loop just formed by it, between the last twist (furthest from the hook) and the hook eye.



5. Holding the free end of the line and the hook in one hand and the fastened end of the line in the other, pull the knot tight. Clip off the extra line.

SOURCE

Let's Go Fishing

by Ronald Howard and John Kelly CCE Department of Natural Resources

ACTIVITY 2: Background Materials

Seine Netting

Introduction

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4. Using the identification resources, identify what you caught.
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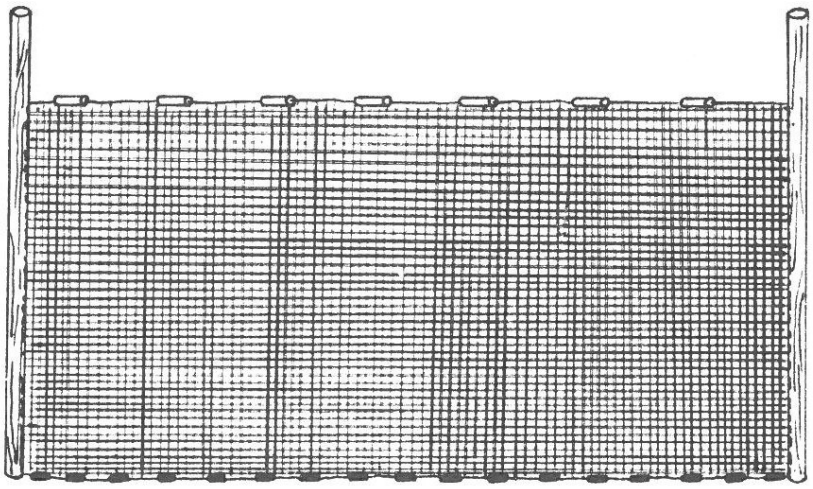


ACTIVITY RECORD SHEET: Activity 2, Fishing Warmwater Ponds

Things Others Left Behind

Determining Your Pace

Mark your point on the ground where your right foot is. Take a step with your left foot and step with your right foot. Mark the point where your right foot is. The distance between the two points is your pace.

Pace= _____ inches

10 yards equals 360 inches. To figure out how many of your paces equals 10 yards., divide 360 by the number of inches in one of your paces. For example, if your pace equals 30 inches, then the number of paves in 10 yards =360/30=12.

How many of your paces equals 10 yards? _____

How many of your paces equals 100 yards? _____

Pace off 100 yards along the shoreline.

What Others Left Behind

Gather all the trash along the shore within the 100 yards you have paced off. Then weigh the trash.

Weight of Trash: _____

What sort of trash did you find?

Which kinds of trash were left by anglers?

Estimate the percent of trash left by anglers: _____

Pace around the pond to estimate the total length of shoreline: _____ yards

Multiply the amount of trash you found in 100 yards by the total length of shoreline to find out the total amount of trash on the entire shore.

_____/ 100 yards x _____ = _____

Weight of trash

Total Yards

Total trash on the shore

ACTIVITY RECORD SHEET: Activity 2, Fishing Warmwater Ponds
Food Chains and Food Webs

Food Chains and Food Webs

Your instructor will help you identify the stomach and other organs of the fish you are examining. Carefully slice open the stomach and look to see what is inside. Empty the stomach contents into a white container with a little water to help separate the contents. Can you identify any of the food this fish has been eating?

If you can identify some of the foods the fish has been eating, then you are on your way to understanding food chains. Food chains show the feeding relationships of all organisms in a system, such as fish, insects, and plants. Green plants are at the bottom of the food chain. Insects are often the next level above green plants.

Animals such as sunfish are the next higher level in the food chain. They are called **predators** because they feed on other animals. The insects, worms, and minnows that the sunfish feed on are called **prey**.

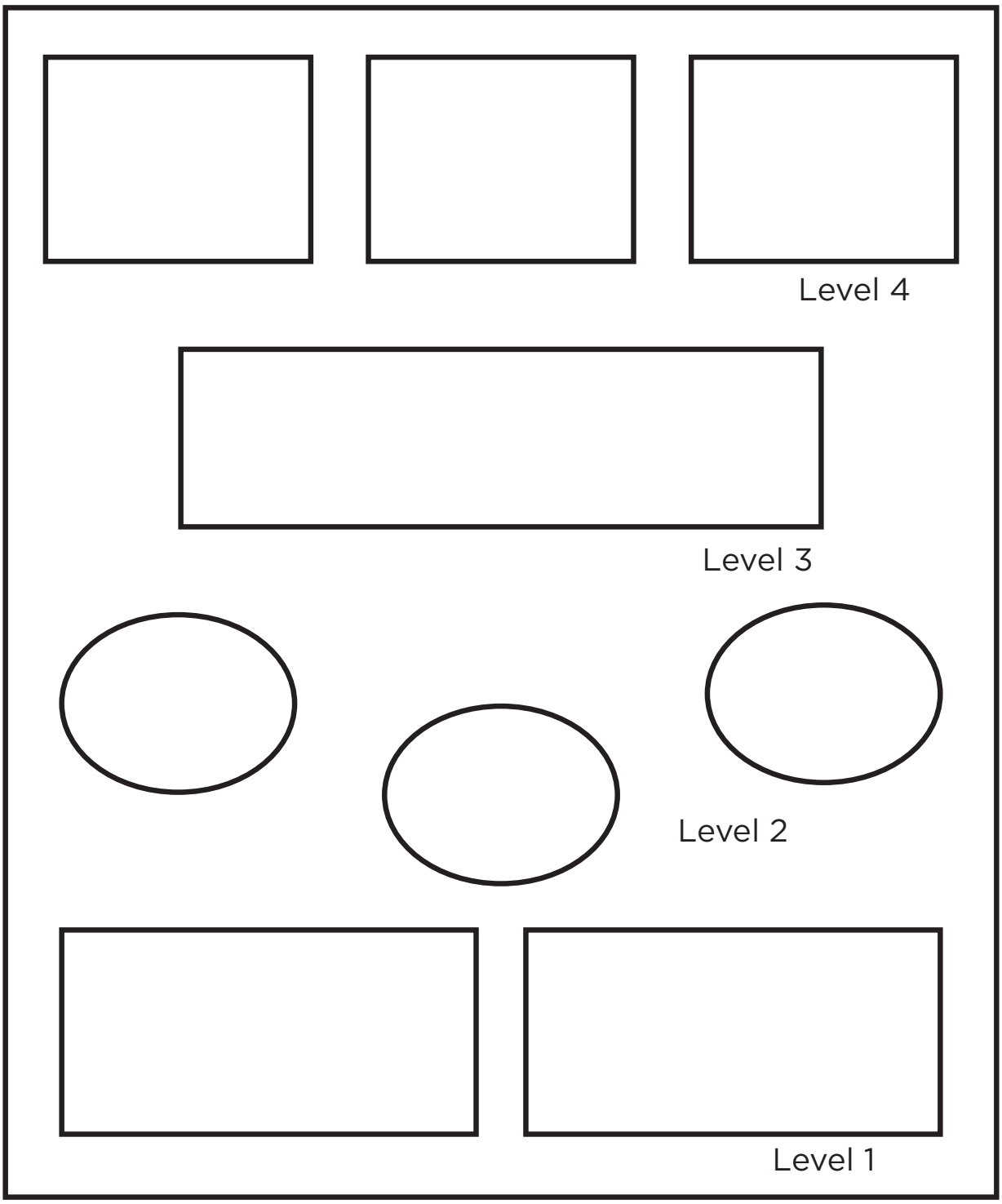
The "Food Chain" Diagram

1. Write the common name of the fish you are examining in the box in the center of the diagram (Level 3).
2. Write the names of the food items you found in the fish's stomach in the circles below the box (Level 2).
3. What do the animals you found in the fish's stomach eat? For example, if you found a minnow in the stomach of your fish you might guess that minnows feed on insects. Write the names of these animals or plants in the boxes of Level 1.
4. Now let's think about what animals might eat the fish in front of you. Write the names of the fish's predators in the boxes on Level 4. These predators might be birds, mammals, reptiles, and/or other fish.
5. Draw arrows connecting the plants and animals that might feed on one another. For example, sunfish may feed on worms so you would draw an arrow from the "worm box" to the "sunfish box." The arrows show that food and energy move from one animal or plant to another animal on the next highest level.
6. Do you have any plants on your diagram? In the food chain, plants are called **producers** because they actually make the food, using energy from the sun in a chemical reactions called photosynthesis. All other animals in the food chain depend on producers to make the food they need to live.
7. Fill in the name of the pond or lake in which you explored the food chain.
8. Make more boxes as you need them.

ACTIVITY RECORD SHEET: Activity 2, Fishing Warmwater Ponds

Food Chains and Food Webs

THE FOOD WEB OF: _____



With all the possible arrows drawn, your diagrams begins to look more like a spider's web than a chain. The idea of a food chain is too simple. In real life, each aquatic animals feeds on several different things and is part of many different food chains. Food webs are many different food chains which are "woven" together. Think about how many different plants and animals you eat every day! You are part of many food webs and so are most fish and other aquatic animals and plants.

How might understanding food chains and food webs help you catch fish?

Are you part of a food web? Which level?

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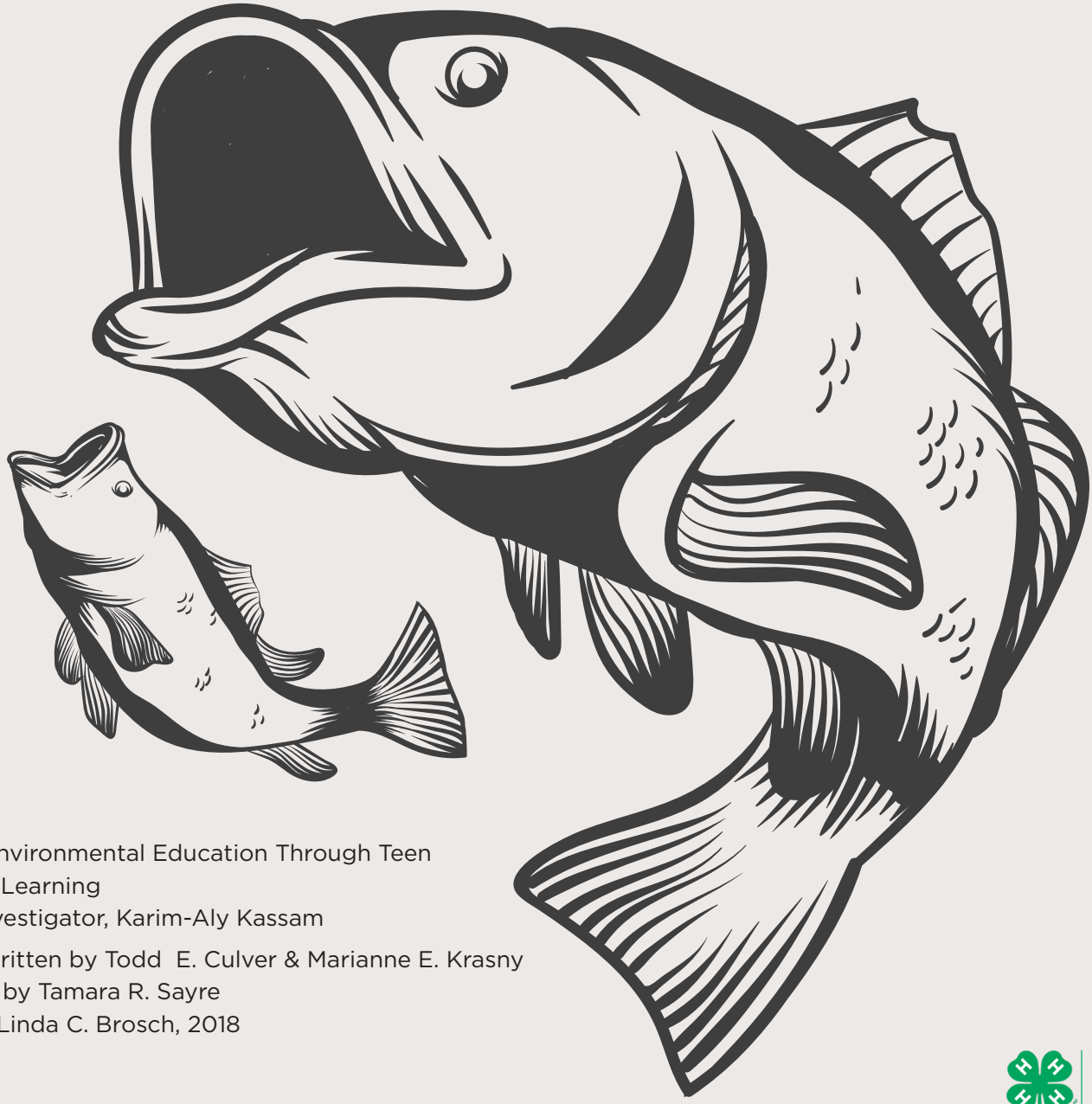
New York State 4-H

SPORT FISHING PROJECT

Fishing Warmwater Lake Habitats

Activity 3

Leader Guide



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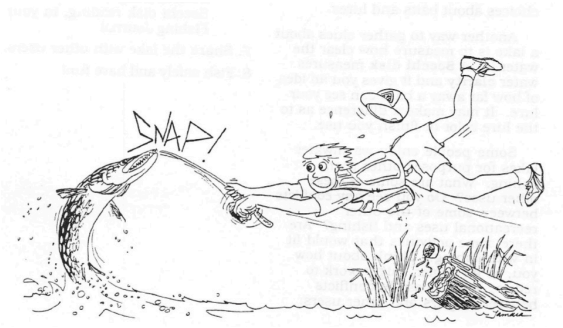
Revised by Linda C. Brosch, 2018

Cornell University Cooperative Extension

NEW YORK STATE 4-H



Revised by Linda Brosch, Oswego County Cooperative Extension, 2018

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— Lucinda A. Noble, Director

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PREFACE

Ethic of Stewardship through Environmental Education

To whom much is given, much is expected! It is with this outlook; young people are asked to engage in both the learning objectives and activities of environmental education. This curriculum for ***Fishing Warmwater Lake Habitats*** opens a window of curiosity and wonder into the habitat for the 4-H youth.

We do not exist outside of "nature" because it is all around us and we, ourselves, are fundamentally "natural"! We breathe, feed, live, reproduce, and die like other beings. In other words, the habitat consists of communities of living beings all around us. The word 'animal' derived from the Latin root animus meaning that which is endowed with will, spirit, or mind carries with it the understanding that we are part a larger community of beings. The world around us is animate, a source of deep wonder through observation and reflection, and through direct engagement with it, the basis of boundless insight. By mindfully participating in our habitat, we learn as much about it as we do about each other and ourselves.

The Greek word oikos, "household," is the root of the prefix 'eco' in both ecology and economics. In the twenty-first century, we grasp the complex connectivity of geophysical, biological and sociocultural systems, in which the planet is truly our oikos: it is the dwelling place of humanity. However, to understand it, we must begin locally with our habitat, our home.

The objectives of this revised and updated curriculum for the 4-H youth are:

- to generate an appreciation for their natural habitat;
- to provide knowledge about specific aspects of that habitat;
- to directly engage the habitat through guided activity; and
- to develop an ethic of stewardship through responsibility, recognizing that one's community includes the living habitat.

These objectives, while distinct, are not mutually exclusive because they work in tandem to achieve environmental education among youth. For instance, appreciation of ones habitat occurs only when a young person acquires knowledge about it. This knowledge creates wonder and curiosity that act to widen a youth's perception and understanding of their natural environment – to create a wider sense of community. Furthermore, knowledge is firmly grounded among the youth through guided experiential learning by undertaking activities outside. Book learning is not sufficient, as it must be accompanied by direct experience. This engagement, in turn, creates appreciation. Only when one appreciates, does a young person develop a sense of responsibility to care for ones habitat. At its core, this process creates informed and committed youth to environmental stewardship.

Responsibility for ones habitat is at the core of the ethic of stewardship. The word 'steward' combines the two active roles: of being 'in charge' on the one hand; and 'to serve' on the other. Humanity and by extension the 4-H youth are both 'guardians of' and 'servants to' life on this planet. Both ideas are commensurate, equally relevant, neither can be compromised. For 4-H youth, this means inculcating through this curriculum the value of responsibility by demonstrating how a human being is simultaneously in charge of their habitat and by knowledgeable action serves its wellbeing. The specific activities should engender a sense of mutual relationship where the youth benefits from and conserves their habitat.

A human ecological perspective informed by the ethic of stewardship is not only desirable, rather it is a necessary value in the twenty-first century. As a result of engaging (Place the name of the specific curriculum here), over the lifetime of the 4-H youth we should expect:

- An expanded ethic of stewardship encompassing all lands and waters whether they are urban or rural;
- A desire to work collaboratively with employers and employees, educators, artists, clergy and laypeople, young and old alike – to achieve a future that is sustainable;
- An understanding that economic and ecological matters relating to their habitat or home (oikos) are not unrelated, but are profoundly interconnected;
- Valuing of local place-based and indigenous knowledge about landscapes and natural resources; and
- An embrace of the ethic of stewardship throughout their adult life.

In short, it is important that the 4-H youth understands that: once you know about ***Fishing Warmwater Lake Habitats***, you become responsible for your habitat!

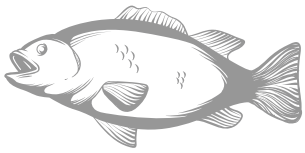
Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

INTRODUCTION

Many of New York's angling opportunities are in shallow warmwater lakes. These lakes provide suitable habitat for some of the state's most popular gamefish, such as largemouth and smallmouth bass, walleyes, chain pickerel, northern pike and muskellunge. Numerous state fishing access points, parks, and forestlands allow anglers to enjoy themselves with their warmwater fisheries.

In this activity, youth move up to fishing for gamefish with spinning tackle and artificial lures. The group members will develop new angling skills while learning about predators and predator-prey interactions. Youth learn to relate aquatic organisms and their behaviors to artificial lures and lure presentations. In addition, they learn to relate parts of the fish's anatomy to its predatory lifestyle, with an emphasis on its feeding behaviors.

Many aquatic organisms make their living at or near the lake bottom. Bottom sampling often yields a wide variety of interesting organisms for observation and study. The simplest type of bottom sampling in still water involves using a rake attached to a net bag to dig up and capture bottom-dwellers. In this activity, youth use a rake bottom sampler they have built themselves to sample some of the aquatic organisms that are prey items for warmwater predators. An angler who is observant of the animals and habitat is better able to select artificial lures and present those lures in a realistic manner to catch more fish.



New York State P-12 Science Learning Standards*

K-LS1-1, K-ESS3-1
2-LS2-2, 2-LS4-1
3-LS2-1, 3-LS4-3
MS-LS2-2, MS-LS2-5, MS-LS4-4, MS-LS4-6

*Effective July 1, 2017

Objectives

Angling Skills

Youth will:

- Learn to use spinning fishing equipment
- Learn to load line onto spinning and spin casting reels.
- Learn how artificial lures imitate prey items of warmwater gamefish.
- Demonstrate skill in setting the hook when a fish strikes an artificial lure.
- Demonstrate skill in playing a fish and using a landing net.

Fish Biology & Ecology

Youth will:

- Understand the characteristics of predatory fish.
- Learn about bottom-dwelling organisms that are prey items for fish.

Handling Fish

Youth will:

- Observe the proper methods of field dressing a fish.
- Become aware of the importance of icing down fish right after caught.

Aquatic Sampling

Youth will:

- Build a rake bottom sampler.
- Learn to sample bottom-dwelling aquatic organisms using a homemade rake bottom sampler.
- Learn to build a Secchi disk
- Learn to measure water clarity using Secchi disk.

Safety

Youth will:

- Learn to increase their personal safety while wading.

Environmental Stewardship

Youth will:

- Learn to share public water resources with non-angling users.

MATERIALS AND EQUIPMENT

Pre-Trip Meeting

- *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app
- *New York State Fishing Regulations Guide*
- Pencil for each member
- 4-foot section of clothesline and an eye-bolt for each participant
- One spinning rod and reel for each participant
- Supply of 4-8 lb (1.8-3.6 kg) test monofilament line
- Bell sinker or casting plug for each member

Rake Bottom Sampler

- Piece of burlap or heavy netting
- Needle and thread
- Metal tines garden rake
- 3 feet (1 m) string or fishing line

Secchi Disk

- Metal or plastic disk, 6-8 inches (15-20 cm) diameter (the top of a paint can or metal pie plate will work)
- Hand drill
- Black and white paint
- Long piece of heavy string or light rope (about 10 feet or 3 m)
- One or more large lead weights (equal to or heavier than 1 ounce [30 grams])
- Stick or wooden dowel (about 1 foot or 0.3 m)
- Waterproof marker
- Yardstick or ruler

Fishing Trip

- *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app
- *New York State Fishing Regulations Guide*
- Pencils
- Waders with wading belt or hip boots, at least two pairs
- Wading Staff
- Polarized sunglasses, at least for the people wearing the waders
- One spinning rod for each individual with 4-8 lb (1.8-3.6 kg) test monofilament line
- Assortment of artificial lures, including examples of surface plugs, diving plugs, spinners, spoons, jigs, spinnerbaits, and plastic worms
- Landing net
- Needle-nosed pliers or hook remover
- Stringers or buckets, if you plan to keep some of the fish
- Rake bottom sampler
- First aid kit (including emergency telephone numbers)
- Permission slip

Website Resources for Fish Identification

NYS DEC Fish:
http://www.dec.ny.gov/animals/269.html
Inland Fishes of New York Directory by Cornell University:
http://www2.dnr.cornell.edu/cek7/nyfish/index.html

WHAT TO DO

This activity should be divided into a pre-trip meeting followed by a fishing trip. During the pre-trip meeting, the youth will be introduced to the fish species they are likely to catch and the tackle needed to catch them.

Pre-Trip Meeting

1. Introduce the activity by describing where the group will be fishing. If possible, show the youth a topographic or navigational map of the public lake. Explain that the group will be fishing for predatory gamefish with spinning equipment.

2. Before any fishing trip, anglers should know the fishing regulations and be able to identify the fish species they are likely to catch. Have half of the group look up the fish species they may catch in *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app, and the other half look up the regulations regarding those species in the *New York State Fishing Regulations Guide*.

3. Have those who looked up the regulations share what they find out about the size restrictions, length limits, and daily limits for the species they may catch. Have the individuals who looked up the fish species tell the others what to look for to identify these fish.

4. Demonstrate the proper way to load monofilament line onto fishing reels. Have the participants follow along with their own reels. Improper loading can cause the line to twist, which reduces the casting accuracy and distance, and causes snarls and knots.

5. When filling spinning and spin casting reels you must allow for the rotation of the pick-up bail, which can cause the line to twist. Have a participant hold the spool supply or place it on the floor or ground. Pull the line so it spirals off the end of the spool.

6. Thread the line through the guides and tie the line to the reel with the bail open. Hold the rod tip 3 or 4 feet (1 m) away from the supply spool. Make 15 to 20 turns on the reel handle and stop.

7. Check the line twist by moving the rod tip to about one foot (0.3 m) from the supply spool. If the slack line twists, turn the supply spool upside down. Continue reeling in the new line, keeping tension on the line by holding it between the thumb and fingers of your free hand.

8. Let youth practice tying the Palomar or improved clinch knots they learned in the previous lessons by having them tie on a bell sinker or casting plug.

9. Demonstrate how to cast a spinning rod and reel. Let the group practice spin casting in a location without obstructions or other difficulties. If desired, you can play casting games such as Backyard Bass or set out a floating target, like a floating plastic hoop and let the youth try to cast into it. Practice for accuracy and distance.

10. Show the group a variety of artificial lures, including a surface plug, diving plug, spinners, spoon, jig and spinnerbait. Relate each to the prey items it imitates.

11. Divide into two groups. Have one group build a rake bottom sampler and the other one construct the Secchi Disk.

12. Explain the trip safety precautions (accidental hooking, horse play, dangerous areas). The youth will be fishing with artificial lures added with treble hooks, so remind them to be cautious handling and casting lures. Tell them to remove all hooks from their line when not fishing.

13. Explain that participants will be wading to do some of the aquatic sampling during this activity. Demonstrate how anglers can increase their personal safety while wading by wearing wading belts (reduces the amount of water entering waders if anglers fall in), polarized sunglasses (allows anglers to see into the water to avoid holes, rocks, and debris), and using a wading staff (to provide balance

and to probe for soft bottoms).

14. Before everyone leaves, be sure they know when and where to meet and what to bring for the fishing trip. Remind each club member to bring his or her permission slip. Discuss any other items that each person should bring on the trip such as clothing, proper footwear, insect repellent, sunscreen, hat, fishing equipment, water, and lunch.

Fishing Trip

1. Remind the group about safety precautions and responsible angling behavior.

2. If fishing public waters, explain that many people use the lake for numerous activities. Good anglers are courteous about sharing the water with others. Explain that many anglers fish when and where conflicts with other users are minimal, such as remote portions of the lake, early mornings, or late evenings. These times and places also often provide the best fishing.

3. Demonstrate how to set the hook into the fish's mouth by quickly lifting the tip of the rod. It is important for new anglers to understand that they need to keep the fishing line high. Show the youth how to adjust the drag on the reel they are using. Help them set the appropriate drag for the size of fish they are after.

4. As the participants begin catching fish, show them how to "play" the fish, tiring the fish enough so that it can be brought into a landing net. Show the youth how to properly handle the landing net and then give them a chance to practice.

5. By wetting your hands before handling fish, you can minimize the damage to the fish's protective scales and slime. Demonstrate how to handle and release fish with a minimum amount of damage. Treat fish like the wonders these organisms are and your participants will learn to value and respect aquatic life.

6. If the group has only fished for panfish prior to the trip, they will likely notice a difference in the striking and fighting behavior or gamefish compared to panfish. Encourage the youth to record these types of observations in the Fishing Journal.

7. Many predatory fish species inhabit warmwater lakes. When one of the participants catches a bass, walleye, or member of the pike family, use the opportunity to point out their adaptations for a predatory lifestyle. Starting from the tip of the nose working back towards the tail, point out:

- Sharp teeth—used to grasp and hold prey
- Large eyes—used to spot prey hiding in vegetation, often in low light
- Large mouth—used to swallow prey whole
- Barbels—used to taste for prey items by members of the catfish family
- Torpedo-shaped body—used to minimize water resistance and increasing swimming speed
- Lateral line—a sensory system used to detect movement in the water, such as prey and predators
- Large strong tail fins—used to ambush prey with quick bursts of speed

8. If some of the fish will be kept, demonstrate how to field dress these fish. This skill will be taught in detail later, but youth can absorb a lot of knowledge by watching you. It does not take much time to explain what you are doing and why as you field dress a couple fish, ice them down, and prepare them for freezing.

9. When the group begins to tire of fishing, start the sampling exercise.

10. Demonstrate how to take a measure of the water clarity with the Secchi disk. Hold onto the stick and rope and lower the Secchi disk into the water until you no longer can see the painted surface.

11. Using the marks on the rope, determine how deep the Secchi disk is when you just barely lose sight of the black and white pattern.

12. This depth is your measure of turbidity. Ask participants to record it on the activity record sheets.

13. Have the youth take Secchi disk depths at several locations and compare the reading. Point out the importance of water clarity to fish habitats.

14. Many of the prey items by predatory fish live on or near the bottom. Demonstrate how to use the rake bottom sampler the group built to capture bottom-dwelling aquatic organisms.

15. This sampler works best on mud, gravel, and sand bottoms. Drag the tines of the rake across the bottom to stir up any animals living there. The animals are captured in the bag hanging behind the rake. Try to catch as little mud or sand in the net as possible. Transfer this catch to a container or bucket with water for easier observation.

16. Help the group identify some of the animals that were caught. Which of these might be food for fish? What types of artificial lures might mimic these organisms? Pay careful attention to how each organisms behaves. Can you think of ways to move an artificial lure to make it act like a living prey item?

17. Have the group work the rake bottom sampler in several locations with different types of substrates (rock, gravel, sand, mud). Do different organisms live in the different types of lake substrates? Do you find particular animals near certain kinds of plants or in certain types of substrates? Does this tell you anything about where you should fish with different lures?

18. Carefully return the organisms to the water as quickly as possible. Return them in a way that minimizes the risk of injury and predation.

19. Rinse off the rake bottom sampler and allow to dry.

Fishing Trip Wrap-Up

1. Have the participants work on completing the "Predator-Prey" table. This table relates predatory gamefish, possible prey items, artificial lures, and the behaviors of prey lures. An example of a partially completed table is shown in Figure 1.

2. Preview the next meeting with the members. Discuss what the activities will be and how they can prepare for the meeting. Always try to end the meeting with the members more excited and enthusiastic about New York State 4-H Sport Fishing Project than before the meeting started.

Predator	Prey Items	Artificial Lures	Prey Behavior Lure Presentation
Largemouth Bass	Minnow	Rapala, spinner, spoon, crankbait	In or near cover, swimming action, erratic
Largemouth Bass	Worm	Plastic worm	Crawling along the bottom
Largemouth Bass	Frog	Surface plus, deer hair frogs	Start-and-stop swimming on surface, splashy, noisy
Walleye			
Northern Pike			

Figure 1: Partially Completed Predator-Prey Table

ACTIVITY 3: Background Materials

Sampling Aquatic Life with a Rake Bottom Sampler

Introduction

Many aquatic organisms make their living at or near a lake or pond's bottom. Bottom sampling often yields a wide variety of interesting organisms for observation and study. The simplest type of bottom sampling in still water involves using a rake attached to a net bag to dig up and capture these organisms.

Materials & Equipment

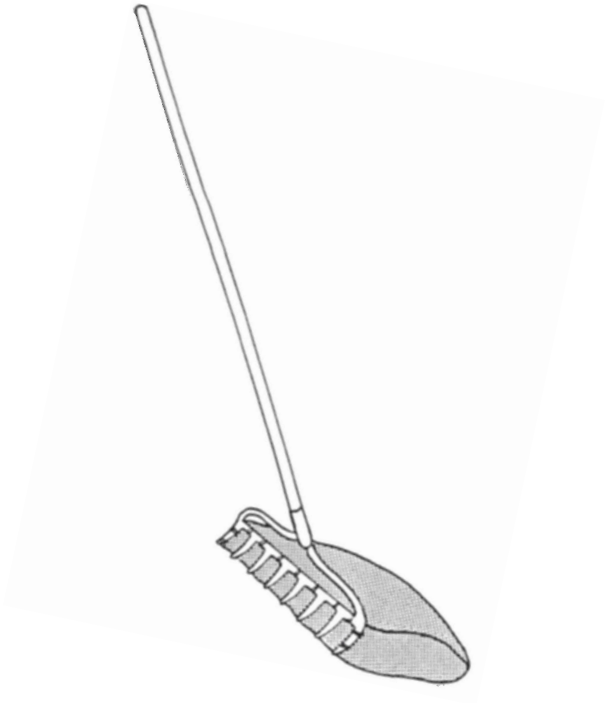
- Piece of burlap or heavy netting
- Needle and thread
- Metal tines garden rake
- 3 feet (1 m) string or fishing line

Building the Rake Bottom Sampler

1. Sew the burlap or netting into a bag with an opening that just fits over the rake head.
2. Using string or fishing line, attach the bag opening to the back of the rake head.

Using the Rake Bottom Sampler

1. This sampler works best on mud, sand, or gravel substrates. Drag the tines of the rake across the substrate to stir up any animals living there. The animals are captured in the bag hanging behind the rake.
2. Try to catch as little mud or sand in the net as possible.
3. Transfer your catch to a white or light colored container of water for easier observation.
4. Work the net in several locations with different types of substrates, (rocks, gravel, sand, mud). Do different organisms live in the different types of lake substrates?
5. Do you find particular animals near certain kinds of plants or in certain types of substrates?
6. Using the appropriate field guides and keys (aquatic plants, insects, and fish) try to identify what was caught.



ACTIVITY 3: Background Materials

Sampling Aquatic Life with a Rake Bottom Sampler

Most fish lead predatory lifestyles, feeding upon other animals. These fish all have adaptations that enable them to catch and eat their prey.

A quick examination of a fish's mouth can offer clues to its feeding habits. Piscivorous or fish-eating fish, such as northern pike, have evolved elongated "snouts" loaded with sharp teeth. It is not difficult to imagine the effectiveness of this mouth at grasping and holding small fish (or your finger). The largemouth bass has found a less toothy solution to the problem of catching fish. These bass are able to open their huge mouth wide enough to catch and swallow fish up to one-half times their entire body length. Panfish, such as bluegill and sunfish, feed on fairly small animals. These fish tend to have small mouths with protrusible "lips." When projected outward, these lips form a small "O" which is used like a suction tube. The "O" sucks small animals out of the mud or water with great precision. Another type of feeding adaptation is the bottom facing mouth of bottom feeders, such bullheads, carp, and suckers.

The eyes of a fish may also be adapted to aid in predation. In the walleye, the ability to see well in low light has been developed to an extreme. The cloudy appearance of the walleye's eyes is the result of adaptations to catch almost all available light. The ability to see well when other fish cannot is a big advantage for the walleye.

Fin arrangement and body shape of a fish determine its swimming speed and maneuverability and may also be important in catching prey. Panfish have large fins near the front of the body. This enables them to catch little prey using small "fine-tuned" motions. The broad tail and torpedo shape of bass and trout make them very fast swimmers, enabling them to capture rapidly swimming fish. The pike family has a very specialized fin arrangement and body shape. The snake-like body with its broad tail and far back fins can be bent into an "S" shape. By quickly straightening out, these fish are able to spring forward in incredible bursts of speed. This ability to accelerate rapidly from a motionless position is ideal for ambush predators like those in the pike family.

The coloration of a predator's body often blends in with its background. Predators living in weeds tend to have mottled green patterns. Other predators often have what's called "counter-shading" camouflage. These fish have dark backs and light or white bellies. When viewed from above, the fish's back blends in well with the murky, dark bottom. When viewed from below, the white belly blends in with the bright surface of the water.

ACTIVITY 3: Background Materials

Field Dressing Fish

Fish that will not be kept alive should be killed, field dressed, and kept cold. When killing fish, be mindful of the fact that you are showing youth what attitude a fisherman should have towards killing his or her catch. It is important to respect and be grateful for the life you are taking. To kill a fish, use a heavy object to deliver a sharp blow to the top of its head just behind the eyes. When the blow is properly administered, the fish will quiver briefly before dying. If field dressing with youth, encourage them to say a word of thanks, out loud, to the fish.

Field dressing involves removing the gills and internal organs of the fish. Using a fillet knife, make a cut along the belly from the anus to the gill arches. Try not to puncture the stomach or intestines. Next, cut the bridge that attaches the gills. Remove the gills and entrails by pulling the gill arch towards the tail. Along the backbone on the inside of the gut cavity is a long, dark red organ. This is the kidney. Remove the kidney by scraping it out with the knife blade or thumbnail. Rinse the gut cavity well and cover the fish with ice.

Packing the body cavity with ice will speed cooling. Usually, ice is the easiest and least expensive way to cool fish. Melting ice not only cools the fish, but washes bacteria from its surface and keeps it from drying out. Crushed and flaked ice is best, because the greater amount of ice surface is in contact with the fish. However, large pieces of ice are better than no ice at all. One pound (0.5 kg) of ice is usually sufficient to cool three pounds (1.5 kg) of fish.

It is best to pack fish on ice in an insulated cooler or a container that can be drained easily with a spigot. A rack or false bottom can also be used to keep fish out of the meltwater. Start with a 3 inch (8 cm) deep layer of ice, then add fish and more ice in alternating layers. If the fish are field dressed, store them with the gut cavities down to prevent meltwater from pooling in the bodies.

In situations where it is not feasible to carry ice along, fish should be field dressed and stored in a damp creel or cloth sack. Packing the body cavity with grass or ferns will help cool the fish, as will evaporation from the damp creel. Some surf anglers bury their field dressed fish in moist sand to keep the catch cool. The importance of keeping freshly killed fish cold cannot be overemphasized. The higher the flesh temperature, the faster the deterioration process.

ACTIVITY 3: Background Materials

Measuring Turbidity

Introduction

New York State 4-H Sport Fishing Project participants can determine the turbidity or clarity of a pond, lake, or ocean using a Secchi disk. Waters that are very murky are called "turbid." The turbidity of a lake has an important effect on plant and fish life. You may want to take a Secchi disk along on several fishing trips so that you can compare the turbidity in a number of different lakes or ponds. It may also be interesting to measure the turbidity of a lake or pond during different times of the year.

Materials & Equipment

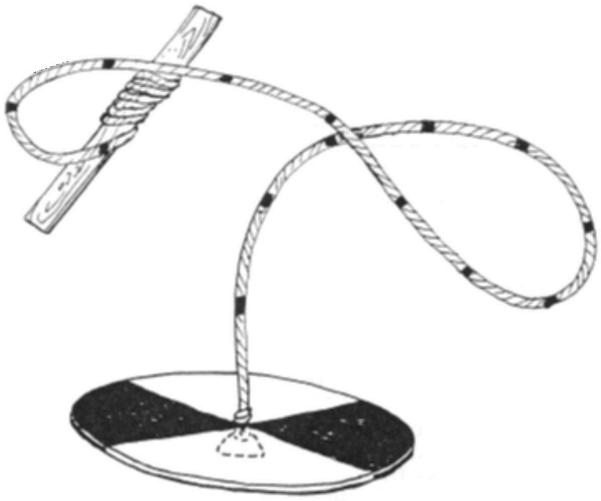
- Metal or plastic disk, 6-8 inches (15-20 cm) diameter (the top of a paint can or metal pie plate will work)
- Hand drill
- Black and white paint
- Long piece or heavy string or light rope (about 10 feet or 3 m)
- One or more large lead weights (equal to or heavier than 1 ounce [30 grams])
- Stick or wooden dowel (about 1 foot or 0.3m)
- Waterproof marker
- Yardstick or ruler

Building the Secchi Disc

1. Drill a hole large enough for the rope to pass through in the center of the metal or plastic disk.
2. Divide the disk into quarters and paint alternating sections black and white.
3. Thread the rope through the hole in the disk and attach the weights to the end of the rope on the unpainted side of the disk.
4. With the disk against the weight(s) tie a knot in the rope that is snug against the painted side of the disk.
5. Tie the free end of the rope to the stick of wooden dowel.
6. Using the marker and ruler, make a mark on the rope every 6 inches (10 cm) staring at 6 inches (10 cm) above the disk.

Using the Secchi Disc

1. Hold onto the stick and rope, and lower the Secchi disk into the water until you no longer can see the painted surface.
2. Using the marks on the rope, determine how deep the Secchi disk is when you loose sight of the black and white pattern.
3. The depth is your measure of your turbidity. You can record it on your Measuring the Physical Environmental Activity Record Sheet.



ACTIVITY 3: Background Materials

Water Turbidity

Water clarity is affected by many things, including the presence of silt, plankton, algae, and nutrients. Some waters such as those of Oneida Lake are naturally turbid because lands surrounding the lake supply a steady flow of nutrients which stimulate the growth of algae. Other waters become turbid through pollution caused by humans. Erosion from construction, logging, or farming practices may increase the silt content of a body of water. High-phosphate soaps and fertilizers running into water may dramatically increase the growth of plankton.

Water turbidity may provide a hint regarding what fish are present. Where waters are constantly turbid from silt, bass, walleye, and other species which depend upon vision to capture their food may be replaced by bullhead and other fish which feed by touch and odor. Turbidity caused by excess algae may indicate depleted oxygen levels. In this type of water, only fish that survive in low oxygen environments, such as carp and certain members of the catfish family, may be present.

NOTES

NOTES

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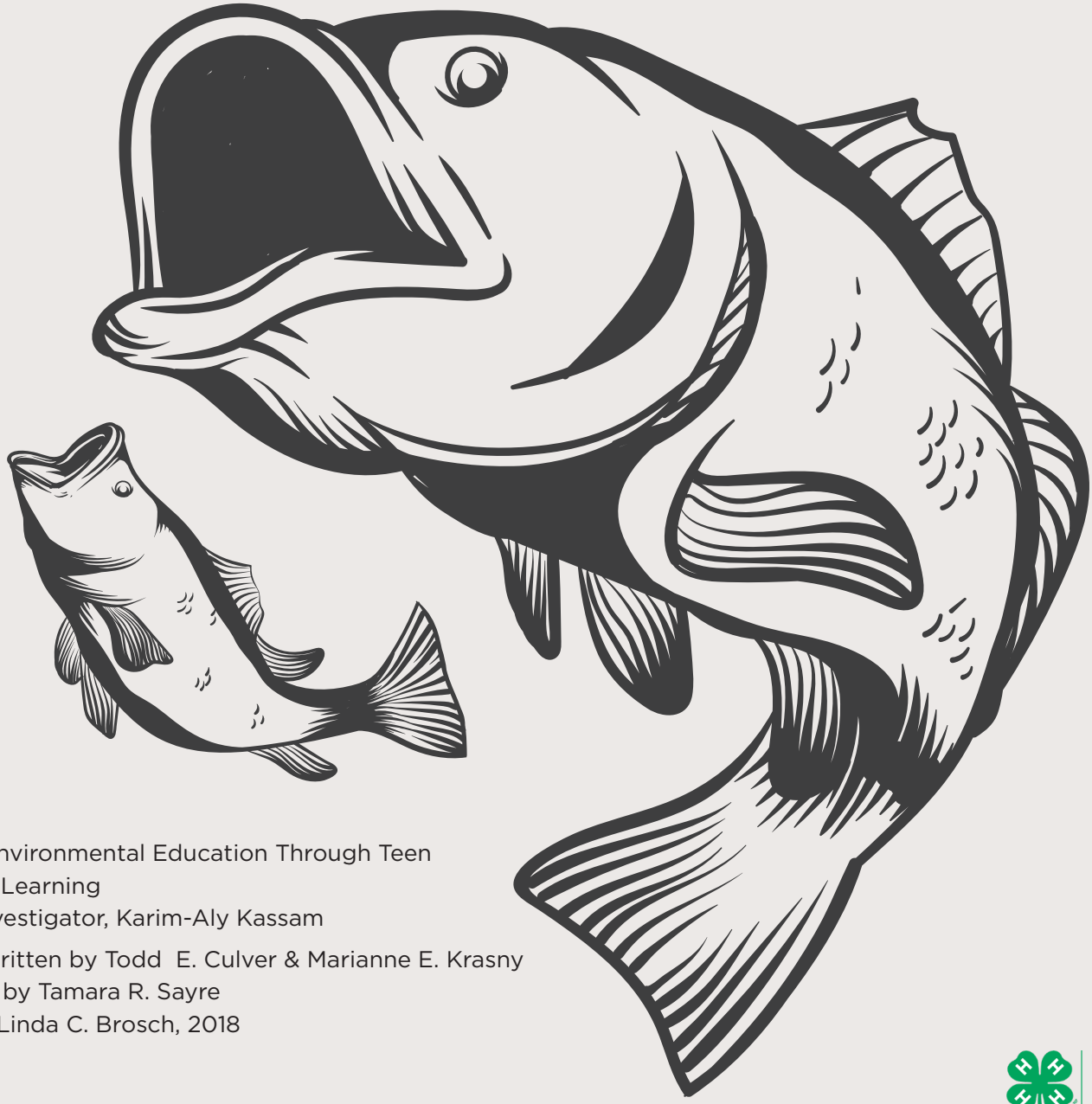
New York State 4-H

SPORT FISHING PROJECT

Fishing Warmwater Lake Habitats

Activity 3

Member Guide

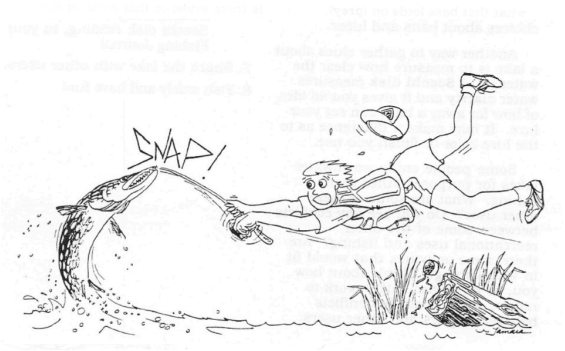


Engaging Environmental Education Through Teen Experiental Learning
Principal Investigator, Karim-Aly Kassam

Originally written by Todd E. Culver & Marianne E. Krasny
Illustrations by Tamara R. Sayre
Revised by Linda C. Brosch, 2018

Cornell University Cooperative Extension

NEW YORK STATE 4-H



Revised by Linda Brosch, Oswego County Cooperative Extension, 2018

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— Lucinda A. Noble, Director

Project Team:
Karim-Aly Kassam, P.I. Department of Natural Resources
and American Indian and Indigenous Studies Program;
John Bowe, Warren County Cooperative Extension;
Linda Brosch, Oswego County Cooperative Extension;
Madeline Rich, Undergraduate Research Assistant, Department of Natural Resources;
Jenn Bassman, Communications & Events Administrator, New York State 4-H

PREFACE

Ethic of Stewardship through Environmental Education

To whom much is given, much is expected! It is with this outlook; young people are asked to engage in both the learning objectives and activities of environmental education. This curriculum for ***Fishing Warmwater Lake Habitats*** opens a window of curiosity and wonder into the habitat for the 4-H youth.

We do not exist outside of "nature" because it is all around us and we, ourselves, are fundamentally "natural"! We breathe, feed, live, reproduce, and die like other beings. In other words, the habitat consists of communities of living beings all around us. The word 'animal' derived from the Latin root animus meaning that which is endowed with will, spirit, or mind carries with it the understanding that we are part a larger community of beings. The world around us is animate, a source of deep wonder through observation and reflection, and through direct engagement with it, the basis of boundless insight. By mindfully participating in our habitat, we learn as much about it as we do about each other and ourselves.

The Greek word oikos, "household," is the root of the prefix 'eco' in both ecology and economics. In the twenty-first century, we grasp the complex connectivity of geophysical, biological and sociocultural systems, in which the planet is truly our oikos: it is the dwelling place of humanity. However, to understand it, we must begin locally with our habitat, our home.

The objectives of this revised and updated curriculum for the 4-H youth are:

- to generate an appreciation for their natural habitat;
- to provide knowledge about specific aspects of that habitat;
- to directly engage the habitat through guided activity; and
- to develop an ethic of stewardship through responsibility, recognizing that one's community includes the living habitat.

These objectives, while distinct, are not mutually exclusive because they work in tandem to achieve environmental education among youth. For instance, appreciation of ones habitat occurs only when a young person acquires knowledge about it. This knowledge creates wonder and curiosity that act to widen a youth's perception and understanding of their natural environment – to create a wider sense of community. Furthermore, knowledge is firmly grounded among the youth through guided experiential learning by undertaking activities outside. Book learning is not sufficient, as it must be accompanied by direct experience. This engagement, in turn, creates appreciation. Only when one appreciates, does a young person develop a sense of responsibility to care for ones habitat. At its core, this process creates informed and committed youth to environmental stewardship.

Responsibility for ones habitat is at the core of the ethic of stewardship. The word 'steward' combines the two active roles: of being 'in charge' on the one hand; and 'to serve' on the other. Humanity and by extension the 4-H youth are both 'guardians of' and 'servants to' life on this planet. Both ideas are commensurate, equally relevant, neither can be compromised. For 4-H youth, this means inculcating through this curriculum the value of responsibility by demonstrating how a human being is simultaneously in charge of their habitat and by knowledgeable action serves its wellbeing. The specific activities should engender a sense of mutual relationship where the youth benefits from and conserves their habitat.

A human ecological perspective informed by the ethic of stewardship is not only desirable, rather it is a necessary value in the twenty-first century. As a result of engaging (Place the name of the specific curriculum here), over the lifetime of the 4-H youth we should expect:

- An expanded ethic of stewardship encompassing all lands and waters whether they are urban or rural;
- A desire to work collaboratively with employers and employees, educators, artists, clergy and laypeople, young and old alike – to achieve a future that is sustainable;
- An understanding that economic and ecological matters relating to their habitat or home (oikos) are not unrelated, but are profoundly interconnected;
- Valuing of local place-based and indigenous knowledge about landscapes and natural resources; and
- An embrace of the ethic of stewardship throughout their adult life.

In short, it is important that the 4-H youth understands that: once you know about ***Fishing Warmwater Lake Habitats,*** you become responsible for your habitat!

Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

INTRODUCTION

A habitat is a home. As an angler, you will use this term to describe where certain types of fish live, such as smallmouth bass or northern pike. New York's warmwater lake habitats are home to many of the most popular gamefish, including smallmouth and largemouth bass, chain pickerel, northern pike, muskellunge and walleye. In this Fishing Warmwater Lake Habitats activity you will be trying your luck for these beautiful gamefish.

Catching gamefish is different from catching panfish. Gamefish are usually larger, fight harder and longer, and are more difficult to land. They do strike, or bite, artificial lures readily. Gamefish offer a fun challenge to any angler.

A gamefish is a predatory fish. In other words, it eats smaller animals or prey. While fishing in the warmwater lake you will learn how each type of gamefish has a unique way of capturing its prey. By applying this knowledge, along with what you have learned about food webs and water temperatures, you should have some more clues as to what kids of baits and lures might work, and where to use them when you are fishing. After sampling the warmwater lake to get clues about what prey might be available for gamefish, you will be in an even better position to make smart choices about baits and lures.

Another way to gather clues about a lake is to measure how clear the water is. A Secchi disk measures water clarity and gives you an idea of how far away a bass can see your lure. It may make a difference as to the lure color or finish you use.

Some people enjoy warmwater lakes for purposes other than fishing. What are some of these other uses? Do you see any conflicts between some of the other recreational uses and fishing? Are there some activities that would fit in with fishing? Think about how you, as an angler, might work to reduce some possible conflicts between anglers and other users.

Successful anglers also respect the environment. They practice environmental stewardship, which is the **responsible use and protection of the environment** through conservation and sustainable practices both at home and while fishing. It is with the help of such caring and mindful practices that fish population will continue to thrive and grow.

In your Fishing Warmwater Lake Habitats activity, you will:

- Build a rake bottom sampler.
- Build a Secchi disk.
- Use your rake bottom sampler to find out what plants and animals live on the bottom of the lake. Use care when catching plants and animals in your rake bottom sample. Some plants and animals may be rare. Return them to the lake when you are done.
- Fill out the Predator-Prey Activity Record Sheet.
- Use your Secchi disk to measure how clear the water in the lake is.
- Record your fishing experience in your Fishing Journal, including drawings of small animals you caught in the rake bottom sampler and your Secchi disk reading.
- Share the lake with other users.
- Fish safely and have fun!

ACTIVITY 3: Background Materials

Rake Bottom Sampler

Introduction

Many aquatic organisms make their living at or near a lake or pond's bottom. Bottom sampling often yields a wide variety of interesting organisms for observation and study. The simplest type of bottom sampling in still water involves using a rake attached to a net bag to dig up and capture these organisms.

Materials & Equipment

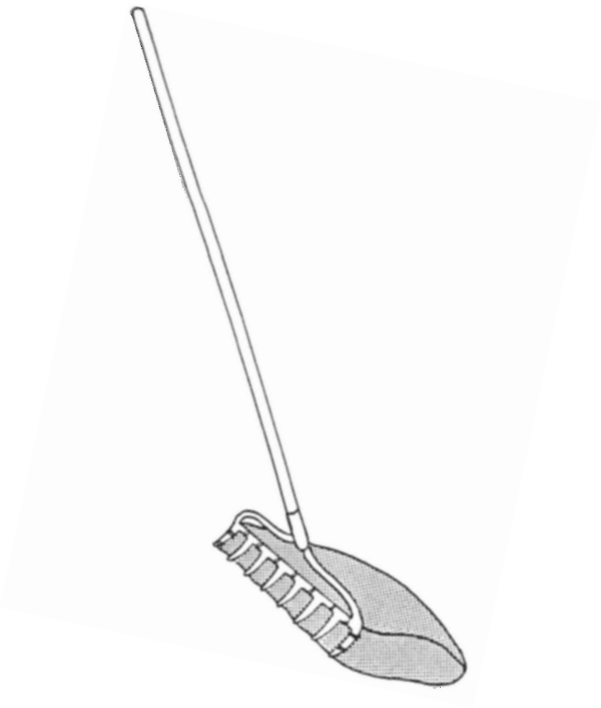
- Piece of burlap or heavy netting
- Needle and thread
- Metal tines garden rake
- 3 feet (1 m) string or fishing line

Building the Rake Bottom Sampler

1. Sew the burlap or netting into a bag with an opening that just fits over the rake head.
2. Using string or fishing line, attach the bag opening to the back of the rake head.

Using the Rake Bottom Sampler

1. This sampler works best on mud, sand, or gravel substrates. Drag the tines of the rake across the substrate to stir up any animals living there. The animals are captured in the bag hanging behind the rake.
2. Try to catch as little mud or sand in the net as possible.
3. Transfer your catch to a white or light colored container of water for easier observation.
4. Work the net in several locations with different types of substrates, (rocks, gravel, sand, mud). Do different organisms live in the different types of lake substrates?
5. Do you find particular animals near certain kinds of plants or in certain types of substrates?
6. Using the appropriate field guides and keys (aquatic plants, insects, and fish) try to identify what was caught.



ACTIVITY 3: Background Materials

Measuring Water Clarity

Introduction

You can determine the clarity or turbidity of a pond, lake or ocean using a Secchi disk. Waters that are very murky are called "turbid." The turbidity of a lake has an important effect on plant and fish life. You may want to take a Secchi disk along on several fishing trips so that you can compare that turbidity of a number of different lakes or ponds. It may also be interesting to measure the turbidity of a lake or pond during different times of the year.

Materials & Equipment

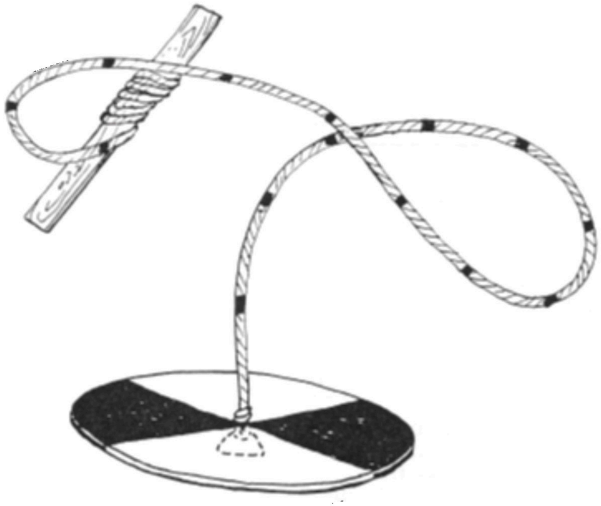
- Metal or plastic disk, 6-8 inches (15-20 cm) diameter (the top of a paint can or metal pie plate will work)
- Hand drill
- Black and white paint
- Long piece or heavy string or light rope (about 10 feet or 3 m)
- One or more large lead weights (equal to or heavier than 1 ounce [30 grams])
- Stick or wooden dowel (about 1 foot or 0.3m)
- Waterproof marker
- Yardstick or ruler

Building the Secchi Disc

1. Drill a hole large enough for the rope to pass through in the center of the metal or plastic disk.
2. Divide the disk into quarters and paint alternating sections black and white.
3. Thread the rope through the hole in the disk and attach the weights to the end of the rope on the unpainted side of the disk.
4. With the disk against the weight(s) tie a knot in the rope that is snug against the painted side of the disk.
5. Tie the free end of the rope to the stick of wooden dowel.
6. Using the marker and ruler, make a mark on the rope every 6 inches (10 cm) staring at 6 inches (10 cm) above the disk.

Using the Secchi Disc

1. Hold onto the stick and rope, and lower the Secchi disk into the water until you no longer can see the painted surface.
2. Using the marks on the rope, determine how deep the Secchi disk is when you loose sight of the black and white pattern.
3. The depth is your measure of your turbidity. You can record it on your Measuring the Physical Environmental Activity Record Sheet.



ACTIVITY RECORD SHEET: Activity 3, Fishing Warmwater Lake Habitats

Predator-Prey

Fill in the following table. Largemouth bass is given as an example.

Predator	Prey Items	Artificial Lures	Prey Behavior Lure Presentation
Largemouth Bass	Minnow	Rapala, spinner, spoon, crankbait	In or near cover, swimming action, erratic

How can knowing what a fish feeds on (its prey) help you to catch that fish?

Cornell University

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USDA NIFA

NEW YORK STATE 4-H

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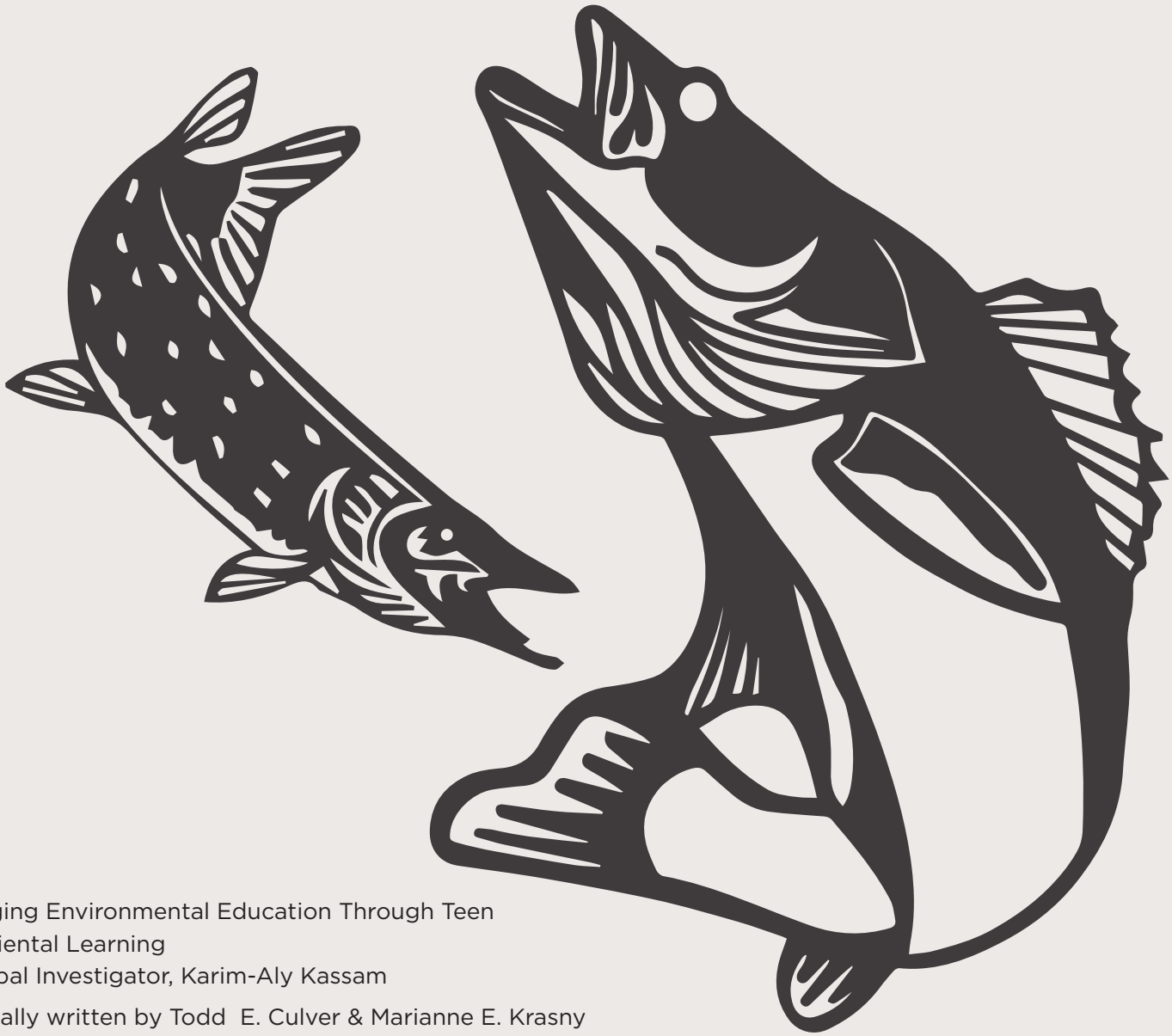
New York State 4-H

SPORT FISHING PROJECT

Fishing Coldwater Lake Habitats

Activity 4

Leader Guide



Engaging Environmental Education Through Teen Experiental Learning

Principal Investigator, Karim-Aly Kassam

Originally written by Todd E. Culver & Marianne E. Krasny

Illustrations by Tamara R. Sayre

Revised by Linda C. Brosch, 2018

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NEW YORK STATE 4-H

Revised by Linda Brosch, Oswego County Cooperative Extension, 2018

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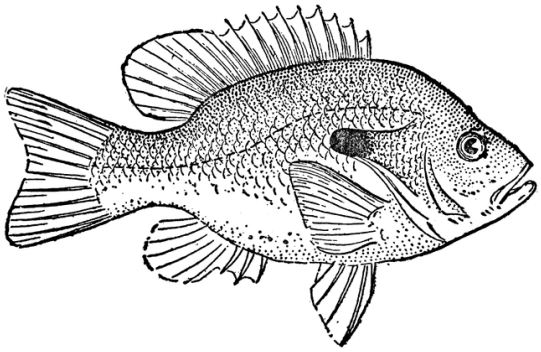
INTRODUCTION

Several of New York's most popular gamefish, including trout and smallmouth bass, inhabit deep coldwater lakes. Although coldwater lakes can be found in any region of the state, they are most common in the Adirondack, Catskill, and Allegheny Mountains. In this activity, youth learn about coldwater lake environments by sampling their physical and biological features. In particular, they will measure pH and use a minnow trap to capture small fish. The participants then relate what they learn about the lake environment to the fish they catch using spinning equipment.



New York State P-12 Science Learning Standards*

2-LS4-1
3-LS4-3, 3-LS4-4
5-ESS2-1, 5-ESS3-1
MS-LS2-1, MS-LS2-2, MS-LS2-5, MS-LS4-6

*Effective July 1, 2017

Objectives

Angling Skills

Youth will:

- Master the use of spinning fishing equipment.
- Demonstrate the ability to tie snelled hooks.
- Learn to use artificial lures to catch coldwater gamefish.

Fish Biology & Ecology

Youth will:

- Learn to use the New *York State Fishing Regulations Guide* to find the regulations pertaining to this fishing trip.
- Learn to identify the fish that are caught
- Understand some of the adaptations of fish for avoiding predation.

Handling Fish

Youth will:

- Learn to how to safely handle coldwater fish species.
- Demonstrate the ability to field dress fish.

Aquatic Sampling

Youth will:

- Learn to measure pH.
- Learn to use a minnow trap.

Safety

Youth will:

- Understand the threat of hypothermia and how to prevent its effects.

Environmental Stewardship

Youth will:

- Understand responsible use and protection of the environment through conservation and sustainable practices.

MATERIALS AND EQUIPMENT

Pre-Trip Meeting

- *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app
- *New York State Fishing Regulations Guide*
- Pencil for each member
- Litmus paper, aquarium pH kit or pH meter
- Nylon cord and eye-bolt for each participant

Fishing Trip

- *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app
- *New York State Fishing Regulations Guide*
- One fishing pole for each youth with 4-8 lb (1.8-3.6 kg) test monofilament line (spin-casting or bamboo rods are easiest to use)
- Variety of natural baits (activity includes trapping minnows which can be used as bait)
- Assortment of artificial lures
- Hooks, sinkers, bobbers, swivels, etc.
- Landing net
- Needle-nosed pliers or hook remover
- Measuring board or tape
- Cutting board
- Sharp fillet knife
- Garbage bags
- Ice and cooler, if you plan to keep some fish
- Stringers or buckets, if you plan to keep some fish
- White container or fish buckets
- Personal floatation devices (PFDs)
- Warm change of clothing for each participant
- First aid kit (including emergency telephone numbers)
- Camera (optional)
- pH kit
- Minnow trap
- Stake or weight to hold trap in place
- Cottage cheese, wrapped in cheese cloth
- Permission slip

Website Resources for Fish Identification

NYS DEC Fish:
http://www.dec.ny.gov/animals/269.html
Inland Fishes of New York Directory by Cornell University:
http://www2.dnr.cornell.edu/cek7/nyfish/index.html

WHAT TO DO

This activity should be divided into a pre-trip meeting followed by a fishing trip. During the pre-trip meeting, the youth will be introduced to the fish species they are likely to catch and the tackle needed to catch them.

Pre-Trip Meeting

1. Introduce the activity by describing where the group will be fishing. If possible, show the youth a topographic or navigational map of the public lake. Explain that the group will be fishing for predatory gamefish with spinning equipment.

2. Before any fishing trip, anglers should know the fishing regulations and be able to identify the fish species they are likely to catch. Have half of the group look up the fish species they may catch in *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app, and the other half look up the regulations regarding those species in the *New York State Fishing Regulations Guide*.

3. Have those who looked up the regulations share what they find out about the size restrictions, length limits, and daily limits for the species they may catch. Have the individuals who looked up the fish species tell the others what to look for to identify these fish. Consider why the regulations are in place, and why they're important to follow as a responsible angler.

4. Pass out a section of nylon cord and an eye-bolt to each individual. Show the group how to tie a "snelled hook" using the nylon cord and eye-bolt. Let the group practice while the leader checks to see if anyone needs help. Once the group has mastered the "snelling" with nylon cord and eye-bolt, teach them to tie a surgeon's end loop to complete the snelled hook. Pass out a length of 10-15 lb (3.5-7 kg) test monofilament and six hooks to each participant. Have the individuals tie six snelled hooks. These may be used during future fishing trips.

5. Introduce the equipment that the group will be using to measure pH. Demonstrate how to use the litmus paper, aquarium pH kit, or pH meter by taking the pH of tap water or distilled water. The pH of pure water is neutral, neither acid nor base (pH=7).

6. Have the individuals practice using the equipment by measuring the pH of several household acids and bases such as vinegar (pH=1.7), lemon juice (pH=2) and ammonia (pH=10). Have the youth record each pH on their pH scales.

7. This should be the second time the group has used spinning equipment. The objective of this activity is to increase their level of casting skill using this tackle. If necessary, review how to use the spinning rod and reel. Using a drop sinker, have the group practice their casting accuracy in an open field or parking lot.

8. Discuss the dangers of hypothermia to anglers by explaining how the body becomes chilled and how to recognize the warning signs of hypothermia. Explain how to treat hypothermia and how to prevent it by dressing warmly and minimizing your exposure to extreme cold, wetness, and wind. The essential ingredients to surviving a hypothermic situation are: being prepared to prevent it, recognizing it when it occurs, and knowing how to treat it. It is possible to die from hypothermia in temperatures well above freezing.

9. Before the group leaves, be sure they know when and where to meet and what to bring for the fishing trip. Remind each person to bring his or her permission slip. Discuss any other items the participants need to bring on the trip such as clothing, proper footwear, insect repellent, sunscreen, hat, fishing equipment, water and lunch.

Fishing Trip

1. Remind the group about safety precautions and responsible angling behavior.

2 The leader should set the minnow trap as soon as he or she arrives at the lake or pond. Find a quiet, secluded spot near some submerged cover and stake or weigh down the trap so it does not float or drift away.

3. Baiting the inside of a trap with cottage cheese (wrapped in cheesecloth) will attract minnows and increase the trap's catch.

4. Let the minnow trap work as long as possible while the group uses the other sampling equipment. Make sure to move to another area of the lake for the other activities so the minnow trap is undisturbed.

5. Have the participants choose whether they want to fish with bait or artificial lures. Have a variety of natural bait and lures available for them to choose from.

6. Point out areas such as drop offs, weed beds, docks, or sunken logs that may hide fish.

7. As individuals start catching fish, the leader should move around and show the youth how to get lures or baits into deeper water that may hold fish. Explain which lures dive deeply and how to rig lines to get bites at or near the bottom.

8. The group should help each other identify the fish that are caught using G*uide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app.

9. Caught fish should have their length measured using a measuring board or tape.

10. Information can be recorded in the Fishing Journal.

11. If fish are being kept for consumption, the leader should remind the group how to field dress the fish and of the safety precautions for using knives. Have the youth field dress the fish they are going to keep and ice them down immediately. It would be best to have at least one other adult supervise the youth when they are cleaning fish. Set up a cleaning station where the youth can bring the fish to clean and ice. Be sure to dispose waste properly. Some locations in New York State require fish to be cleaned at a fishing station, so check the local rules and regulations in the New Y ork State Fishing Regulations Guide. Consider why the regulations are in place, and why they're important to follow as a responsible angler.

12. As the group field dresses the fish, have them open up the fish stomachs and identify what the fish have been eating. This may provide tips on what might be effective as baits and lures.

13. Plan to end the fishing trip before the group loses interest. If the fishing is not great, start the sampling activities.

14. Review the instructions on how to measure pH with the group.

15. If litmus paper, aquarium pH test kits, or swimming pool pH test kits are being used, measure pH at the site. If a pH meter is being used, the group can collect a water sample and take it offsite to the meter for measuring.

16. Measure the pH of the body of water and record the data on the Measuring the Chemical Environment Activity Record Sheet. The youth should repeat the measure three times with different samples and take an average of the measures. Have the group compare these pH reading to their pH scale. Is this water acidic, basic or neutral? How does the water compare to the household liquids the group measured earlier?What would happen to the lake's ability to support fish if the water became more acidic or more basic?What happens to the pH of the lake as "acid rain" becomes more severe? What steps can the group take to reduce the amount of acid rain entering the lakes, rivers, and streams?

17. Return to the minnow trap at the end of the day. Pull the trap close to shore without lifting it from the water. Transfer what was captured into a bucket or container of water for easier observation.

18. Have the participants record the names of the organisms caught in the table on the Predator-Prey Activity Sheet. Observe the organisms and record anything interesting about their behaviors, especially behaviors that might help increase angling success. Can you think of any artificial lure that resembles the minnows that were caught? What is the most common size and color of the minnows caught? Would this information be useful next time someone fished this lake?

19. Carefully return the organisms to the water as quickly as possible. Return them in a way that minimizes their risk of injury or predation.

20. Pick up and rinse off the sampling equipment.

Fishing Trip Wrap-Up

1. If fishing on private land, have the group thank the landowner or landowner's family member for the day's fishing. If the group had permission to keep some of the fish, offer to share the catch. Remind the group to send the landowner a thank you note.

2. In *New York State 4-H Sport Fishing Project: Fishing Warmwater Ponds*, the group learned about some of the adaptation of gamefish to a life of predation. Discuss some of the adaptations and behaviors that prey fish have come up with as "defenses" against predators. Have the group complete the Avoiding Predation table.

3. Preview the next meeting with group. Discuss what the activities will be and how they can prepare for the meeting. Always try to end the meeting with the members more excited and enthusiastic about the New York State 4-H Sport Fishing Project than before the meeting started.

ACTIVITY 4: Background Materials

Measuring pH

Introduction

Because of concern about acid rain, pH is becoming a household word in New York State. pH is a measure of the acidity of a solution. The pH scale ranges from 0 to 14. Those substances with a pH of below 7 are said to be acidic, pH of 7 is neutral, and above 7 is basic or alkaline. Although the exact technical meaning of pH, which refers to "potential of Hydrogen," may be difficult to get across, the core concept is one which the group should understand. Ask the participants to provide some examples of acidic substances. They may mention lemons or vinegar. Lemon juice has a pH of 1.7 and vinegar a pH of 2.

The simplest way to measure pH is with litmus paper, available through a local pharmacy. An aquarium pH test kit from a pet store can be used, as well as a swimming pool pH test kit. A local school or college may have a pH meter which they might let the group borrow. The group may want to measure the pH of several bodies of water at different times of the year. They may also want to measure the pH of the rain in the immediate area.

What To Do

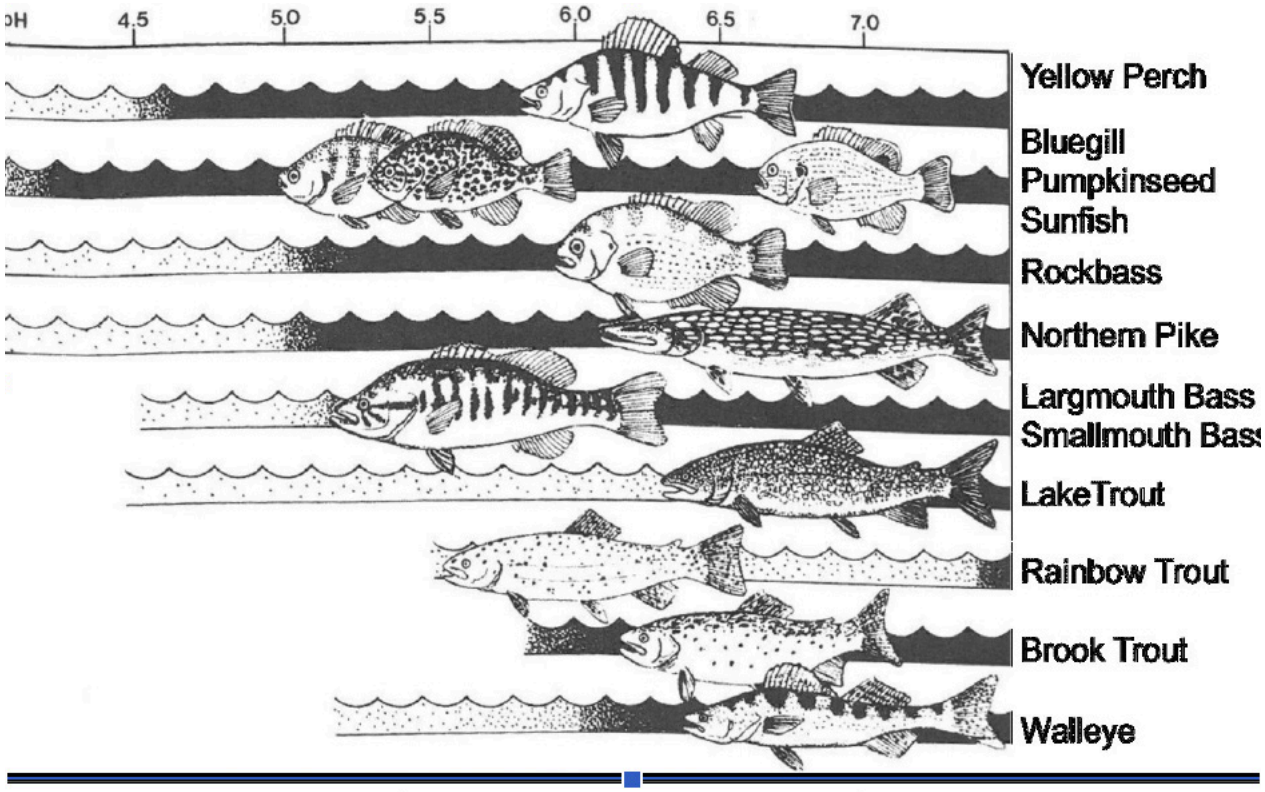
Before You Go

1. Obtain the necessary materials to measure pH. Read the instructions that accompany the materials on how to measure pH.

2. If the group is using litmus paper or a pH test kit, the pH can be measured on site. If they are using a pH meter, the water sample can be tested offsite at home.

At the Site

1. Measure the pH of the body of water. Record the data on the Measuring the Chemical Environment Activity Record Sheet. Repeat three times and take an average of the measures.



Acid Rain Tolerance in Fish

ACTIVITY 4: Background Materials

Acid Rain

Most fish lead predatory lifestyles, feeding upon other animals. These fish all have adaptations that When humans burn gas and oil in power plants, cars, and homes, sulfur and nitrogen compounds are released into the atmosphere. These compounds act as acids and lower the pH of rain and snow. When power plants utilize tall “stacks” to keep air closer to the ground cleaner, the sulfur and nitrogen compounds are released into the atmosphere at a high altitude, and can be carried long distances by air currents. In this way, burning fuels in one location, such as in the industrial Midwest, can create acid rain and snow at another location far away, such as in the Adirondacks.

Normal, unpolluted rain has a slightly acidic pH of 5.6. This is due to some natural atmospheric gases, such as those given off by plants, being dissolved in the rain. Any precipitation with a pH below 5.0 is considered acid precipitation. In New York State, the average pH of rain currently ranges from 4.5 to 5.0.

Although precipitation across the entire state of New York is acidic, only some areas experience the negative effects of acid precipitation on the environment. Whether or not an area is negatively impacted by acid rain depends largely on the nature of its soils. Some soils, such as those in a region where limestone is present, have the ability to neutralize the acid in rain and snow. Even if the precipitation is acidic, lakes and ponds may not be affected in these regions. In contrast, thin soils developed from bedrock containing granite, such as those present in the Adirondacks, have little capacity to buffer the acid of rain. Therefore, the acidity is washed into streams and lakes and has a detrimental effect on aquatic life. In the 1930’s, the mean pH of lakes in the Adirondacks was about 6.8. Today, it is lower in many lakes in the Adirondacks, though each lake’s individual pH depends on its context. Other areas in New York that have been heavily impacted by acid rain include the central Catskills, Hudson Highlands, eastern Long Island, and Rensselaer Highlands.

The effect of acid waters on fish depends on the species of fish, its life stage, and its physiological condition. The fathead minnow, arctic char, Eurasian perch and northern pike are especially sensitive to pH declines. Fry stages are generally more sensitive to acidification than adult sages. In addition, fish in a weakened condition from overwintering or spawning are particularly sensitive to low pH. The spring snowmelt, with its major input of acidic water to the aquatic ecosystem, may have a particularly negative impact on fishes weakened by overwintering.

Acid rain affects fish indirectly, through its effect on overall aquatic ecosystems, and directly, through its effect on the health of individual fish. In the vicinity of a pH of 6.0, several important forage species for fish may die, including plankton, freshwater shrimp, crayfish, snails, some mussels, and mayflies. The baitfish that depend on these species may subsequently starve, causing ripples around the food web.

Acid precipitation may harm fish directly in a number of ways. Females fail to reproduce when they suffer stress from a lack of calcium caused by high acid levels. The population may gradually become extinct if no young fish are produced to replace aging fish. Fish living in acidic waters experience altered growth rates, weakened bones, and excess mucus buildup in their gills. They may also die from the accumulation of heavy metals such as aluminum and lead.

ACTIVITY 4: Background Materials

Adaptations for Avoiding Predation

In the quest for survival, fish have evolved adaptations to avoid being eaten. These adaptations are both physical (having to do with the body of a fish) and behavioral.

One of the most common physical adaptations is camouflage or cryptic coloration. Camouflage colors and patterns usually blend in well with the habitat in which the fish is most often found. Almost all fish have countershading camouflage, which means the fish have light colored bellies and dark backs. When viewed from below, the white belly blends in well with the bright surface waters. When viewed from above, the dark back is barely distinguished from the bottom or the deeper, dark water. Often the back also has a mottled pattern that blends in well with a specific bottom type or with the flickering pattern of sunlight in the water.

The vertical bars of the yellow perch provide excellent camouflage in weedy habitats. These bars are especially confusing to a predator when the perch is moving through the flickering light of a weedbed.

Another type of camouflage is the bright sliver color of some fishes. Fish that live in open waters, such as alewife, shiners, and gizzard shad, have silver bodies. This helps the fish in two ways. First, the silver color blends in well with brightly lit waters and reduces the clarity of the fish's silhouette. Second, when these fish turn quickly, there is often a flash as their sides catch the light. This flashing can startle a predator and allow its prey to escape.

Many fish use behavioral adaptations to avoid predation. One of the most common behaviors is schooling, which has several advantages. A predator has a much more difficult time approaching a school of watchful fish than it has approaching a single individual. If a predator does approach the school to within striking distance, it is difficult to concentrate on one individual in the swirling mass of bodes.

Another behavioral adaptation is simply hiding in weeds, rocks, or shade. Shade provides a good deal of safety for fish. When in a shady spot, fish are able to see farther away while at the same time are themselves difficult to see. It is much the same as looking out the window of an unlit room on a bright day. A person inside can see out very well, but someone on the outside has difficulty seeing in. If all these anti-predator tactics fail and a predator approaches too closely, some fish have another physical adaptation: spines. The spines of the catfish family can produce painful wounds in a fish's mouth as well as in an angler's hand. After being stuck once or twice by these spines, most predators will be reluctant to attack again. Panfish have combined a compressed body shape with protective spines to make themselves very difficult to swallow. Although this strategy is not very helpful to small individuals, it ensures that the larger members of the species will be around to reproduce.

Sources

North Dakota Aquatics Resource Education, Leader's Edition
Aquatic Resources Education Curriculum
Cornell Cooperative Extension: Water Worlds
Cornell Cooperative Extension: Water Wise: Lessons in Water Resources
Acid Rain: Effects on Fish and Wildlife
Effects of Acidic Deposition

ACTIVITY 4: Background Materials

Sampling Aquatic Life with a Minnow Trap

Introduction

Learning to trap minnows is a useful skill for young anglers to learn. Legal minnow traps (maximum length of 20 inches [50 cm], maximum entrance diameter of 1 inch [2.5 cm] and marked with the owner's name and address) can be operated in all New York waters at any time.
This activity should be set up as soon as the group arrives and left in an undisturbed area for the best results. This is a good opportunity for young anglers to learn about some of the fish we normally do not fish for but are important parts of the aquatic environment as they provide food for the larger gamefish. The groups may be fortunate enough to catch some young gamefish. Be sure to release all the protected species that are caught and do not release minnows in bodies of water other than where they were caught.

Materials & Equipment

- One minnow trap
- Stake or weight to hold trap in place
- Cottage cheese wrapped in cheese cloth or dog food
- White containers or buckets
- *Guide to Freshwater Fishes* of New York or New York Fishing, Hunting & Wildlife app

What to Do

At the Site

1. The group should set the minnow trap upon arrival at the lake or pond. Find a quiet, secluded spot near some submerged cover and stake or weigh down the trap so its does not float or drift away.

2. Baiting the inside of the trap with cottage cheese or dog food (wrapped in cheese cloth) will attract minnows and increase the trap's catch.

3. Let the minnow trap work as long as possible while the group uses the other sampling equipment. Make sure to move to another area of the lake or pond, so the minnow trap in undisturbed.

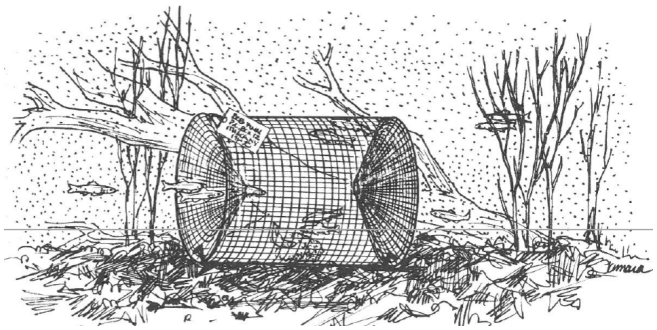
Wrap Up

1. Return to the minnow trap at the end of the day. Pull the trap close to shore without lifting it from the water. Transfer what you have captured into a bucket or container of water for easier observation.

2. Use the *Guide to Freshwater Fishes* of New York or New York Fishing, Hunting & Wildlife app and help the group identify what was caught.

3. Have the group record the names of the organisms and how many were caught on their Sampling the Biological Environment Activity Record Sheets. Observe these organisms and record anything interesting about their behaviors, especially behaviors that might help increase angling success. Do any of the artificial lures resemble the minnows that were caught? What is the most common size and color of the minnows caught? Would this information be useful next time someone fished this lake?

4. Carefully return the organisms to the water as quickly as possible. Return them in a way that minimizes the risk of injury and predation.



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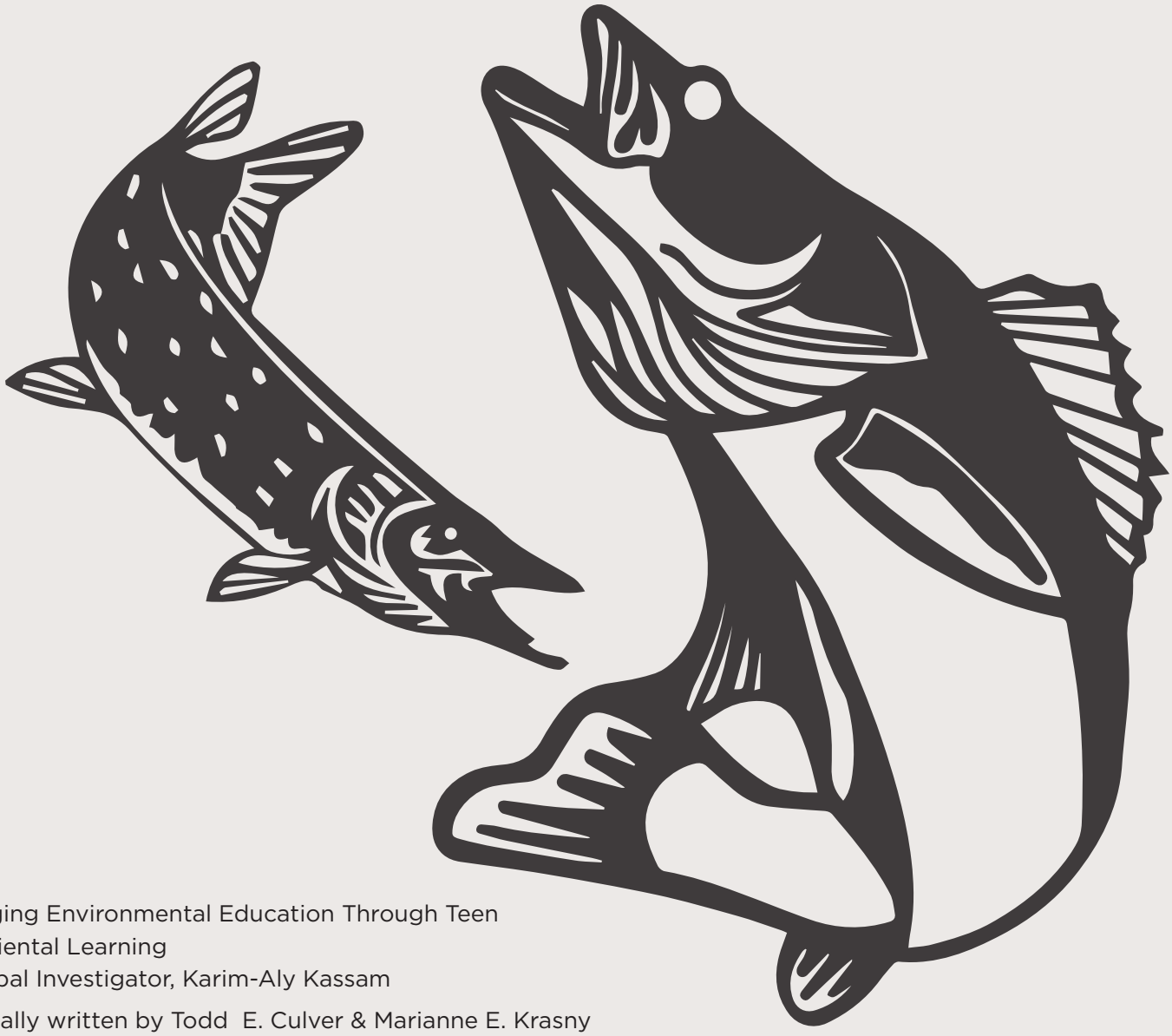
New York State 4-H

SPORT FISHING PROJECT

Fishing Coldwater Lake Habitats

Activity 4

Member Guide



Engaging Environmental Education Through Teen Experiental Learning

Principal Investigator, Karim-Aly Kassam

Originally written by Todd E. Culver & Marianne E. Krasny

Illustrations by Tamara R. Sayre

Revised by Linda C. Brosch, 2018

Cornell University Cooperative Extension

NEW YORK STATE 4-H

Revised by Linda Brosch, Oswego County Cooperative Extension, 2018

Special thanks to Mark Clapsadl, Bruce Matthews, and Frank Panek for assistance in writing this manual. The authors would also like to express our appreciation of Glenn Applebee, Robert Kent, Kurt Jirka, Diane Held Phillips, and Michael Voiland for helping in the initial stages of SAREP. In addition, we would like to thank the many reviewers of this manual including: Bob Banister, Brian Butts, Daniel Decker, Mike Duttweiler, John Forney, David Greene, Glen Sapir, David Scudder, Bruce Shupp, George Steele and Eileen Stegemann. Finally, we would like to thank the many Cooperative Extension agents who have contributed to SAREP including: Robert Adsit, Mary Anderson, Niles Brown, William Fink, Kevin Mathers, Mary de Munecas, Henry Hogue, Gregory Neal, William Schwerd, Andrew Turner and Patricia Zellmer.

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Illustrated by Tamara R. Sayre
Designed, edited and produced by Karen L. Edelstein and Roslyn E. Scheib
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— Lucinda A. Noble, Director

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PREFACE

Ethic of Stewardship through Environmental Education

To whom much is given, much is expected! It is with this outlook; young people are asked to engage in both the learning objectives and activities of environmental education. This curriculum for ***Fishing Coldwater Lake Habitats*** opens a window of curiosity and wonder into the habitat for the 4-H youth.

We do not exist outside of "nature" because it is all around us and we, ourselves, are fundamentally "natural"! We breathe, feed, live, reproduce, and die like other beings. In other words, the habitat consists of communities of living beings all around us. The word 'animal' derived from the Latin root animus meaning that which is endowed with will, spirit, or mind carries with it the understanding that we are part a larger community of beings. The world around us is animate, a source of deep wonder through observation and reflection, and through direct engagement with it, the basis of boundless insight. By mindfully participating in our habitat, we learn as much about it as we do about each other and ourselves.

The Greek word oikos, "household," is the root of the prefix 'eco' in both ecology and economics. In the twenty-first century, we grasp the complex connectivity of geophysical, biological and sociocultural systems, in which the planet is truly our oikos: it is the dwelling place of humanity. However, to understand it, we must begin locally with our habitat, our home.

The objectives of this revised and updated curriculum for the 4-H youth are:

- to generate an appreciation for their natural habitat;
- to provide knowledge about specific aspects of that habitat;
- to directly engage the habitat through guided activity; and
- to develop an ethic of stewardship through responsibility, recognizing that one's community includes the living habitat.

These objectives, while distinct, are not mutually exclusive because they work in tandem to achieve environmental education among youth. For instance, appreciation of ones habitat occurs only when a young person acquires knowledge about it. This knowledge creates wonder and curiosity that act to widen a youth's perception and understanding of their natural environment – to create a wider sense of community. Furthermore, knowledge is firmly grounded among the youth through guided experiential learning by undertaking activities outside. Book learning is not sufficient, as it must be accompanied by direct experience. This engagement, in turn, creates appreciation. Only when one appreciates, does a young person develop a sense of responsibility to care for ones habitat. At its core, this process creates informed and committed youth to environmental stewardship.

Responsibility for ones habitat is at the core of the ethic of stewardship. The word 'steward' combines the two active roles: of being 'in charge' on the one hand; and 'to serve' on the other. Humanity and by extension the 4-H youth are both 'guardians of' and 'servants to' life on this planet. Both ideas are commensurate, equally relevant, neither can be compromised. For 4-H youth, this means inculcating through this curriculum the value of responsibility by demonstrating how a human being is simultaneously in charge of their habitat and by knowledgeable action serves its wellbeing. The specific activities should engender a sense of mutual relationship where the youth benefits from and conserves their habitat.

A human ecological perspective informed by the ethic of stewardship is not only desirable, rather it is a necessary value in the twenty-first century. As a result of engaging (Place the name of the specific curriculum here), over the lifetime of the 4-H youth we should expect:

- An expanded ethic of stewardship encompassing all lands and waters whether they are urban or rural;
- A desire to work collaboratively with employers and employees, educators, artists, clergy and laypeople, young and old alike – to achieve a future that is sustainable;
- An understanding that economic and ecological matters relating to their habitat or home (oikos) are not unrelated, but are profoundly interconnected;
- Valuing of local place-based and indigenous knowledge about landscapes and natural resources; and
- An embrace of the ethic of stewardship throughout their adult life.

In short, it is important that the 4-H youth understands that: once you know about ***Fishing Coldwater Lake Habitats***, you become responsible for your habitat!

Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

INTRODUCTION

By this time, participants of the New York State 4-H Sport Fishing Project have enough skill to try fishing in some of New York's colder, deeper lakes. Smallmouth bass and trout are the gamefish most likely to be caught. Many of the bait and lure techniques used for panfish and warmwater gamefish also work on coldwater gamefish. Checking water temperature, sampling for aquatic plants and animals, and understanding the coldwater food web will provide insights into what baits and lures will have the greatest success.

Have you ever heard of the story about the canary in the coal mine? Coal miners work deep in the earth, where sometimes there are dangerous gases that can kill a miner before he or she becomes aware of them. Before miners had any modern devices telling them when these gases were there, the old-timers would take cages with canaries into the mines with them. Being such small birds, canaries are much more susceptible to dangerous gasses than we humans are. When the canary fell over, unconscious in its cage, the miners knew a dangerous gas was present, and they got out of there fast.

In some ways, the smallmouth bass and trout in New York' coldwater lakes are like canaries in a mine. When these gamefish are healthy and plentiful, it is a indicator that the lake habitat is healthy. However when the smallmouth bass or trout are absent or in poor condition, then one knows that there is a problem. Like the canary being affected by the poisonous gas in the air, these fish are sensitive to pollution in the water. And like the old-time miners, a person will need to do something quick if they want the lake to recover.
One of the pollution problems that can affect coldwater lakes is acid rain. Acid rain forms when pollution from power plants, cars, and factories mixes with water in the air and returns to the earth. The acid "rain" could be any form of precipitation, such as snow, fog, mist or rain.

One way acid rain affects gamefish is by killing insects and small fish that the gamefish prey upon. One can use a minnow trap to find out what small fish are present in the lake that they fish. He or she may want to take action as an individual or as a group to remediate damage that has already happened, and to keep more damage from happening due to acid rain.

If a person is concerned about the fish population, he or she may also want to think more about what is meant by "catch and release." A famous angler and conservationist named Lee Wulff once said, " A trout is too valuable to be caught only once." We must be aware that other humans enjoy fishing too...and other organisms rely on the same fish for survival!

Successful anglers also respect the environment. They practice environmental stewardship, which is **the responsible use and protection of the environment** through conservation and sustainable practices both at home and while fishing. It is with the help of such caring and mindful practices that fish populations will continue to thrive and grow.

In your Fishing Coldwater Lake Habitats activity, you will:

- Use a minnow trap to sample small fish in the lake. Use care when handing the animals in the minnow trap. Some may be rare. Remember to return them to the lake when done.
- Play casting games to develop distance casting skills.
- Measure the pH of the lake. Keeping a record of favorite lakes' pH over a period of time will help one document if the lake is being affected by acid rain.
- Complete the Matching Lures with Baits Activity Record Sheet.
- Record the fishing trip including pH and drawings of the organisms caught in the minnow trap in a Fishing Journal.
- Fish safely and have fun!

ACTIVITY 4: Background Materials

Sampling Aquatic Life with a Minnow Trap

Introduction

Learning to trap minnows is a useful skill for young anglers to learn. Legal minnow traps (maximum length of 20 inches [50 cm], maximum entrance diameter of 1 inch [2.5 cm] and marked with the owner's name and address) can be operated in all New York waters at any time.
This activity should be set up as soon as the group arrives and left in an undisturbed area for the best results. This is a good opportunity for young anglers to learn about some of the fish we normally do not fish for but are important parts of the aquatic environment as they provide food for the larger gamefish. The groups may be fortunate enough to catch some young gamefish. Be sure to release all the protected species that are caught and do not release minnows in bodies of water other than where they were caught.

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What to Do

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Wrap Up

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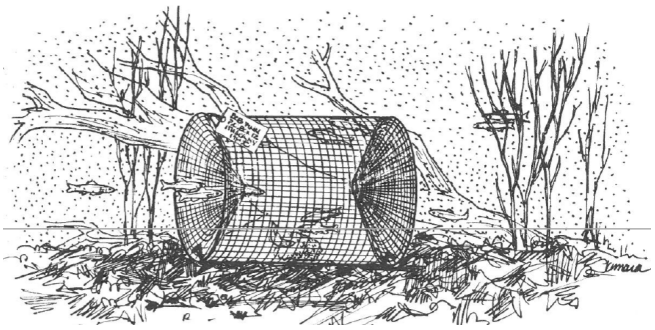

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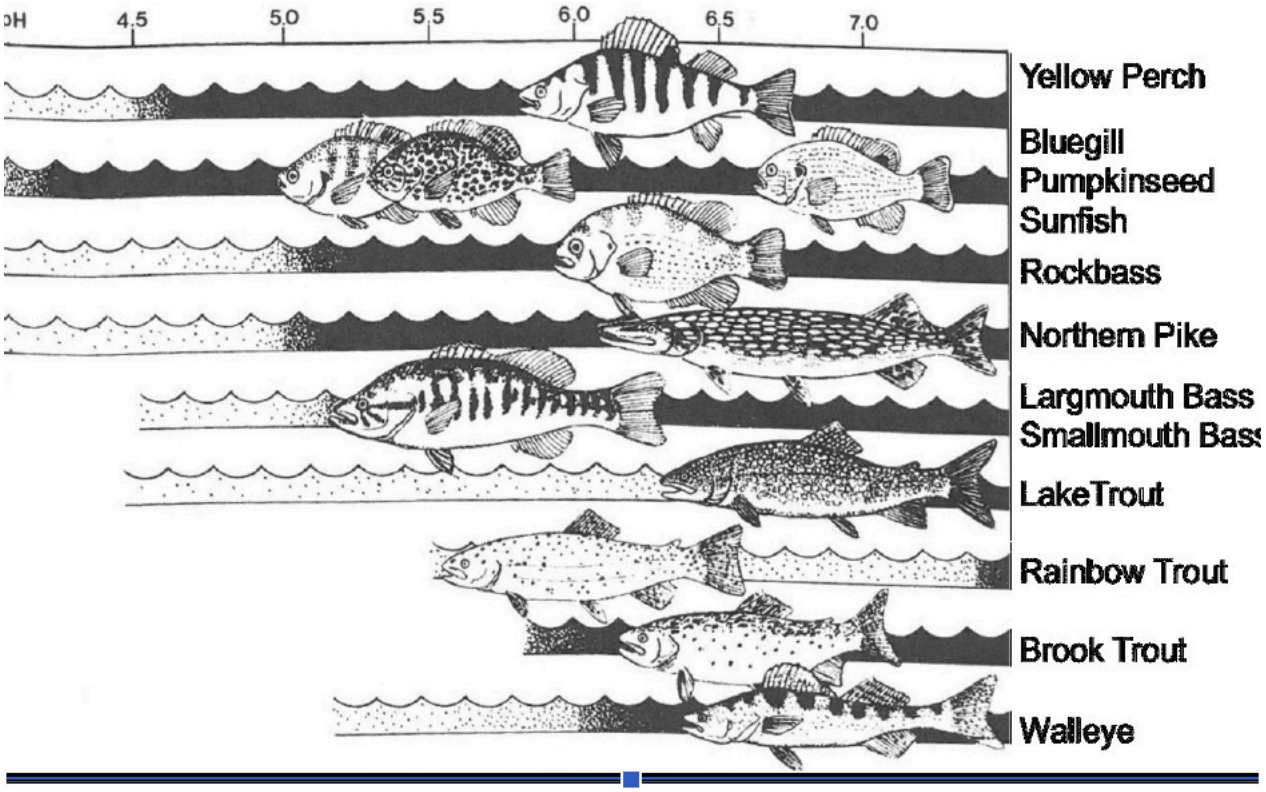


Acid Rain Tolerance in Fish

ACTIVITY RECORD SHEET: Activity 4, Fishing Coldwater Lake Habitats

Measuring the Chemical Environment Activity Record Sheet

Fill in the following table.

Name of Pond: _____

Ph

Average Ph: _____

ACTIVITY RECORD SHEET: Activity 4, Fishing Coldwater Lake Habitats

Predator-Prey

Fill in the following table. Largemouth bass is given as an example.

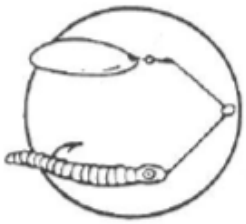
Predator	Prey Items	Artificial Lures	Prey Behavior Lure Presentation
Largemouth Bass	Minnow	Rapala, spinner, spoon, crankbait	In or near cover, swimming action, erratic

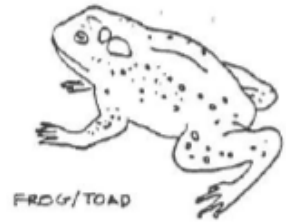
How can knowing what a fish feeds on (its prey) help you to catch that fish?

ACTIVITY RECORD SHEET: Activity 4, Fishing Coldwater Lake Habitats

Matching Lures with Baits

Based on the sampling the pictures of the lure types with the bait or prey they are designed to imitate.





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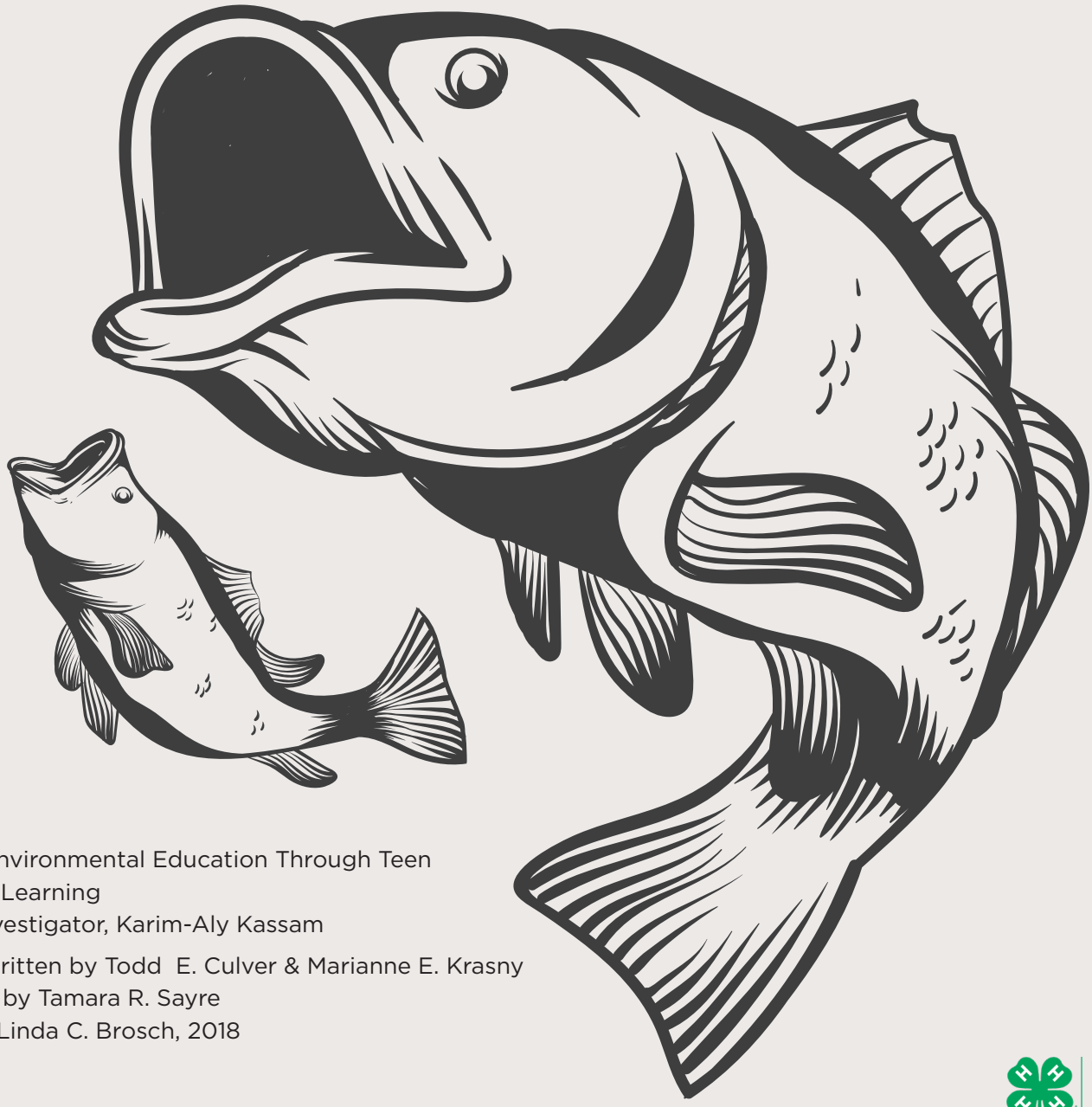
New York State 4-H

SPORT FISHING PROJECT

Fishing Stream & River Habitats

Activity 5

Leader Guide



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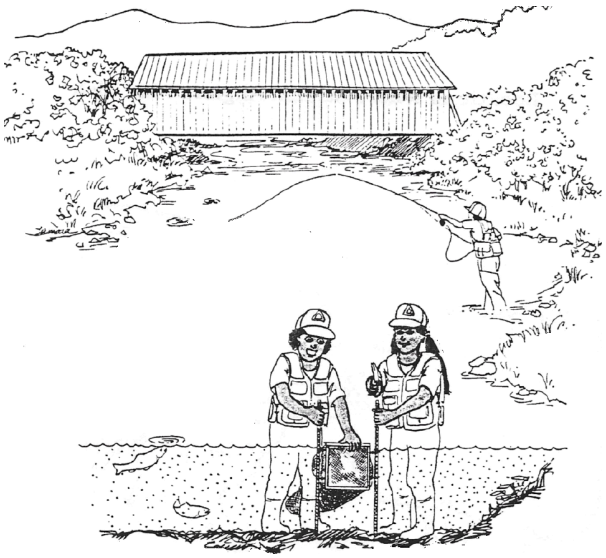

Revised by Linda Brosch, Oswego County Cooperative Extension, 2018

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Written by Todd A. Culver and Marianne Krasny
Illustrated by Tamara R. Sayre
Designed, edited and produced by Karen L. Edelstein and Roslyn E. Scheib
Additional artwork by Steve Sierigk

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— Lucinda A. Noble, Director

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and American Indian and Indigenous Studies Program;
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Linda Brosch, Oswego County Cooperative Extension;
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PREFACE

Ethic of Stewardship through Environmental Education

To whom much is given, much is expected! It is with this outlook; young people are asked to engage in both the learning objectives and activities of environmental education. This curriculum for ***Fishing Stream & River Habitats*** opens a window of curiosity and wonder into the habitat for the 4-H youth.

We do not exist outside of "nature" because it is all around us and we, ourselves, are fundamentally "natural"! We breathe, feed, live, reproduce, and die like other beings. In other words, the habitat consists of communities of living beings all around us. The word 'animal' derived from the Latin root animus meaning that which is endowed with will, spirit, or mind carries with it the understanding that we are part a larger community of beings. The world around us is animate, a source of deep wonder through observation and reflection, and through direct engagement with it, the basis of boundless insight. By mindfully participating in our habitat, we learn as much about it as we do about each other and ourselves.

The Greek word oikos, "household," is the root of the prefix 'eco' in both ecology and economics. In the twenty-first century, we grasp the complex connectivity of geophysical, biological and sociocultural systems, in which the planet is truly our oikos: it is the dwelling place of humanity. However, to understand it, we must begin locally with our habitat, our home.

The objectives of this revised and updated curriculum for the 4-H youth are:

- to generate an appreciation for their natural habitat;
- to provide knowledge about specific aspects of that habitat;
- to directly engage the habitat through guided activity; and
- to develop an ethic of stewardship through responsibility, recognizing that one's community includes the living habitat.

These objectives, while distinct, are not mutually exclusive because they work in tandem to achieve environmental education among youth. For instance, appreciation of ones habitat occurs only when a young person acquires knowledge about it. This knowledge creates wonder and curiosity that act to widen a youth's perception and understanding of their natural environment – to create a wider sense of community. Furthermore, knowledge is firmly grounded among the youth through guided experiential learning by undertaking activities outside. Book learning is not sufficient, as it must be accompanied by direct experience. This engagement, in turn, creates appreciation. Only when one appreciates, does a young person develop a sense of responsibility to care for ones habitat. At its core, this process creates informed and committed youth to environmental stewardship.

Responsibility for ones habitat is at the core of the ethic of stewardship. The word 'steward' combines the two active roles: of being 'in charge' on the one hand; and 'to serve' on the other. Humanity and by extension the 4-H youth are both 'guardians of' and 'servants to' life on this planet. Both ideas are commensurate, equally relevant, neither can be compromised. For 4-H youth, this means inculcating through this curriculum the value of responsibility by demonstrating how a human being is simultaneously in charge of their habitat and by knowledgeable action serves its wellbeing. The specific activities should engender a sense of mutual relationship where the youth benefits from and conserves their habitat.

A human ecological perspective informed by the ethic of stewardship is not only desirable, rather it is a necessary value in the twenty-first century. As a result of engaging (Place the name of the specific curriculum here), over the lifetime of the 4-H youth we should expect:

- An expanded ethic of stewardship encompassing all lands and waters whether they are urban or rural;
- A desire to work collaboratively with employers and employees, educators, artists, clergy and laypeople, young and old alike – to achieve a future that is sustainable;
- An understanding that economic and ecological matters relating to their habitat or home (oikos) are not unrelated, but are profoundly interconnected;
- Valuing of local place-based and indigenous knowledge about landscapes and natural resources; and
- An embrace of the ethic of stewardship throughout their adult life.

In short, it is important that the 4-H youth understands that: once you know about ***Fishing Stream & River Habitats*** you become responsible for your habitat!

Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

INTRODUCTION

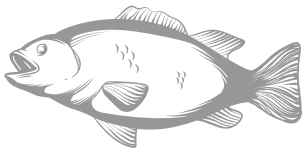
Fishing in streams and rivers is different than fishing in still water. Youth put their skills to the test as they learn where fish are likely to be in the river or stream environment and how to present a lure or bait to those fish. They also wade in moving water for the first time, an excellent opportunity to teach the new anglers wading safety. Respect the water because it is powerful. It can hurt you if you don't!

The ecology of rivers and streams differs greatly from the ecology of ponds and lakes. In this activity, the group takes samples of aquatic insects using a stream sampling net. They also learn to measure current speed and relate current to the food and cover present for fish in the river or stream. If desired, the group could also measure the pH using the equipment from the previous activity.

Dangerous currents are a safety concern while working in and near rivers and streams. Avoid fast moving or deep rivers or streams for this activity. Watch out for holes, snags, and drop-offs in the water. Everyone wading, especially when operating a sampling net, should wear a PFD (personal floatation device).

Website Resources for Fish Identification

NYS DEC Fish:
http://www.dec.ny.gov/animals/269.html
Inland Fishes of New York Directory by Cornell University:
http://www2.dnr.cornell.edu/cek7/nyfish/index.html



New York State P-12 Science Learning Standards*
K-LS1-1, K-ESS3-1
2-LS4-1
3-LS2-1, 3-LS4-3, 3-LS4-
MS-LS2-1, MS-LS2-2, MS-LS2-5, MS-LS4-6

*Effective July 1, 2017

Objectives

Angling Skills
Youth will:
- Learn to locate fish in rivers and streams.
- Demonstrate proper lure or bait presentation techniques.
- Learn to tie a figure eight knot.

Fish Biology & Ecology
Youth will:
- Learn to use the New *York State Fishing Regulations Guide* to find the regulations pertaining to this fishing trip.
- Learn to identify the fish that are caught
- Understand the importance of aquatic insects as food.

Handling Fish
Youth will:
- Learn to how to safely handle coldwater fish species.
- Demonstrate the ability to field dress fish.

Aquatic Sampling
Youth will:
- Learn to measure current speed.
- Learn to build a stream sampling net.
- Learn to sample aquatic organisms using a stream sampling net.

Safety
Youth will:
- Demonstrate how to determine if water may be waded safety.
- Wade in shallow moving water using proper safety.
- Learn to handle knives safely.

Environmental Stewardship
Youth will:
- Show respect for landowner's property rights, other resource users, and the environment while demonstrating responsible fishing behavior.

MATERIALS AND EQUIPMENT

Pre-Trip Meeting

- *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app
- *New York State Fishing Regulations Guide*
- Pencil for each member
- Topographic map of the area
- Nylon cord, 2 pieces for each person
- Tape measure or yardstick
- One 4-foot section of nylon cord and an eye-bolt for each member

Stream Sampling Net

- 2 strong metal rods (concrete reinforcing rods work well), 3 feet (1 m) long
- 4 screw-eyes, large enough to fit over metal rods
- 2 hose clamps, large enough to fit over metal rods
- Old nylon stocking or fiberglass screening (about 4 foot square or 0.4 meters square)
- 1”x2” lumber, pre-cut into 4 12-inch (0.3 m) sections
- Small galvanized nails
- Hammer
- Staple gun or fishing line

Fishing Trip

- *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app
- *New York State Fishing Regulations Guide*
- One fishing pole for each youth with 4-8 lb (1.8-3.6 kg) test monofilament line (spin-casting or bamboo rods are easiest to use)
- Pencil for each person
- Variety of natural baits worms, grubs, small insects, very small minnows, or crayfish
- Variety of artificial lures
- Hooks, sinkers, bobbers, swivels etc.
- Landing net
- Needle-nosed pliers or hook remover
- Stringers or buckets, if you plan to keep some of the fish
- Measuring board or tape
- Cutting board
- Sharp knife
- Ice and cooler, if you plan to keep some fish
- Camera (optional)
- Personal floatation devices (PFDs)
- Weighted thermometer
- Water depth gauge
- Current speed kit, including yard stick or measuring tape, stopwatch, and several sticks large enough to be seen from a distance
- Stream sampling net
- First aid kit (including emergency telephone numbers)
- Permission slip

WHAT TO DO

This activity should be divided into pre-trip meeting and a fishing trip. During the pre-trip meeting, you can introduce members to the fish they are likely to catch and the knots they will be tying. In addition, the group will build a stream sampling net.

If you are planning to fish on private property or need to cross private land to fish public water, get permission from the landowner well in advance. In addition because youth will be wading in moving currents, be sure to select a portion of the stream or river that has shallow, slow-moving currents, sand or gravel bottoms, and is free of obstructions.

Stream sampling nets are most effective if they are set and allowed to collect insects overnight. Most insect species that display drifting behavior do so primarily at night, most likely to avoid predation. If possible, set the stream sampling net the evening before the fishing trip

Pre-Trip Meeting

1. Introduce the fishing and sampling trip by explaining where you will be going, the types of fish the group is likely to catch, and whether the river or stream is on private or public land. Show the group a topographic map of the area and point out characteristics (altitude, geology, surrounding land uses, etc.) that may influence the stream or river and its fish.

2. On any fishing trip, anglers should know the fishing regulations and be able to identify the fish species they're likely to catch. Have half of the club members look up the panfish species they may catch in *Guide to Freshwater Fishes* or New York Fishing, Hunting & Wildlife app , and the other half look up the regulations regarding those species in the *New York State Fishing Regulations Guide*.

3. Have the participants who looked up the regulations share what they find out about the size restrictions, length limits, and daily limits for the species they may catch. Have the members who looked up the fish species tell the others what to look for to identify these fish.

4. Pass out a section of nylon cord and a small eye-bolt to each participant. Show them how to tie a figure eight knot using the pieces of nylon. The figure eight knot is a strong useful knot to know for all outdoor activities.

5. Select group members that have not built any sampling equipment and get them started on building the streams sampling net by following the provided instructions. While one part of the group works on building the sampling net, the other part can practice their knots. Check to see if anyone needs help.

6. Explain the trip safety precautions (accidental hooking, horse play, dangerous areas).

7. Before the everyone leaves, be sure they know when and where to meet and what to bring for the fishing trip. Remind each club member to bring his or her permission slip. Discuss any other items the club members need to bring on the trip such as clothing, proper footwear, insect repellent, sunscreen, hat, fishing equipment, water, lunch, fishing regulations book and fish identification guides.

Fishing Trip

1. If you did not set the stream sampling net the evening before, the first thing you should do is to set up the stream sampling net and allow it to collect organisms while the group fishes. Select a location well away from the fishing site, preferably upstream, to minimize disturbances. The sampling activities will involve wading and are likely to disrupt the fishing immediately downstream. Select a sampling site where the group will not disrupt other anglers.

2. Before wading out to set the net, demonstrate how anglers can increase their personal safety while wading. Polarized sunglasses allow anglers to see holes and obstacles. Wearing PFDs provides an extra margin of safety in swiftly moving currents. Wading staffs help waders keep their footing and helps them avoid accidental falls.

3. The stream sampling net should be set in the center of the current, 8-12 inches (20-30 cm) deep. Using a hammer, pound the two metal rods into the stream bottom, spaced so the screw-eyes on the wooden frame slip over the rods.

4. Lower the wooden frame onto the metal rods and hold it just below the surface of the water using the hose clamps.

5. Be sure that the net is not tangled. Let the net collect insects for as long as possible.

6. By now the group should be handling both the spinning and spin casting equipment with ease. Allow the participants to choose whether they want to fish with bait or artificial lures. Have a variety of natural baits and lures for them to choose from. Remind them to record any catch they make in their Fishing Journal and share information about what is catching fish with other group members.

7. Point out areas in the river or stream that may hold fish, such as behind rocks and debris or beneath undercut banks.

8. As the group starts fishing, move around and point out how to present lures or baits to fish in rivers or streams. Explain that fish hide in pockets where the current is relatively weak. These fish face upstream, swimming into the current to stay in place. Show the new anglers how to work their way upstream so that the fish do not see them approach. You may need to demonstrate how to cast across the stream, working the bait or lure into likely pockets of cover.

9. Help the group identify the fish they have caught. Ask the youth to think about what would happen to the fish population if people only fished with nets. What size fish gets caught? What are the dominant species caught? How would catching only these fish affect the ecosystem?

10. Have the group measure the length of each fish caught, using a measuring board or tape, and record the information in their Fishing Journals.

11. If you keep some of the fish to eat, remind the participants how to field dress the fish, and the safety precautions of using knives. Set up a cleaning station where the youth can bring the fish to clean and ice. It is best to have at least one other adult supervise the youth while they are cleaning fish. Be sure to dispose the waste properly.

12. As the participants field dress the fish, have them open up the stomachs and identify what the fish have been eating. This may provide tips on what might be effective baits and lures.

13. Plan to finish fishing before the participants lose interest. If the fishing is not great, the group may want to concentrate more on the sampling activity.

14. At the end of the day, return to the stream sampling net site and wade out to the sampler.

Stroke the sides of the net and use the water current to wash all of the collected sample into the back of the net. Slide the net off the metal rods and pull them out of the stream or river bottom. Transfer what you have captured into a bucket or container of water for easier observation. Pick out any plant materials, such as leaves or sticks, that interfere with observing the sampled organisms.

15. Have the group identify what was caught.

16. Have the group determine the speed of the stream or river.

Fishing Trip Wrap-Up

1. Have everyone thank the landowner or a member of the landowner's family for the day's fishing. If some of the fish were kept, offer to share some of the catch. Ask the club members to send a thank-you note to the landowner.

2. Discuss some of the landowner's concerns over letting people fish his or her stream or river and what responsible anglers can do to keep the landowner happy and the stream or river open for fishing.

3. Preview the next meeting with the members. Discuss what the activities will be and how they can prepare for the meeting. Always try to end a club meeting with the members more excited and enthusiastic about the New York State 4-H Sport Fishing Project than before the meeting started.

ACTIVITY 5: Background Materials

Using a Stream Sampling Net

Introduction

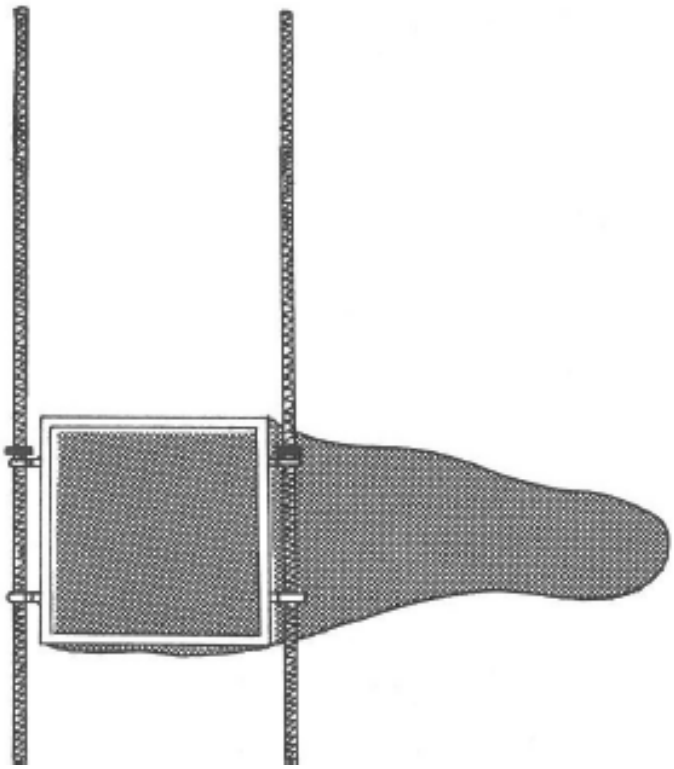
Stream sampling nets are a common tool used by fisheries biologists to study the aquatic insects found in rivers and streams. Aquatic insects drift or float downstream, mostly at night. This type of sampler takes advantage of that behavior and collects the insects by capturing them in the net as the current sweeps by. Combined with information on the stream's total flow and current speed, sampling with this net allows a biologist to accurately estimate the number and types of aquatic insects present in a body or water. This can provide an insight into the food available to fish.

In this activity, the youth will build and set up a stream sampler to collect aquatic organisms. The materials used to build a sampler are inexpensive and easily obtained. The insects collected are the primary food of many species of trout and are the models for many of the common fly patterns used by fly enthusiasts.

Dangerous currents are a safety concern while working in and near rivers and streams. Avoid fast moving or deep rivers or streams for this activity. Watch out for holes, snags, drop-offs in the water. Non-swimmers should wear life vests while they are on the bank. Everyone wading, especially when operating a sampling device, should wear a PFD (personal floatation device). Minimize the number of youth in the water at one time, and be sure they are under adult supervision.

Materials & Equipment

- 1-inch by 2-inch (2-5 cm) lumber cut into four 12-inch (30 cm) sections
- Four screw-eyes
- A piece of fine mesh netting or burlap
- Two 4-foot (1.2 m) metal or concrete-reinforcing rods
- 20-30 foot (7-10 m) nylon rope
- White containers or buckets



Building the Stream Sampling Net

1. Make the wooden frame by nailing together the four pre-cut 1-inch by 2-inch (2 by 5 cm) lumber. Two sections form the sides of the frame and the other two sections forms the top and bottom.
2. Sew or staple the stocking to the wooden frame to form a net.
3. Place the screw-eyes on upright opposite sides of the wooden frame, about 2 inches (5 cm) from each end. The metal rods should slide through the screw-eyes parallel with the wooden frame.

Using the Stream Sampling Net

1. Set up the stream sampler and allow it to collect organisms while you do the other exercises.

Select a location well away from the other activities, preferably upstream, to minimize disturbances. The best results would be obtained by setting this net and allowing it to sample organisms overnight. Secure the sampler against being washed downstream by typing a rope through one of the screw-eyes and attaching the rope to a tree or a strong bush on the bank of the stream.

2. The sampling net should be set in the center of the current, 8-12 inches (20-30 cm) deep. Using a hammer, pound the two metal rods into the stream bottom, spaced so the screw-eyes on the wooden frame slip over the rods.

3. Lower the wooden frame onto the metal rods and hold it just below the surface of the water using the hose clamps.

4. Be sure that the net is not tangled. Let the net collect insects for as long as possible.

5. At the end of the day, return to the stream sampling net site and wade out to the sampler. Stroke the sides of the net and use the water current to wash the collected sample into the back of the net. Slide the net off the metal rods and pull them out of the stream or river bottom. Transfer what you have captured into a bucket or container of water for easier observation. Pick out any plant material, such as leaves or sticks, that interfere with observing the sampled organisms.

6. Using the appropriate field guides and keys (aquatic plants, crustaceans, and fish) try to identify what was caught. Think about what would happen to the animal populations in the area if people only fished with nets. What size organisms get caught? What are the dominant species caught? How would catching only these organisms affect the ecosystem?

ACTIVITY 5: Background Materials

Current Speed

The current of the stream has an influence on what fish are present. This is because the current largely determines what plants and arthropods are present, along with the amount of energy that a fish uses to stay in one place.

Almost any plant living in a current has some way to hold it in place. Algae may use secretions or holdfast cells to attach to rocks. Larger plants may be rooted in the bottom of a stream. Plankton generally do not exist in fast moving water. Immature insects, including the larvae of caddisflies, dobson flies and alder flies, and the nymphs of mayflies and stoneflies require running water. These animals may live under or cling to the surface of rocks. Trout and salmon that prefer cold, moving water feed on these insects.

Current is generally slower nearer the bottom or side of the stream than at the surface, mid-depth, or center. This is because of the drag exerted by the shore or bottom. Current will also be slower in depressions and behind rocks or other obstacles. Fish will position themselves near the bottom and in other areas of slower current. They will face into the flow of the water and wait for food to be carried past them. Because these fish rarely move far to catch a meal, it is important for the angler to present a bait or lure near the fish. Otherwise, the bait will be carried downstream without response.

ACTIVITY 5: Background Materials

Aquatic Insect Habitats

When a person looks at a lake, stream or pond, he or she may see only one habitat. However, from a small insect's "point of view," there are a number of different "micro-habitats" within a larger body of water.

Aquatic insects can be divided into three basic groups, depending on the micro-habitat in which they are found. These groups are:

1. insects that live on the surface of the water;
2. insects that move freely through the water column;
3. insects that cling to the surface of submerged vegetation or rocks;
4. insects that live on the bottom of a body of water.

Insects that occupy the surface habitat have specialized adaptations which allow them to actually walk on the water. For example, the feet of the water striders secrete a substance which repels water, thereby keeping them from "falling through" the surface. Almost all surface dwellers are predators and move rapidly, feeding on any insects that may land on the water surface.

The insects which move freely thoroughly the water column are easily swept downstream because of their small size. Therefore, they are found only in slow moving rivers or lakes and ponds. There are many adaptations which allow insects to move through the water column. Predaceous diving beetles have hairs on their legs which expand to make large "paddles." Rather than swim, dragonfly nymphs propel themselves through the water by contracting their abdomen and creating a jet of water.

However, these insects do not spend all of their time moving through the water column. They can often be found near the surface getting air or resting on submerged vegetation on the bottom of the body of water. As with the surface dwellers, most of the swimmers are voracious predators– just ask anyone who has experienced the painful bite of the giant water bug or "toe biter." Insects inhabiting the water column will feed on just about anything, from plankton and insects to amphibians and small fish.

By far the largest groups of aquatic insects are those which cling to submerged vegetation or rocks or live on the bottom of the body of water. This is due to the abundant food sources, including dead plant and animal material and algae which accumulate in this habitat, and the protection plants and submerged objects can provide. The insects that inhabit the bottoms of swift moving streams and rivers have adaptations which help them from being swept downstream. Stonefly nymphs are flattened in appearance, and use the flow of the water to hold themselves in place. Blackfly larvae have a special suction device that allows them to adhere to rocks. Other insects' larvae, such as that of the caddisfly, stay on the downstream and undersides of rocks to avoid swift currents.

Aquatic insects are an essential part of aquatic ecosystem. They help recycle dead plant and animal material, and provide a vital link in the food web to larger animals such as ourselves.

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NEW YORK STATE 4-H

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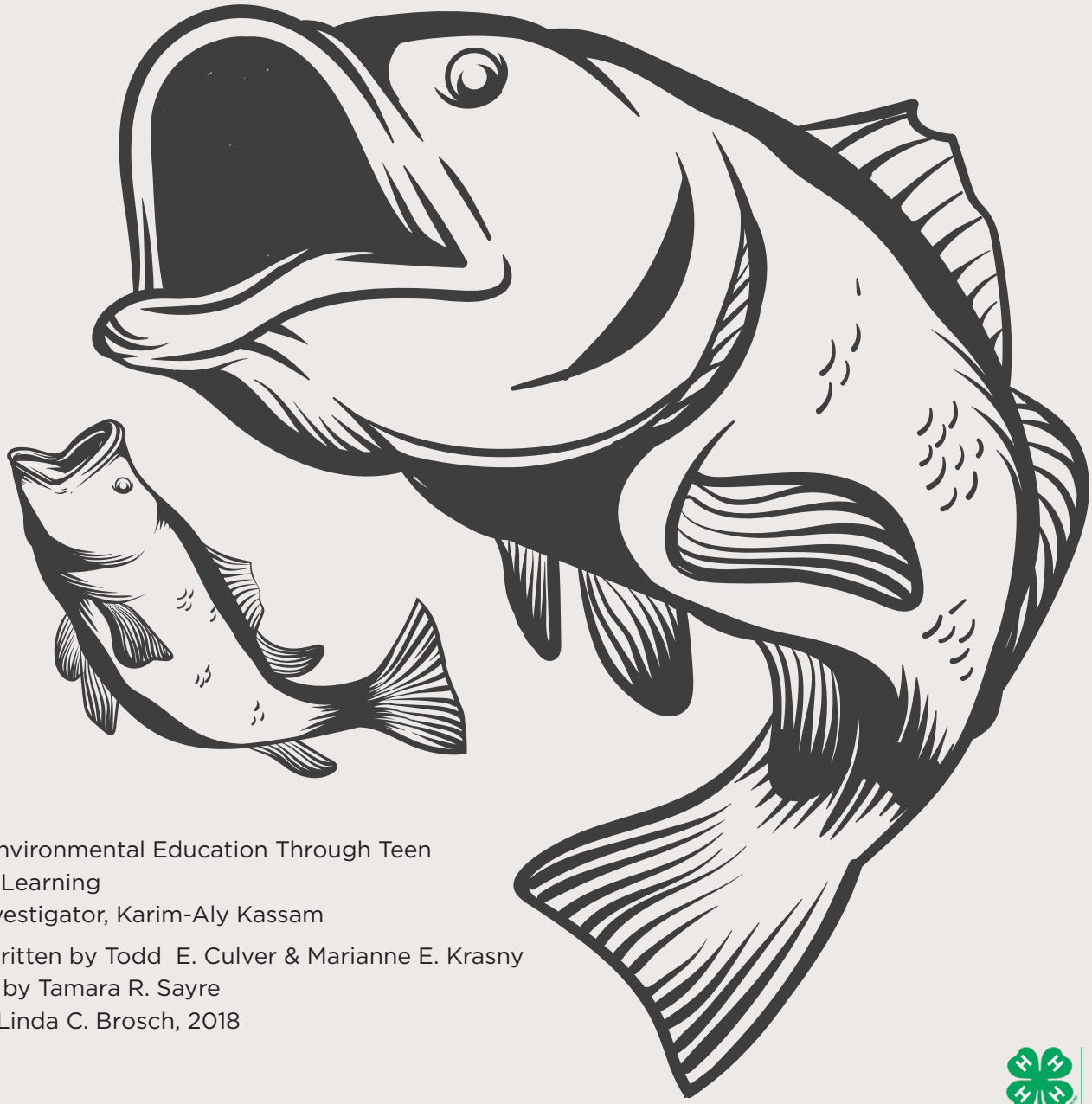
New York State 4-H

SPORT FISHING PROJECT

Fishing Stream & River Habitats

Activity 5

Member Guide



Engaging Environmental Education Through Teen Experiental Learning

Principal Investigator, Karim-Aly Kassam

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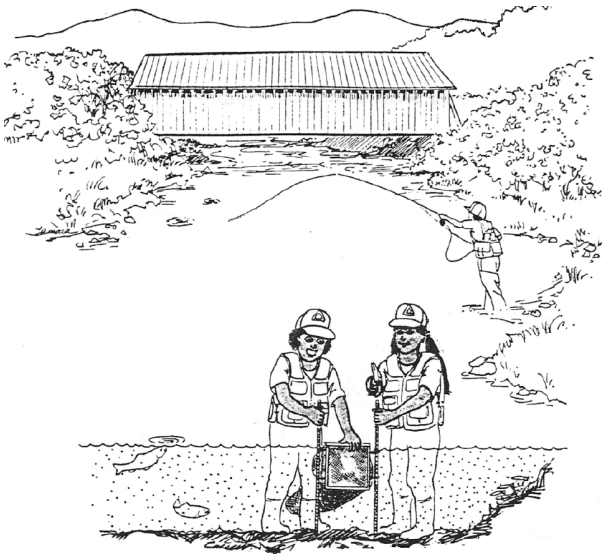

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Responsibility for ones habitat is at the core of the ethic of stewardship. The word 'steward' combines the two active roles: of being 'in charge' on the one hand; and 'to serve' on the other. Humanity and by extension the 4-H youth are both 'guardians of' and 'servants to' life on this planet. Both ideas are commensurate, equally relevant, neither can be compromised. For 4-H youth, this means inculcating through this curriculum the value of responsibility by demonstrating how a human being is simultaneously in charge of their habitat and by knowledgeable action serves its wellbeing. The specific activities should engender a sense of mutual relationship where the youth benefits from and conserves their habitat.

A human ecological perspective informed by the ethic of stewardship is not only desirable, rather it is a necessary value in the twenty-first century. As a result of engaging (Place the name of the specific curriculum here), over the lifetime of the 4-H youth we should expect:

- An expanded ethic of stewardship encompassing all lands and waters whether they are urban or rural;
- A desire to work collaboratively with employers and employees, educators, artists, clergy and laypeople, young and old alike – to achieve a future that is sustainable;
- An understanding that economic and ecological matters relating to their habitat or home (oikos) are not unrelated, but are profoundly interconnected;
- Valuing of local place-based and indigenous knowledge about landscapes and natural resources; and
- An embrace of the ethic of stewardship throughout their adult life.

In short, it is important that the 4-H youth understands that: once you know about ***Fishing Stream & River Habitats***, you become responsible for your habitat!

Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

INTRODUCTION

Picture a red-colored bridge over a deep green pool, hazy blue mountains in the background, and a happy angler, waist deep in a riffle, wicker basket full of brook trout. What a beautiful scene! This New York State 4-H Sport Fishing Project activity can put a person right in the middle of such a glorious picture.
Fishing in streams and rivers offers anglers challenges not found in ponds and lakes. The moving water adds something new and different. The current dramatically affects the fish and fishing. On this fishing trip a person will have the chance to wade in a stream, experience moving-water fishing techniques, and check out the different kinds of life that make their homes in streams and rivers.

When people imagine fish in a steam or river, they often think of trout. And in many places in New York State the brown, rainbow or brook trout offers some great stream fishing. In fact, if you haven't already learned how to tell the different trout apart, you should learn how in this activity. Trout are not the only fish in a stream, however. In some areas the fishing will be for smallmouth bass or perhaps bullheads, suckers, or carp. Larger rivers may contain walleye, northern pike, and even muskellunge.

This makes it extra important to know how to use the *New York State Fishing Regulations Guide*. There is more to it than just knowing when fishing season begins! One never knows what he or she might catch in a New York river, and knowing that trout season opens on April 1st will not be very helpful when a nice bass shows up on the other end of the line. There are many different rules governing many different waters, and an angler who does not know them may be missing out on a lot of good fishing, or may find him or herself in a lot of hot water, so to speak. Good stream anglers know how important it is to understand moving water. A lack of understanding often means the bait is never where the fish are, a situation that is not likely to result in a lot of trout in that old wicker creel. While fishing streams and rivers, you will be measuring the speed of the stream current. Knowing about the current, where it is fast and where it is slow, can help one to find likely spots that hold fish. Here is another one of those clues that angler detectives use!

The group will also be sampling the living organisms in the stream and exploring food webs in moving waters. How are these organisms different from or the same as the ones you have been finding in lakes and ponds? How are these organisms adapted to life in moving waters? Do you find different kinds of organisms in fast moving water than in slow moving? How will this information affect how you fish?

The successful stream anglers knows where fish are likely to be caught by "reading water." By the time you are complete this Fishing Stream and River Habitats Activity, you will have begun to read the water yourself. Successful anglers also respect the environment. They practice environmental stewardship, which is the **responsible use and protection of the environment** through conservation and sustainable practices both at home and while fishing. It is with the help of such caring and mindful practices that fish populations will continue to thrive and grow.

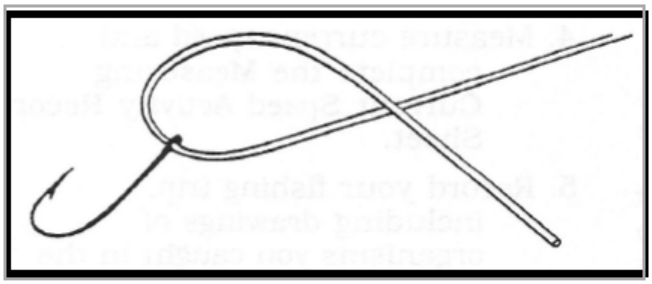
In your Fishing Stream & River Habitats activity, you will:

- Learn to tie a figure eight knot and the dropper loop knot.
- Build a stream sampling net.
- Use your stream sampling net to find out what organisms are found in moving water. Use care when handling the organisms in your stream sampling net. Some of the organisms may be rare. Return them to the stream when you are done.
- Measure current speed and complete the Measuring Current Speed Activity Record Sheet.
- Record your fishing trip, including drawings of the organisms you caught in the stream sampling net, in the Fishing Journal.
- Fish safely and have fun!

ACTIVITY 5: Background Materials

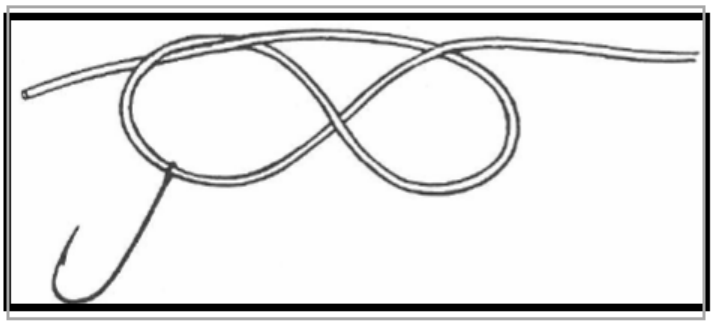
Tying A Figure Eight Knot

1



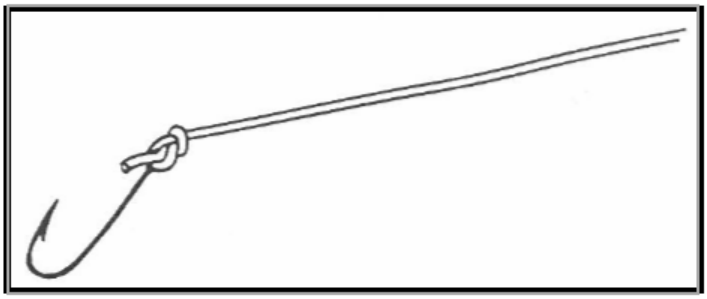
Insert the end of the braided wire through the lure or hook. Bring the end back around and lay it under the standing part of the line.

2



Pass the end of the braided wire over the standing part of the line. Insert it in the loop that is formed at the eye of the hook or lure. You should see the shape of the figure eight.

3



Holding the hook or lure in your one hand, pull the standing part of the braided wire with your other had to secure the knot. Trim the knot, leaving about 1/16 of an inch (2mm) of wire extending part the knot.

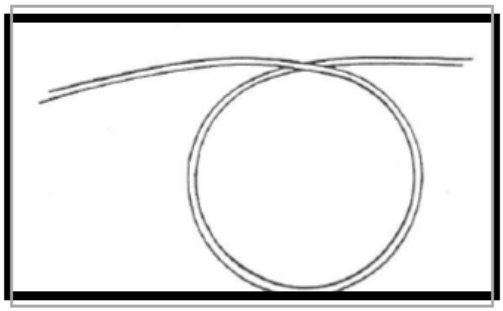
Source

Practical Fishing Knots, by Lefty Kreh and Mark Sosin. Crown Publishers, Inc. : New York 1972

ACTIVITY 5: Background Materials

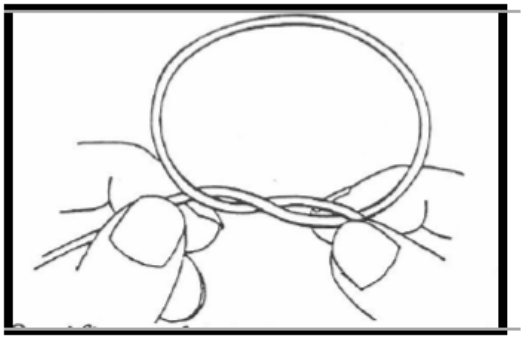
Tying A Dropper Loop Knot

1



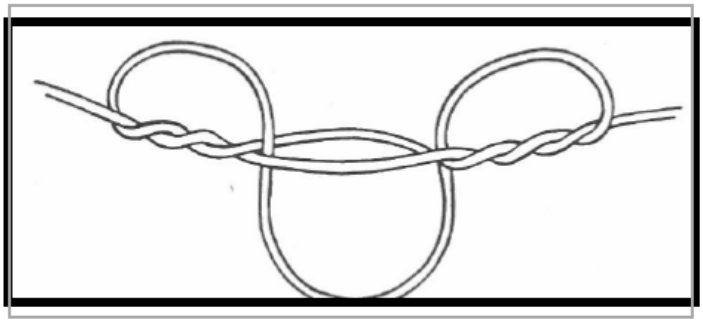
Form a loop in the line.

2



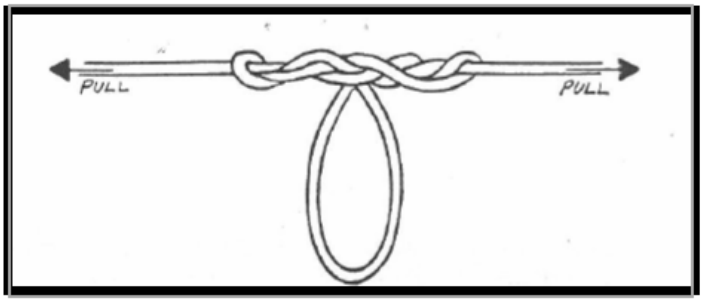
Pull one side of the loop down and begin making turns with it around the main-line by twisting the loop. Keep the point open where the turns are made so the turns gather equally on each side.

3



After 8 to 10 turns, reach through the center, opening and pull the remaining loop through. Keep a finger in this loop so it will not spring back.

4



Hold the loop with your teeth and pull both ends tight. This is not a strong knot but it works well for smaller fish.

Source

Practical Fishing Knots, by Lefty Kreh and Mark Sosin. Crown Publishers, Inc. : New York 1972

ACTIVITY 5: Background Materials

Using a Stream Sampling Net

Introduction

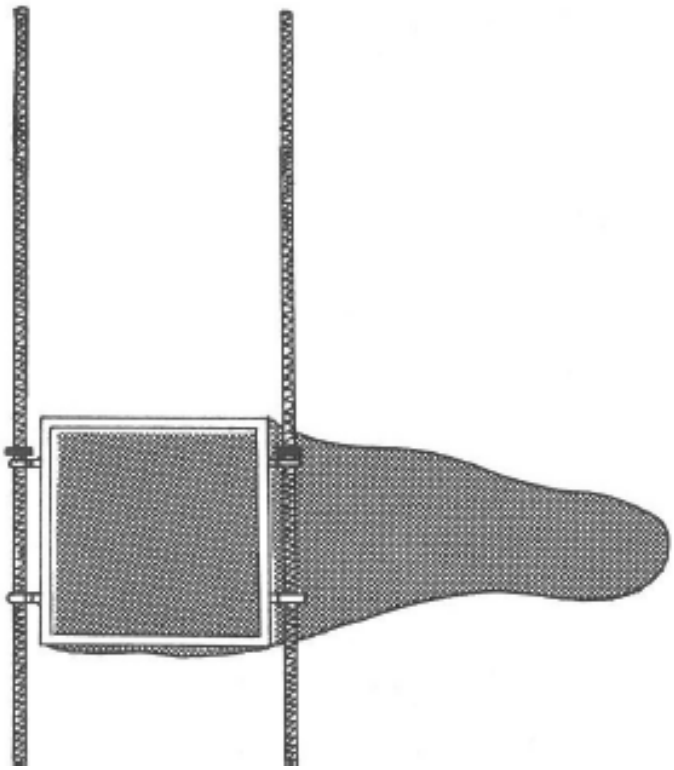
Stream sampling nets are a common tool used by fisheries biologists to study the aquatic insects found in rivers and streams. Aquatic insects drift or float downstream, mostly at night. This type of sampler takes advantage of that behavior and collects the insects by capturing them in the net as the current sweeps by. Combined with information on the stream's total flow and current speed, sampling with this net allows a biologist to accurately estimate the number and types of aquatic insects present in a body or water. This can provide an insight into the food available to fish.

In this activity, the youth will build and set up a stream sampler to collect aquatic organisms. The materials used to build a sampler are inexpensive and easily obtained. The insects collected are the primary food of many species of trout and are the models for many of the common fly patterns used by fly enthusiasts.

Dangerous currents are a safety concern while working in and near rivers and streams. Avoid fast moving or deep rivers or streams for this activity. Watch out for holes, snags, drop-offs in the water. Non-swimmers should wear life vests while they are on the bank. Everyone wading, especially when operating a sampling device, should wear a PFD (personal floatation device). Minimize the number of youth in the water at one time, and be sure they are under adult supervision.

Materials & Equipment

- 1-inch by 2-inch (2-5 cm) lumber cut into four 12-inch (30 cm) sections
- Four screw-eyes
- A piece of fine mesh netting or burlap
- Two 4-foot (1.2 m) metal or concrete-reinforcing rods
- 20-30 foot (7-10 m) nylon rope
- White containers or buckets



Building the Stream Sampling Net

1. Make the wooden frame by nailing together the four pre-cut 1-inch by 2-inch (2 by 5 cm) lumber. Two sections form the sides of the frame and the other two sections forms the top and bottom.
2. Sew or staple the stocking to the wooden frame to form a net.
3. Place the screw-eyes on upright opposite sides of the wooden frame, about 2 inches (5 cm) from each end. The metal rods should slide through the screw-eyes parallel with the wooden frame.

Using the Stream Sampling Net

1. Set up the stream sampler and allow it to collect organisms while you do the other exercises.

Select a location well away from the other activities, preferably upstream, to minimize disturbances. The best results would be obtained by setting this net and allowing it to sample organisms overnight. Secure the sampler against being washed downstream by typing a rope through one of the screw-eyes and attaching the rope to a tree or a strong bush on the bank of the stream.

2. The sampling net should be set in the center of the current, 8-12 inches (20-30 cm) deep. Using a hammer, pound the two metal rods into the stream bottom, spaced so the screw-eyes on the wooden frame slip over the rods.

3. Lower the wooden frame onto the metal rods and hold it just below the surface of the water using the hose clamps.

4. Be sure that the net is not tangled. Let the net collect insects for as long as possible.

5. At the end of the day, return to the stream sampling net site and wade out to the sampler. Stroke the sides of the net and use the water current to wash the collected sample into the back of the net. Slide the net off the metal rods and pull them out of the stream or river bottom. Transfer what you have captured into a bucket or container of water for easier observation. Pick out any plant material, such as leaves or sticks, that interfere with observing the sampled organisms.

6. Using the appropriate field guides and keys (aquatic plants, crustaceans, and fish) try to identify what was caught. Think about what would happen to the animal populations in the area if people only fished with nets. What size organisms get caught? What are the dominant species caught? How would catching only these organisms affect the ecosystem?

ACTIVITY 5: Background Materials

Measuring Current Speed

Introduction

You can determine the speed of a stream by dropping a stick in the water and timing how long it takes to travel a certain distance. The current of a stream may be different at different places. That is why it is good to measure current speed at several locations, for example, at the inside and the outside of a bend in the stream. Being aware of the stream current can help you predict what fish are likely to be present.

Materials & Equipment

- Tape measure or yardstick
- Stopwatch, or watch with a secondhand
- Several sticks large enough to be seen from a distance
- Water Current Activity Record Sheet
- pencil

What to Do

1. The Water Current Activity Record Sheet will help you with the arithmetic needed to determine current speed.

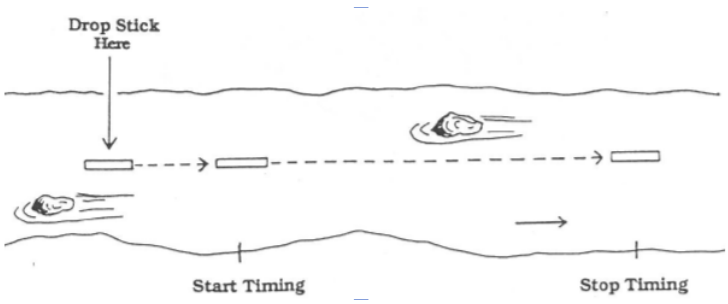
2. Divide into teams of 2 or 3 people. One person of each team should measure the length of his or her pace. One pace is the length of one step with the left foot plus one step with the right foot.

3. Mark off the beginning and end of the section of the stream you plan to measure. Then have one team member pace off that section of stream. Determine the length of this section based on your pace. For example, if one pace is equal to 2 feet (0.6 m), then 20 paces will be equal to a 40 foot (12 m) section of stream.

4. Have one team member stand at the beginning of the section of stream with the sticks. Another team member should stand at the end with the stopwatch. The first team member should toss the stick in the water several feet above the starting point. When the middle of the stick crosses the starting point, the first team member will say "go" and the second team member starts timing. When the middle of the stick reaches the end point, stop timing, and record the time on the Water Current Activity Record Sheet.

5. To determine the stream speed, divide the length of the section of the stream by the number of seconds it took for the stick to travel that distance. For example, if the stick took 20 second to travel 40 feet (12 m), then the speed of the stream is 40 feet divided by 20 seconds or 2 feet per second (0.6 m per second).

6. Repeat the measurement of the same stream section 2 or 3 times to get an average current speed.



ACTIVITY RECORD SHEET: Activity 5, Fishing Stream & River Habitats

Water Current

Name of Stream _____ Date: _____

Length of 2 paces in feet = _____ feet

Number of paces along stream section = _____

Length of stream section _____
(length of one pace x number of paces)

Time 1 (in seconds) for stick to travel stream section _____
Length of stream section / Time 1

Current speed 1 _____ feet/second
Length of stream section / Time 2

Time 2 (in seconds) for stick to travel stream section _____

Current speed 2 _____ feet/second
Length of stream section / Time 3

Time 3 (in seconds) for stick to travel stream section _____

Current speed 3 _____ feet/second
Current speed 1 + speed 2 + speed 3 / 3

Average current speed _____ feet/second

How might current speed affect aquatic insects?

How might current speed affect fish?

Where might you expect to find the fish in a stream you are fishing? Why?

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USDA NIFA

NEW YORK STATE 4-H

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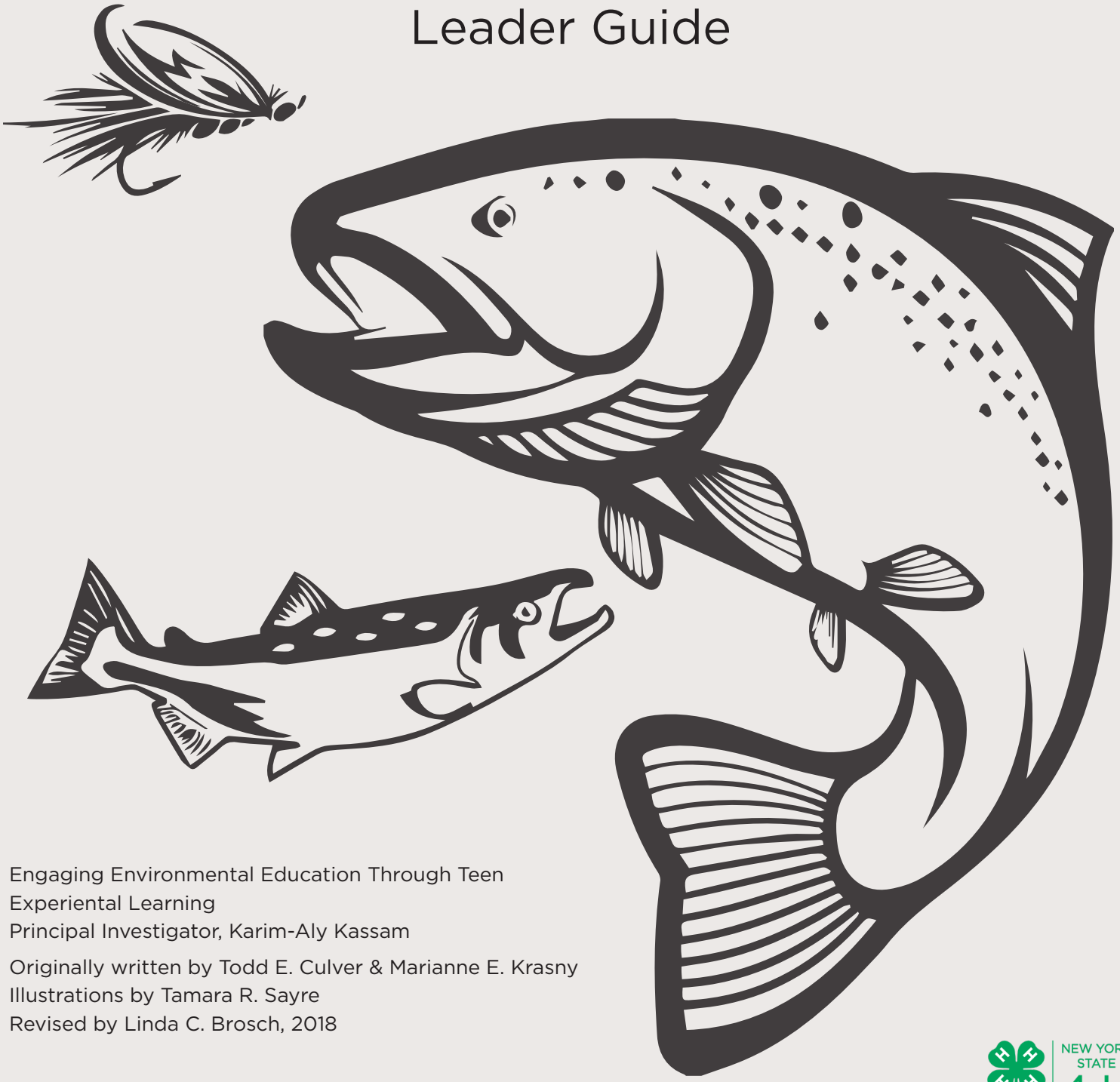
New York State 4-H
SPORT FISHING PROJECT

Fly Fishing FUNdamentals

Activity 6

Leader Guide

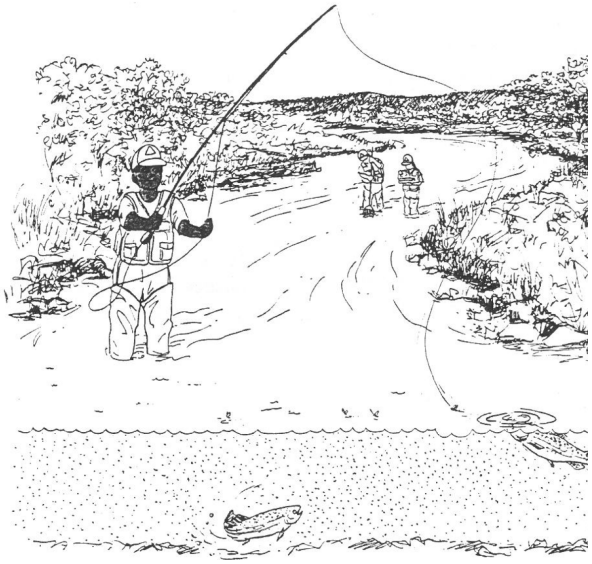


Engaging Environmental Education Through Teen Experiental Learning
Principal Investigator, Karim-Aly Kassam

Originally written by Todd E. Culver & Marianne E. Krasny
Illustrations by Tamara R. Sayre
Revised by Linda C. Brosch, 2018

Cornell University Cooperative Extension

NEW YORK STATE 4-H



Revised by Linda Brosch, Oswego County Cooperative Extension, 2018

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Designed, edited and produced by Karen L. Edelstein and Roslyn E. Scheib.
Additional artwork by Steve Sierigk.

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— Lucinda A. Noble, Director

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PREFACE

Ethic of Stewardship through Environmental Education

To whom much is given, much is expected! It is with this outlook; young people are asked to engage in both the learning objectives and activities of environmental education. This curriculum for ***Fly Fishing FUNdamentals*** opens a window of curiosity and wonder into the habitat for the 4-H youth.

We do not exist outside of "nature" because it is all around us and we, ourselves, are fundamentally "natural"! We breathe, feed, live, reproduce, and die like other beings. In other words, the habitat consists of communities of living beings all around us. The word 'animal' derived from the Latin root animus meaning that which is endowed with will, spirit, or mind carries with it the understanding that we are part a larger community of beings. The world around us is animate, a source of deep wonder through observation and reflection, and through direct engagement with it, the basis of boundless insight. By mindfully participating in our habitat, we learn as much about it as we do about each other and ourselves.

The Greek word oikos, "household," is the root of the prefix 'eco' in both ecology and economics. In the twenty-first century, we grasp the complex connectivity of geophysical, biological and sociocultural systems, in which the planet is truly our oikos: it is the dwelling place of humanity. However, to understand it, we must begin locally with our habitat, our home.

The objectives of this revised and updated curriculum for the 4-H youth are:

- to generate an appreciation for their natural habitat;
- to provide knowledge about specific aspects of that habitat;
- to directly engage the habitat through guided activity; and
- to develop an ethic of stewardship through responsibility, recognizing that one's community includes the living habitat.

These objectives, while distinct, are not mutually exclusive because they work in tandem to achieve environmental education among youth. For instance, appreciation of ones habitat occurs only when a young person acquires knowledge about it. This knowledge creates wonder and curiosity that act to widen a youth's perception and understanding of their natural environment – to create a wider sense of community. Furthermore, knowledge is firmly grounded among the youth through guided experiential learning by undertaking activities outside. Book learning is not sufficient, as it must be accompanied by direct experience. This engagement, in turn, creates appreciation. Only when one appreciates, does a young person develop a sense of responsibility to care for ones habitat. At its core, this process creates informed and committed youth to environmental stewardship.

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- An understanding that economic and ecological matters relating to their habitat or home (oikos) are not unrelated, but are profoundly interconnected;
- Valuing of local place-based and indigenous knowledge about landscapes and natural resources; and
- An embrace of the ethic of stewardship throughout their adult life.

In short, it is important that the 4-H youth understands that: once you know about ***Fly Fishing FUNdamentals***, you become responsible for your habitat!

Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

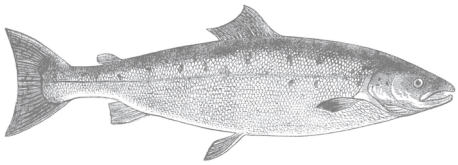
INTRODUCTION

There are few pleasures in the sport of fishing that can match the thrill of taking fish on an artifical fly of your own creation. This activity will give the members of your group the opportunity to do just that. Young anglers in particular find fly dying a fun and rewarding spin-off activity of angling. Fly tying is also an excellent way to learn about the ecology of aquatic insects; many fly tiers become excellent amateur entomologists.

Many of the fish fly enthusiasts normally pursue, such as trout or salmon, can be extremely wary and difficult to catch. Participants will get a much better introduction to fly fishing if the group goes after fish that are a little more cooperative. As in the first activity, a small pond full of sunfish is just the ticket. Everyone will already know a lot about the biology and habits of the sunfish, so they can concentrate on mastering one or two fly patterns and the intricacies fo casting a fly rod. If the group wants to fish for trout, a stocked "fee-fishing" trout pond would be ideal.

Website Resources for Fish Identification

NYS DEC Fish:
http://www.dec.ny.gov/animals/269.html
Inland Fishes of New York Directory by Cornell University:
http://www2.dnr.cornell.edu/cek7/nyfish/index.html



New York State P-12 Science Learning Standards*
2-LS2-2, 2-LS4-1
3-LS2-1, 3-LS4-3, 3-LS4-4
5-ESS3-1
MS-LS2-2, MS-LS2-5, MS-LS4-4, MS-LS4-6

*Effective July 1, 2017

Objectives

Angling Skills
Youth will:
- Be introduced to the lifelong hobby of fly tying by learning to tie one or two simple fly patterns.
- Demonstrate the ability to cast a fly rod.
- Be able to tie a blood knot and a nail knot.

Handling Fish
Youth will:
- Sample aquatic invertebrates using a D-net Bottom Sampler and relate fly patterns to the insects they've collected.
- Understand teh importance of aquatic invertebrates as food for fish.

Aquatic Sampling
Youth will:
- Build a D-net Bottom Sampler.
- Learn to use a D-net Bottom Sampler properly.

Safety
Youth will:
- Observe safe wading techniques and demonstrate those techniques if wading themselves.

Environmental Stewardship
Youth will:
- Understand the importance of catch-and-release fishing to some fisheries and appreciate the recreational value of fish

MATERIALS AND EQUIPMENT

Pre-Trip Meeting

- Several fly tying vises (or vise grip pliers)
- Several small scissors
- Several hackle pliers (can be made from spring-type clothespins)
- Dubbing needle (can be made from a piece of dowel and a sewing needle)
- Bobbins (or something to hold the thread)
- Whip finishing tool (can be made from a wooden match, a piece of monofilament and some glue)
- Fly tying materials (materials needed are listed in fly patterns)
- Thread (2/0 and 6/0 are suggested)
- Head Cement
- Hooks
- Something to carry flies in
- Several hand-tied flies (at least one dry fly, wet fly and streamer)
- Fly leader material of various sizes, enough for each member to tie a fly leader

D-Net Bottom Sampler

- Heavy piece of wire, thin metal rod, or wire coat hanger
- Waterproof tape
- Old nylon stocking or piece of fine mesh netting or burlap
- Needle and thread

Fishing Trip

- *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app
- *New York State Fishing Regulations Guide*
- One 4-foot (1.2 m) piece of clothesline and an eyebolt for each member)
- Fly rod and reel for each member
- Fly line for each member
- Video tape demonstrating fly casting techniques (optional)
- Hand-tied leaders for each member
- Landing net
- Needle-nosed pliers or hook remover
- Hand-held microscope or field lens, one for every 3-4 participants
- 1 or 2 catalogs displaying photographs fo fly patterns
- D-net Bottom Sampler
- Permission slip

WHAT TO DO

This activity should be divided in three: a pre-trip meeting to tie flies and leaders and build a D-net Bottom Sampler, a practice casting session, and a fly-fishing trip. You may want to hold the fly-casting session in the morning before the fishing trip.

Keep the fly fishing trip simple. It is not necessary to teach complex fly patterns or advnaced fly casting techniques. Panfish will usually bite anytime of day, especially in the early summer, so it is not necessary to go out really early or for more than a couple of hours. Most of all this activity should be fun.

Before the pre-trip meeting, you will need to select one or two of the fly patterns to teach your group. Once you have selected the patterns you will need to gather the materials needed to tie the flies. The materials may be purchased at a local fishing tackle dealer, ordered through mail order catalogs, or obtained from hunters and trappers.

Just befor the meeting, set up seeral fly tying stations. Ideally you should have one set of tools for every two or three participants. The more youth have to share a set of tools, the longer this activity will require, so plan accordingly.

Pre-Trip Meeting

1. Introduce the activity by describing the site where you will be fishing. Explain that you will be fly-fishing.
2. Explain the parts of a dry fly, wet fly and streamer to the entire group. Do not get too technical, explain enough so the youth will understand the terms used in the fly patterns.
3. Divide the group into two groups:

    Group 1 - Fly tying: This group should have as many youth as fly-tying stations
    Group 2 - Leader tying: The remainder of the group not tying flies.

Group 1 - Fly tying

1. Show the youth the finished fly or flies they will be tying. Point out some of the mistakes on your flies so the youth understand that hand-tied flies do not need to be perfect to catch fish. In fact, the fish (especially hungry sunfish) will readily take the ragged flies tied by most beginners.
2. Demonstrate how to tie a simple fly pattern. Wooly worms and deer hair bugs are good choices for this activity. Have one member of each group tie the fly by working along with you, step by step.
3. Every person should end up with at least one “fishable” fly, preferably two or three. Remember, the participants’ first attempts at fly tying don’t need to be pretty to catch a fish, but they should be strong enough to hold up to a young angler’s first attempts at fly casting. Quickly have the group members clean up the fly-tying equipment and materials for the next group.
4. After the first group of youth has completed its flies, rotate other members into the tying stations. Those individuals who finish both the fly tying and the leader tying can work on putting together the D-net Bottom Sampler.

Group 2 - Leader tying

1. Pass out two sections of nylon cord to each person. Show them how to tie a blood knot using the nylon cord. Blood knots are used to make your own leaders from various sized monofilament line. Let

the participants practice while the leaders check to see if anyone needs help.

2. Once everyone has mastered the blood knot, have the youth tie a fly leader using the appropriate lengths and sizes of monofilament line.

3. Next, show the youth the nail knot. Explain that this knot is used by fly anglers to tie the leader to the fly line. This is one of the most difficult knots to master. If possible have the yout tie their leader to a fly line using a nail knot.

4. Select a group of yout th build the group's D-net Bottom Sampler.

5. Allow the youth to figure out the instructions; provide help only if they have questions.

Fly-casting Session

1. Teaching fly casting can be challenging. The key is to keep it simple. You may want to introduce fly casting using one of the many good videos that are out there. After a brief instruction, let the participants practice fly castingin an open field or parking lot.

2. Take youth out in an open area without trees or other obstacles that may cause tangled lines. Introduce the fly fishing equipment that will be used. Explain that fly casting is unique; in all other forms of fishing, the weight of the lure or bait enables the angler to cast. In fly fishing, the angler actually casts the fly line and the tearly weightless fly just tags along for the ride.

3. Demonstrate how to fly cast, including a simple roll cast. Start off without a fly; this will help reduce line entanglements. Most new fly casters quickly learn to perform the proper casting movements but often have trouble with the timing. To correct timing problems, limit the new fly casters to only one back cast. This forces them to slow down and allows the back cast to straignten out before beginning the forward throw. Detailed instructions on how to fly cast are found in the Background Materials for this activity.

4. Once the youth have the knack for casting, they are ready to fly fish.

Fishing Trip

1. If going to a private pond, explain the importance of respecting the landowner's rights. Be sure the group members understand that they are invited guests of the landowner, and they may not be invited back if the landowner has any problems. If you are going to be fishing public waters, explain the rights of other users. You may want to explain how litter lessens the quality of a fishing trip and challenge the group to pick-up any trash and litter they find.

2. Remind the club about safety precautions (accidental hooking, horse play, dangerous areas).

3. If the group members are fishing for new species, point out some of the fish's habits and how to present the fly most effectively. The participants can tie on their hand-made flies and start fishing. Be sure to space the people far enough apart so they do not interfere with one another.

4. After the first fish is landed, show the group how little damage is caused by the small artificial fly. Point out the importance of catch-and–release fishing and the recreational value of fish. Explain how catch-and–release fishing can provide recreation for large numbers of anglers on heavily fished waters, without depleting the fish resource.

5. Select an area to bottom sample. The D-net bottom sampler can be used to collect aquatic insects that live underneath the rocks, gravel, sand, or mud that make up the stream's bottom.

6. Wade out into a shallow (4-12 inches [10 to 30 cm] deep) riffle section of a stream or river with the D-net Bottom Sampler. Holding the flat side of the D-net Bottom Sampler firmly against the bottom, downstream of your feet, kick up the stream bottom to dislodge any aquatic insects clinging to the rocks. The dislodged insects will float downstream in the current and into the net.

7. Transfer the contents of the net to a container or water to observe the organisms you have captured.

8. Have the group observe the aquatic insects using a hand-held microscope or field lens. Try to identify the insects collected. Note their habitat (fast water, or slow? Rocky, or sandy bottom?). The presence or absence of some macroinvertebrates can be used as indicators of water quality. Encourage the youth to figure out the quality of the sampled area.

9. Have the youth match the various aquatic insects to actual fly patterns or pictures of fly patterns.

ACTIVITY 6: Background Materials

Casting a Fly Rod

When introducing a young angler to fly casting, it is important to remember that learning this rewarding skill can be quite frustrating at first. One way to prevent frustration is to teach simple casts in a step-by-step manner.

Fly casting can be broken down into several basic elements. These are the grip, pickup and backcast, and the forward cast.

The grip is the simplest of the skills. The rod handle should be held so that it lies in the "v" formed by the thumb and forefinger. For added power and control, either the thumb or forefinger maybe placed along the top of the rod.

At first, actual casting should be done in an open area without a fly. This is to avoid snags. Also, the angler will learn that it is the weight of the line that carries the fly to the fish rather than vice versa. To begin the backcast, a length of line should be stripped out onto the water in front of the angler. An additional foot or so of line should be stripped out and held in the hand not being used to cast. The backcast starts with the arm in the 10 o'clock position and the wrist bent slightly forward. Swing the arm back to the 1 o'clock position while at the same time straightening out the wrist and lifting the elbow about 5 inches (12 cm). As the line comes back behind you, pull slightly on the line in the non-casting hand. By pulling on this line, you will be able to straighten out the line in the air. It is important not to break your wrist during the backcast.

After the line has straightened out the forward cast begins, This part of the cast has motion similar to that of pounding a nail at head level. Extend the arm back to 10 o'clock position while at the same time dropping the elbow down to its original position. Do not allow the rod to end up parallel the surface of the water as this will splash the line hard into the water. The line should gently lay onto the water's surface.

To achieve good casts, these motions must be executed with the correct amount of force and proper timing. Only through practice can these aspects of fly casting be mastered.

ACTIVITY 6: Background Materials

D-Net Bottom Sampling in River's and Streams

Introduction

Most aquatic insects, such as mayflies, stoneflies, and caddisflies, begin their life cycles as nymphs and larvae and inhabit the rocks, sand, and mud of a stream or river bottom. Bottom sampling often yields a wide variety of interesting organisms for observation and study. The simplest type of bottom sampling involves wading a stream while looking for these aquatic insects on the underside of rocks. Many fly anglers do this to help them choose which fly to fish.

In this activity, you will build a net with a D-shaped opening to collect the aquatic organisms that can be found inhabiting the stream or river bottom. This simple equipment can be taken along on future fishing trips.

Materials & Equipment

- Heavy piece of wire, or thin metal rod
- Waterproof tape
- Old nylon stocking or piece of fine mesh meeting or burlap
- Needle and thread

Building the D-net Sampler

1. Bend the wire into a D-shape with the flat side down.
2. Use the tape to attach the two ends of the wire hoop to the pole.
3. Sew the stocking or netting to the wire hoop to form a net.

Using the D-net Sampler

1. Select an area to bottom sample. The D-net bottom sampler can be used to collect aquatic insects that live underneath the rocks, gravel, sand, and mud that make up a stream bottom.

2. Wade out into a shallow (4-12 inches [10 to 30 cm] deep) riffle section of a stream or river with the D-net. Holding the flat side of the D-net against the bottom downstream from your feet, kick up the stream bottom to dislodge any aquatic insects clinging to the rocks. The dislodged insects will float downstream in the current and into the net.

3. Transfer the content of the net into a container of water to observe the organisms you have captured. Ask questions about the organisms, thinking about why they look the way they do, how they're adapted for their environment, and what they might eat.

4. Using appropriate field guides and keys, try to identify what was caught.

ACTIVITY 6: Background Materials

Aquatic Insect Habitats

When a person looks at a lake, stream or pond, he or she may see only one habitat. However, from a small insect's "point of view," there are a number of different "micro-habitats" within a larger body of water.

Aquatic insects can be divided into three basic groups, depending on the micro-habitat in which they are found. These groups are:

1. insects that live on the surface of the water;
2. insects that move freely through the water column;
3. insects that cling to the surface of submerged vegetation or rocks;
4. insects that live on the bottom of a body of water.

Insects that occupy the surface habitat have specialized adaptations which allow them to actually walk on the water. For example, the feet of the water striders secrete a substance which repels water, thereby keeping them from "falling through" the surface. Almost all surface dwellers are predators and move rapidly, feeding on any insects that may land on the water surface.

The insects which move freely thoroughly the water column are easily swept downstream because of their small size. Therefore, they are found only in slow moving rivers or lakes and ponds. There are many adaptations which allow insects to move through the water column. Predaceous diving beetles have hairs on their legs which expand to make large "paddles." Rather than swim, dragonfly nymphs propel themselves through the water by contracting their abdomen and creating a jet of water.

However, these insects do not spend all of their time moving through the water column. They can often be found near the surface getting air or resting on submerged vegetation on the bottom of the body of water. As with the surface dwellers, most of the swimmers are voracious predators– just ask anyone who has experienced the painful bite of the giant water bug or "toe biter." Insects inhabiting the water column will feed on just about anything, from plankton and insects to amphibians and small fish.

By far the largest groups of aquatic insects are those which cling to submerged vegetation or rocks or live on the bottom of the body of water. This is due to the abundant food sources, including dead plant and animal material and algae which accumulate in this habitat, and the protection plants and submerged objects can provide. The insects which inhabitat the bottoms of swift moving streams and rivers have adaptations which help them from being swept downstream. Stonefly nymphs are flattened in appearance, and use the flow of the water to hold themselves in place. Blackfly larvae have a special suction device that allows them to adhere to rocks. Other insects' larvae, such as that of the caddisfly, stay on the downstream and undersides of rocks to avoid swift currents.

Aquatic insects are an indispensable part of aquatic ecosystem. They help recycle dead plant and animal material, and provide a vital link in the food chain to larger animals such as ourselves.

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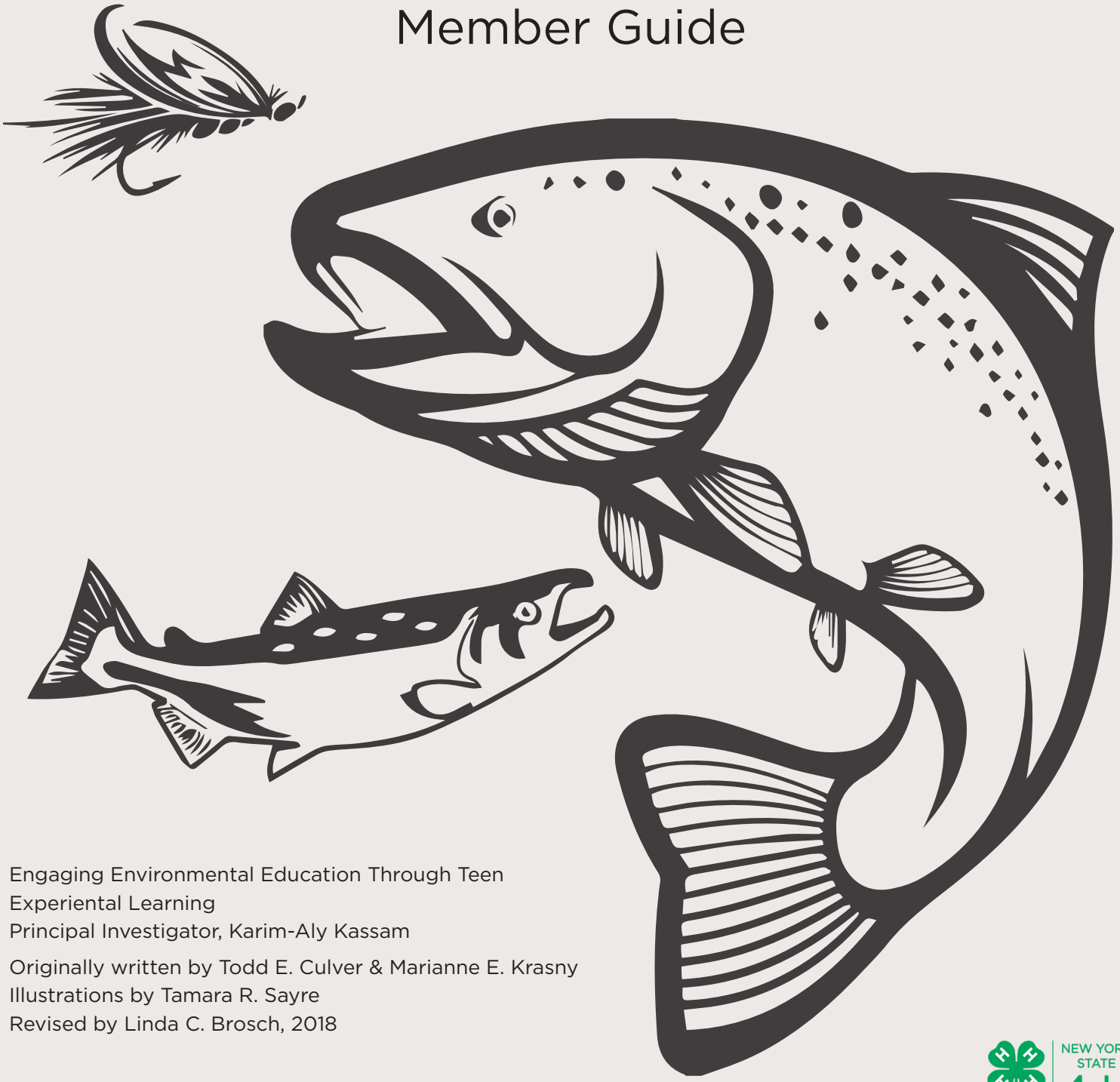
New York State 4-H
SPORT FISHING PROJECT

Fly Fishing FUNdamentals

Activity 6

Member Guide



Engaging Environmental Education Through Teen Experiental Learning
Principal Investigator, Karim-Aly Kassam

Originally written by Todd E. Culver & Marianne E. Krasny
Illustrations by Tamara R. Sayre
Revised by Linda C. Brosch, 2018

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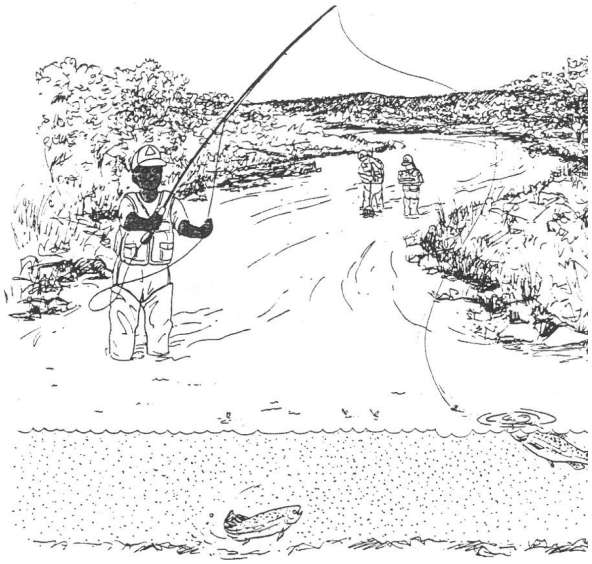
NEW YORK STATE 4-H



Revised by Linda Brosch, Oswego County Cooperative Extension, 2018

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— Lucinda A. Noble, Director

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PREFACE

Ethic of Stewardship through Environmental Education

To whom much is given, much is expected! It is with this outlook; young people are asked to engage in both the learning objectives and activities of environmental education. This curriculum for ***Fly Fishing FUNdamentals*** opens a window of curiosity and wonder into the habitat for the 4-H youth.

We do not exist outside of "nature" because it is all around us and we, ourselves, are fundamentally "natural"! We breathe, feed, live, reproduce, and die like other beings. In other words, the habitat consists of communities of living beings all around us. The word 'animal' derived from the Latin root animus meaning that which is endowed with will, spirit, or mind carries with it the understanding that we are part a larger community of beings. The world around us is animate, a source of deep wonder through observation and reflection, and through direct engagement with it, the basis of boundless insight. By mindfully participating in our habitat, we learn as much about it as we do about each other and ourselves.

The Greek word oikos, "household," is the root of the prefix 'eco' in both ecology and economics. In the twenty-first century, we grasp the complex connectivity of geophysical, biological and sociocultural systems, in which the planet is truly our oikos: it is the dwelling place of humanity. However, to understand it, we must begin locally with our habitat, our home.

The objectives of this revised and updated curriculum for the 4-H youth are:

- to generate an appreciation for their natural habitat;
- to provide knowledge about specific aspects of that habitat;
- to directly engage the habitat through guided activity; and
- to develop an ethic of stewardship through responsibility, recognizing that one's community includes the living habitat.

These objectives, while distinct, are not mutually exclusive because they work in tandem to achieve environmental education among youth. For instance, appreciation of ones habitat occurs only when a young person acquires knowledge about it. This knowledge creates wonder and curiosity that act to widen a youth's perception and understanding of their natural environment – to create a wider sense of community. Furthermore, knowledge is firmly grounded among the youth through guided experiential learning by undertaking activities outside. Book learning is not sufficient, as it must be accompanied by direct experience. This engagement, in turn, creates appreciation. Only when one appreciates, does a young person develop a sense of responsibility to care for ones habitat. At its core, this process creates informed and committed youth to environmental stewardship.

Responsibility for ones habitat is at the core of the ethic of stewardship. The word 'steward' combines the two active roles: of being 'in charge' on the one hand; and 'to serve' on the other. Humanity and by extension the 4-H youth are both 'guardians of' and 'servants to' life on this planet. Both ideas are commensurate, equally relevant, neither can be compromised. For 4-H youth, this means inculcating through this curriculum the value of responsibility by demonstrating how a human being is simultaneously in charge of their habitat and by knowledgeable action serves its wellbeing. The specific activities should engender a sense of mutual relationship where the youth benefits from and conserves their habitat.

A human ecological perspective informed by the ethic of stewardship is not only desirable, rather it is a necessary value in the twenty-first century. As a result of engaging (Place the name of the specific curriculum here), over the lifetime of the 4-H youth we should expect:

- An expanded ethic of stewardship encompassing all lands and waters whether they are urban or rural;
- A desire to work collaboratively with employers and employees, educators, artists, clergy and laypeople, young and old alike – to achieve a future that is sustainable;
- An understanding that economic and ecological matters relating to their habitat or home (oikos) are not unrelated, but are profoundly interconnected;
- Valuing of local place-based and indigenous knowledge about landscapes and natural resources; and
- An embrace of the ethic of stewardship throughout their adult life.

In short, it is important that the 4-H youth understands that: once you know about ***Fly Fishing FUNdamentals***, you become responsible for your habitat!

Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

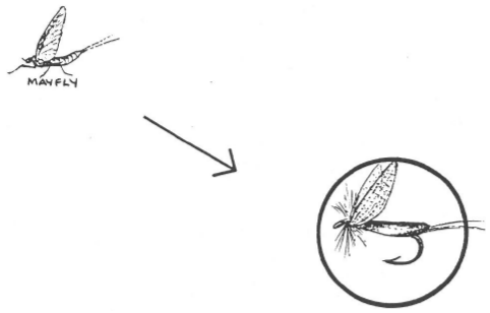
INTRODUCTION

For many anglers, fly fishing becomes a way of life. It has its own uniform, language, and code of ethics. Whether you become a true fanatic, or just fly fish for bluegills in the local pond, there is no question that it is a lot of fun. Fly fishing scares many folks. They may think it is too hard to learn to cast. Maybe they think it would be too hard to learn about the equipment or the names of all the flies. While it is true that it takes a little more coordination to learn to fly cast than it does to push the button on a spin cast reel, it is not all that difficult to master. And like most things, the more you put into it, the greater the rewards.

Fly fishing can lead to tying your own flies, and there is nothing much more exciting than fooling fish on a fly you tied yourself. The world of fly fishing is full of possibilities for tying flies that imitate just about anything a fish would eat, in fresh or salt water. The names of the flies themselves call up all kinds of images...Jock, Scoot, Grey, Ghost, Purple Peril, Irresistible, Tup's Indispensable, Parmachene Belle, Woolly Bugger... this list is endless. You could add to it, and perhaps one day your fly will be added to the ranks of the classic Quill Gordons, Light Cahills, and Mickey Finn.

Fly fishermen and women often release their catch. They do this not just because they are conservationists, but because hooking fish with a fly is far less likely to damage a fish than using bait or lure. Many anglers are truly interested in helping to preserve the future of the sport naturally adopt fly fishing as their method of choice. This activity will introduce you to the work of fly fishing and fly tying. Be careful, though — you might like fly fishing so much that you will give up all other types of angling!

Successful anglers also respect the environment. They practice environmental stewardship, which is the **responsible use and protection of the environment** through conservation and sustainable practices both at home and while fishing. It is with the help of such caring and mindful practices that fish population will continue to thrive and grow.



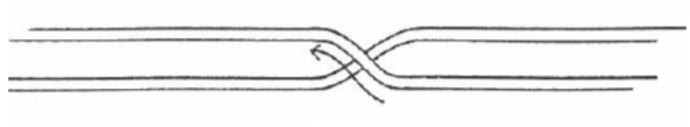
In your Fly Fishing FUNdamentals activity, you will:

- Learn to tie a blood knot and nail knot.
- Build a D-net Bottom Sampler.
- Find out what aquatic insects fish may be eating by sampling insects with the D-net Bottom Sampler. Use care when handling the organisms in your D-net. Some of them may be rare. Return them to the water when done.
- Complete the Fly Tying Patterns Activity Record Sheet.
- Complete the Match an Insect with a Fly Activity Record Sheet.
- Record your fishing experience, including drawing of the small animal you caught in the seine net, in your Fishing Journal.
- Fish safely and have fun!

ACTIVITY 6: Background Materials

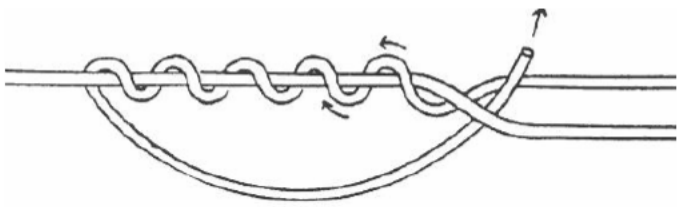
Blood Knot

1.



Cross two sections of line and at their intersection hold them between your thumb and forefinger. About 3 inches (7 cm) of each free end should be extended.

2.

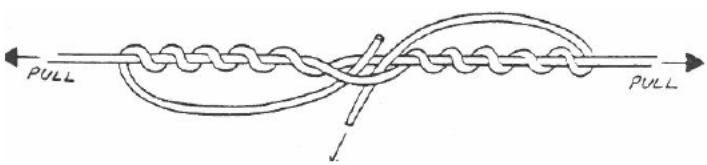


Take one of the short ends and wrap it around the other line's attached portion at least 3 to 5 times. Bring the remainder of the free end down and push it through the loop formed by the two pieces of line near your thumb and forefinger of the previously free hand to hold the line intersection in place.

3.

Twist the remaining free end around the remaining fastened end about five times. Poke this free end through that loop in the opposite direction of the first end.

4.



Holding each free end between the thumb and forefinger of each hand, slowly draw all four sections of line together.

5.

After they have been pulled tightly together, forming a neat knot, the excess portions of the two free ends may be trimmed close to the knot.

Source

Practical Fishing Knots, by Lefty Kreh and Mark Sosin. Crown Publishers, Inc. : New York 1972

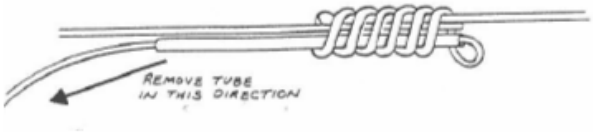
ACTIVITY 6: Background Materials

Nail Knot

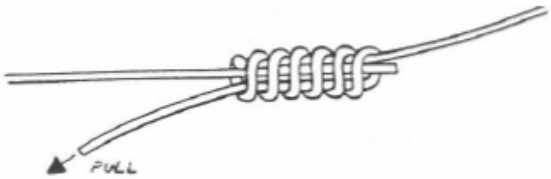
1. Start the knot with the end of the fly line on the right and the leader line on the left. Leave about 12 inches (30 cm) in the tag end of the leader to tie this knot. Hold the fly line, tube and tag end of the leader in your left hand. Working from left to right, toward the tag end of the fly line, wrap the tag end of the leader around the fly line, tube, and standing part of the leader. The first turn must cross over the leader as you wrap toward the tag end of the fly line.

2. When you have made six or seven wraps with the leader, insert the tag end back through the center of the tube. Hold the wraps securely while you pull the tag end of the leader through the tube.

3. While you are still holding the wraps, slowly remove the tube.



4. Holding the wraps, continue pulling the tag end of the leader. When you can feel the turns begin to tighten, you can loosen your grip.



5. To tighten the knot, first moisten it. Pull the standing part of the leader while you grip the tag end with pliers. Trim the tag ends of both the fly and leader. Coat the knot with rubber cement.

Source

Practical Fishing Knots, by Lefty Kreh and Mark Sosin. Crown Publishers, Inc. : New York 1972

ACTIVITY 6: Background Materials

D-Net Bottom Sampling in River's and Streams

Introduction

Most aquatic insects, such as mayflies, stoneflies, and caddisflies, begin their life cycles as nymphs and larvae and inhabit the rocks, sand, and mud of a stream or river bottom. Bottom sampling often yields a wide variety of interesting organisms for observation and study. The simplest type of bottom sampling involves wading a stream while looking for these aquatic insects on the underside of rocks. Many fly anglers do this to help them choose which fly to fish.

In this activity, you will build a net with a D-shaped opening to collect the aquatic organisms that can be found inhabiting the stream or river bottom. This simple equipment can be taken along on future fishing trips.

Materials & Equipment

- Heavy piece of wire, or thin metal rod
- Waterproof tape
- Old nylon stocking or piece of fine mesh meeting or burlap
- Needle and thread

Building the D-net Sampler

1. Bend the wire into a D-shape with the flat side down.
2. Use the tape to attach the two ends of the wire hoop to the pole.
3. Sew the stocking or netting to the wire hoop to form a net.

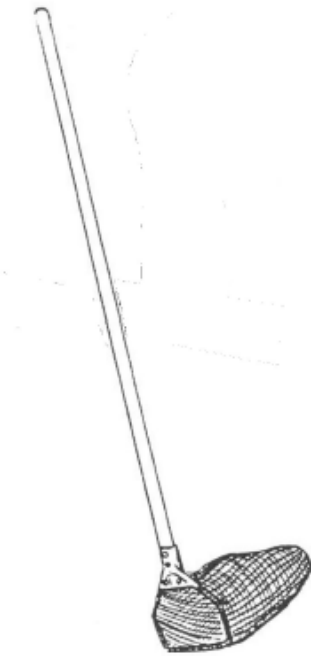
Using the D-net Sampler

1. Select an area to bottom sample. The D-net bottom sampler can be used to collect aquatic insects that live underneath the rocks, gravel, sand, and mud that make up a stream bottom.

2. Wade out into a shallow (4-12 inches [10 to 30 cm] deep) riffle section of a stream or river with the D-net. Holding the flat side of the D-net against the bottom downstream from your feet, kick up the stream bottom to dislodge any aquatic insects clinging to the rocks. The dislodged insects will float downstream in the current and into the net.

3. Transfer the content of the net into a container of water to observe the organisms you have captured. Ask questions about the organisms, thinking about why they look the way they do, how they're adapted for their environment, and what they might eat.

4. Using appropriate field guides and keys, try to identify what was caught.



ACTIVITY RECORD SHEET: Activity 6, Fly FIshing FUNdamentals

Fly Name:

Hook Sizes:

Wing:

Tail:

Ribbing:

Body:

Hackle:

Head:

Comments:

Diagram

Notes on fishing this fly:

ACTIVITY RECORD SHEET: Activity 6, Fly FIshing FUNdamentals

Fly Name:

Hook Sizes:

Wing:

Tail:

Ribbing:

Body:

Hackle:

Head:

Comments:

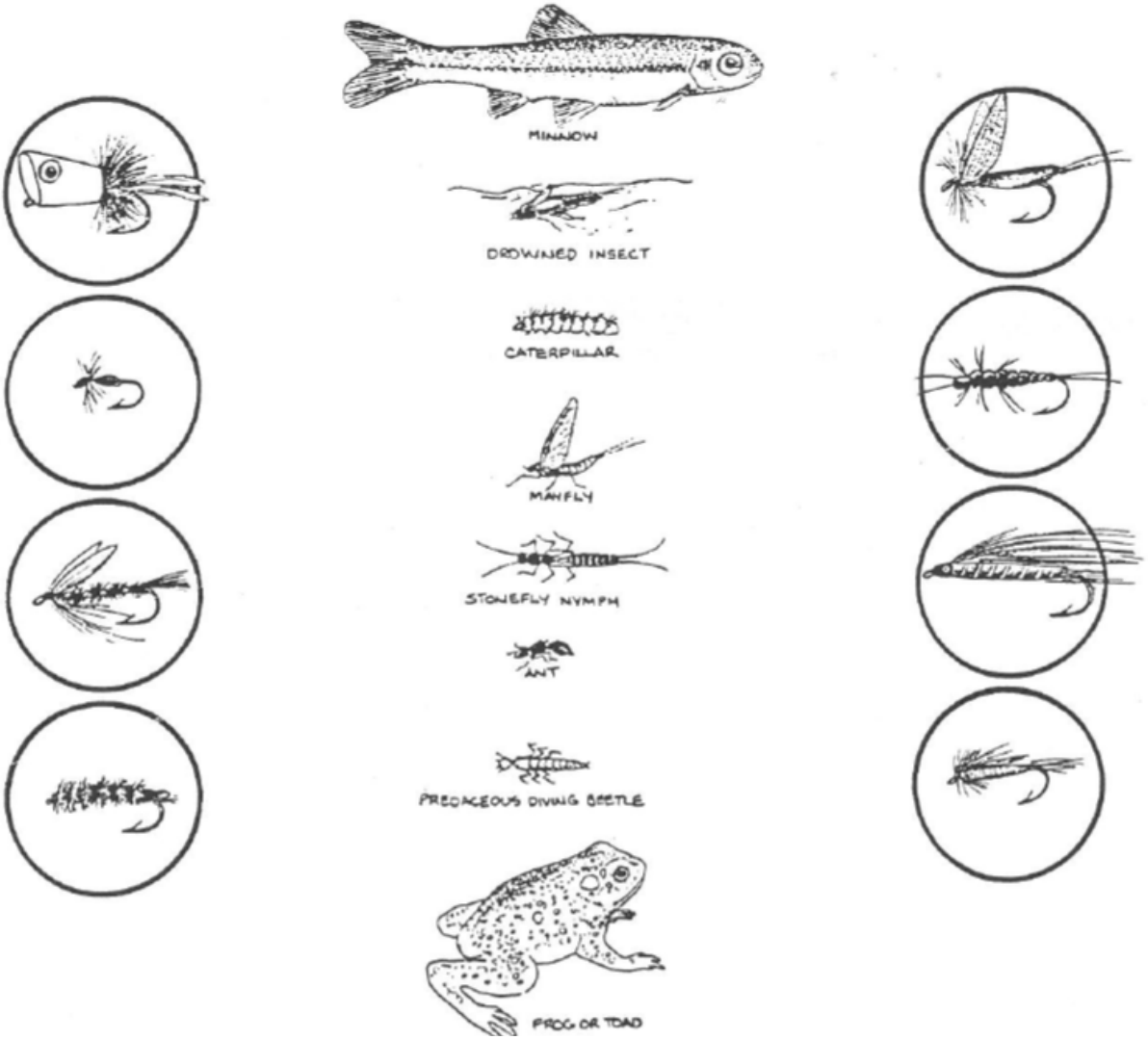
Diagram

Notes on fishing this fly:

ACTIVITY RECORD SHEET: Activity 6, Fly FIshing FUNdamentals

Match an Insect with a Fly

Based on your sampling and your knowledge of flies, try to connect the pictures of the various fly types with the bait or prey they imitate.



There is an almost infinite variety of fly patterns, designed to imitate every imaginable form of insect or prey connected with fishing. New ones are being developed almost every day. Ask your program leader for information on where to go to find out more about fishing flies and fly patterns.

NOTES

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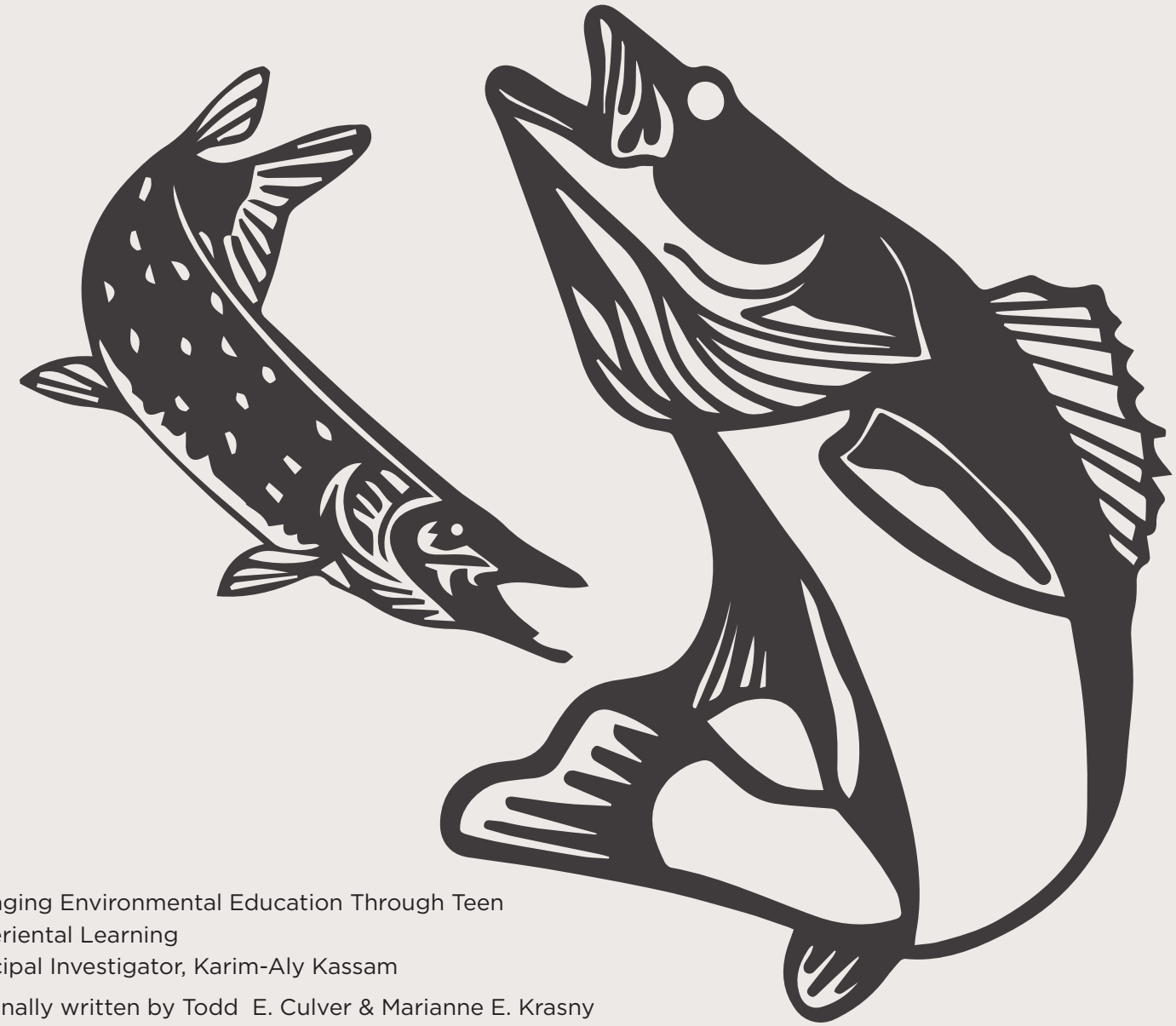
SPORT FISHING PROJECT

Ice Fishing FUNdamentals

Activity 7

Leader Guide



Engaging Environmental Education Through Teen Experiental Learning

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Cornell University Cooperative Extension

NEW YORK STATE 4-H

Revised by Linda Brosch, Oswego County Cooperative Extension, 2018

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— Lucinda A. Noble, Director

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PREFACE

Ethic of Stewardship through Environmental Education

To whom much is given, much is expected! It is with this outlook; young people are asked to engage in both the learning objectives and activities of environmental education. This curriculum for ***Ice Fishing FUNdamentals*** opens a window of curiosity and wonder into the habitat for the 4-H youth.

We do not exist outside of "nature" because it is all around us and we, ourselves, are fundamentally "natural"! We breathe, feed, live, reproduce, and die like other beings. In other words, the habitat consists of communities of living beings all around us. The word 'animal' derived from the Latin root animus meaning that which is endowed with will, spirit, or mind carries with it the understanding that we are part a larger community of beings. The world around us is animate, a source of deep wonder through observation and reflection, and through direct engagement with it, the basis of boundless insight. By mindfully participating in our habitat, we learn as much about it as we do about each other and ourselves.

The Greek word oikos, "household," is the root of the prefix 'eco' in both ecology and economics. In the twenty-first century, we grasp the complex connectivity of geophysical, biological and sociocultural systems, in which the planet is truly our oikos: it is the dwelling place of humanity. However, to understand it, we must begin locally with our habitat, our home.

The objectives of this revised and updated curriculum for the 4-H youth are:

- to generate an appreciation for their natural habitat;
- to provide knowledge about specific aspects of that habitat;
- to directly engage the habitat through guided activity; and
- to develop an ethic of stewardship through responsibility, recognizing that one's community includes the living habitat.

These objectives, while distinct, are not mutually exclusive because they work in tandem to achieve environmental education among youth. For instance, appreciation of ones habitat occurs only when a young person acquires knowledge about it. This knowledge creates wonder and curiosity that act to widen a youth's perception and understanding of their natural environment – to create a wider sense of community. Furthermore, knowledge is firmly grounded among the youth through guided experiential learning by undertaking activities outside. Book learning is not sufficient, as it must be accompanied by direct experience. This engagement, in turn, creates appreciation. Only when one appreciates, does a young person develop a sense of responsibility to care for ones habitat. At its core, this process creates informed and committed youth to environmental stewardship.

Responsibility for ones habitat is at the core of the ethic of stewardship. The word 'steward' combines the two active roles: of being 'in charge' on the one hand; and 'to serve' on the other. Humanity and by extension the 4-H youth are both 'guardians of' and 'servants to' life on this planet. Both ideas are commensurate, equally relevant, neither can be compromised. For 4-H youth, this means inculcating through this curriculum the value of responsibility by demonstrating how a human being is simultaneously in charge of their habitat and by knowledgeable action serves its wellbeing. The specific activities should engender a sense of mutual relationship where the youth benefits from and conserves their habitat.

A human ecological perspective informed by the ethic of stewardship is not only desirable, rather it is a necessary value in the twenty-first century. As a result of engaging (Place the name of the specific curriculum here), over the lifetime of the 4-H youth we should expect:

- An expanded ethic of stewardship encompassing all lands and waters whether they are urban or rural;
- A desire to work collaboratively with employers and employees, educators, artists, clergy and laypeople, young and old alike – to achieve a future that is sustainable;
- An understanding that economic and ecological matters relating to their habitat or home (oikos) are not unrelated, but are profoundly interconnected;
- Valuing of local place-based and indigenous knowledge about landscapes and natural resources; and
- An embrace of the ethic of stewardship throughout their adult life.

In short, it is important that the 4-H youth understands that: once you know about ***Ice Fishing FUNdamentals***, you become responsible for your habitat!

Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

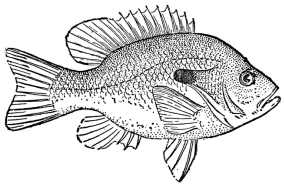
INTRODUCTION

Ice fishing has a number of advantages as a New York State 4-H Sport Fishing Project activity. It requires simple, inexpensive equipment. The techniques used in ice fishing are relatively easy to master. Ice fishing offers a safe, easy way to have a group sample deep-water environments. In addition, ice fishing is an activity that can be done outside during winter.
The key to a successful ice fishing trip is careful planning to avoid unsafe ice and cold injuries. Unsafe ice can be caused by warm springs, running water, above freezing temperatures, and wind and/or wave action. Cold injuries are caused by not being prepared for the elements. Wind and moisture conditions must be taken into account in addition to temperature. Proper clothing is a prerequisite to safe and enjoyable ice fishing. In addition, a personal floatation device should be worn at all times while on the ice and may serve as a windproof jacket.

Anglers spend most of their time pursuing a limited number of species through the ice. Members of the pike, perch, and sunfish families make up the majority of the catch. Because these fish have different habits, different techniques are used in catching them. Many of the techniques that are described for catching these fish in earlier activities also apply to ice fishing. Bait fishing for perch and walleyes is one of the most common ice fishing activities.

Website Resources for Fish Identification

NYS DEC Fish:
http://www.dec.ny.gov/animals/269.html
Inland Fishes of New York Directory by Cornell University:
http://www2.dnr.cornell.edu/cek7/nyfish/index.html



New York State P-12 Science Learning Standards*
K-LS1-1, K-ESS3
2-LS2-2, 2-LS-4-1
3-LS2-1, 3-LS4-1, 3-LS4-4
MS-LS2-1, MS-LS2-2, MS-LS2-5

*Effective July 1, 2017

Objectives

Angling Skills

Youth will:
- Demonstrate how to dress for cold weather activities.
- Demonstrate the ability to safely locate and drill holes for ice fishing.
- Learn to catch fish through the ice using tip-ups, jigging rods, or tilts.

Fish Biology & Ecology

Youth will:
- Learn how to remove scales from fish without injuring them.
- Learn to estimate the fish's age by looking at scales and understand why the growth of fish slows in the winter.
- Understand that fish are coldblooded and that their activity is directly related to the temperature of their environment.
- Understand the relationship between photosynthesis and oxygen levels in aquatic environments in the winter.
- Understand that water on the bottom of lakes and ponds during the winter is warmer than the surface water.

Aquatic Sampling

Youth will:
- Build a weighted thermometer to measure water temperature.
- Build a Secchi disk to measure turbidity.
- Measure water depth, temperature, and turbidity.

Safety

Youth will:
- Learn how to check the ice thickness and evaluate its safety for ice fishing.
- Demonstrate safe ice fishing practices.
- Be aware of what they can do to help each other should someone fall through the ice.
- Understand the dangers of hypothermia including how to prevent its effects and how to treat it should it occur.

Environmental Stewardship

Youth will:
- Learn responsible use and protection of the natural environment through conservation and sustainable practices.

MATERIALS AND EQUIPMENT

Pre-Trip Meeting

- Tip-up, jigging rod, or tilt
- *New York State Fishing Regulations Guide*, copy for each member

Weighted Thermometer

- Empty soda can
- Sand or pebbles
- Short piece of wire or string (10 inches [25 cm])
- Laboratory thermometer with open loop at one end (must be able to read as low as 32°F [0°C])
- Can opener
- Long piece of sturdy string (depending on depth to which you plan to sample)
- Waterproof markers, 2 different colors
- Tape measure or yardstick

Secchi Disk

- Metal or heavy plastic disk, 6-8 inches (15-20 cm) diameter (the top of a metal pie plate will work)
- Hand drill
- Black & white paint
- Long piece of heavy string or light rope (about 10 feet [3 m])
- One or more large lead weights (1 ounce [30 g] or more)
- Stick or wooden dowel (about 1 foot [0.3 m])
- Waterproof marker

Fishing Trip

Participant Clothing Recommendations

- Winter boots with felted soles
- Insulated polypropylene or wool base layer (no 100% cotton)
- Pants and warm sweater or sweatshirt or fleece
- Insulated vest or jacket and/or wind breaker
- Winter hat, and several pairs of gloves and mittens

Tackle

- Auger
- Skimmer (slotted spoon or dipper for removing the chips from the hole)
- Tip-up, jigging rod, or tilt
- Assorted hooks and baits
- Foam or fiber bait bucket
- Minnow dipper

Other

- High energy food, thermos of hot drink
- Extra clothing in case people get cold and wet
- Pack basket or pail
- Plastic bags
- Weighted thermometer and Secchi disk
- Ruler
- Hand-held microscope
- *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app
- *New York State Fishing Regulations Guide*
- Pencil for each member
- Permission slip

WHAT TO DO

This activity works best if divided into two: a pre-trip meeting and an ice fishing trip. Before the pre-trip meeting, you will need to get together the ice fishing equipment needed. Tip-ups and jigging rods can easily be made by the club members as part of the pre-trip meeting.

Pre-Trip Meeting

1. Introduce the activity by describing where the trip will take place. Explain that the group will be ice fishing providing weather and ice conditions on the day of the trip are safe.
2. Demonstrate the tackle that will be used on the ice fishing trip.
3. Explain how thick safe ice should be. According to the New York State Department of Environmental Conservation website, a minimum of three to four inches of solid ice is the general rule for safety. People should be aware that ice is not the same thickness on every body of water, or even in different places on the same body of water. It can be 20% weaker over running water. Slush ice is about 50% weaker. "Good" or new clear ice over non-running water, should be at least:

- **4-6" (7-11 cm) thick - to support small groups of people**
- **6-8" (13-15 cm) thick - to support ice shanties, snowmobiles, or similar equipment**
- **15" (38 cm) thick– to support a pickup truck**

4. Explain what ice anglers should do if they fall through the ice. Often a quick step backwards can save an angler from a hazardous swim in ice water. If an angler does go in, he or she shouldn't panic. Heavy insulating clothing floats until it is completely water-logged. Working quickly, victims should grasp the edge of the ice (if the ice breaks away, they should keep breaking it off until solid ice is reached). By kicking hard, victims should be able to pull their chest out of the water. Once they have cleared the edge, they can roll toward the safe ice while pulling their feet out of the hole. After an accidental swim, immediately get the victim warm and dry. Do not hesitate! A heated shanty, warm car, or any warm shelter is needed immediately to prevent hypothermia.

5. Ice spuds, which can help pull you out of the hole if you fall in, can be made by setting a sharp nail into a four-inch (10 cm) piece of broom handle. These can also be made as part of the activity.

6. Explain what other people can do to help someone else who has fallen in. Have the group come up with possible ways to help spread the rescuer's weight out onto the thin ice that don't put the rescuer in danger.

7. Discuss hypothermia and how to prevent it by dressing appropriately. Participants should wear several layers of clothing on the fishing trip, even if they have to substitute cotton for some of the wool items on the list. If participants arrive without proper clothing, they should not be allowed to participate. Explain to them the dangers of cold, wind, and wet, and the symptoms of frostbite and hypothermia. The group leader should take extra clothing on the ice fishing trip in case someone gets cold.

8. Another danger of ice fishing is getting lost. Explain the importance of having a compass should a "white out" occur or if it gets dark.

9. Have the participants look up the regulations concerning ice fishing in the *New York State Fishing Regulations Guide*. Be sure to have them check the individual county information to see if ice fishing is allowed on local lakes. If using tip-ups be sure they are labeled with the owner's name and address and that the group knows the legal maximum number of tip-ups allowed on that particular water.

10 .Divide the group up to build a weighted thermometer and Secchi disk, following the instructions in this curriculum.

11. Before they leave make sure that everyone knows when and where the fishing trip will be held and what to bring. Remind each person to bring his or her permission slip. Let them know that they will not be allowed on the trip without proper clothing.

Fishing Trip

1. Choose a safe ice fishing spot. Check the weather report to make sure conditions are not overly windy or otherwise unsafe. The group leader should check with local fishing tackle dealers or avid ice anglers in the area about the thickness and safety of the ice. The condition of ice changes on a day to day basis, so be sure to check it yourself before taking the group out on the ice.

2. Be sure that all the members of the group have the proper clothing. Remind them of safety precautions --unsafe ice and hypothermia.

3. Check the ice thickness using an auger or spud. Ice should be at least 4-6 in. (7-11cm) thick to do this activity. If the ice is unsafe, go home and try again after some cold weather. This may be a good opportunity to teach people about their responsibility for their own safety.

4. Before taking the group out onto the frozen lake or pond, have them take a compass reading. Have the youth choose a "buddy" and use the "buddy system" to keep track of everyone during the ice fishing trip.

5. Have participants use an auger or spud to make a hole in the ice large enough for the sampling equipment. Holes should be about 6-8 in (15-20 cm) in diameter. Any hole over 8 in (20 cm) is dangerous.

6. Set up your tackle. The simplest tackle to use is a drop line with a bobber to suspend the bait, attached to a stick anchored beside the hole. Tilts, tip-ups and jigging sticks or rods can also be used if available.

7. Minnows less than 2 -2½ inches (5-6 cm) long or insect larvae can be used as bait for small panfish. Pickerel, pike, walleyes, bass, and larger panfish prefer 2½ -3½ inch (6-9 cm) minnows. A minnow dipper helps to keep the angler's hands out of the bait bucket. Ice fishing lures can also be used.

8. Monofilament line, as light as 1-lb (30 g) test, can be used for perch and bluegills. 2-4-lb (60-120 g) test can be used on small panfish. Use the lightest line as possible that can handle fish without losing them. Doing so will eliminate most problems with tightly curled or coiled monofilament, and it makes your equipment more sensitive to strikes.

9. Drop the line and see what bites!

10. Once the group leader has demonstrated the technique, he or she can help the participants set up their own tackle. However, limit the number of holes you cut in the ice to avoid dangerous conditions. Remind the group to be cautious about where they step.

11. When the first fish is caught, have the group gather around. Identify the fish and discuss where (what depth, what type of habitat) it was caught. Have the youth take a couple of scales from the fish near the lateral line approximately 1/3 of the way down from the head. Place these scales inside a small envelope and mark the outside with the species name and length of the fish.

12. Have the group measure the Secchi disk depth according to the instructions found in Measuring Turbidity (see Background Materials). Have participants measure the depth of the snow surrounding the ice hole. If there is enough snow present, have the youth move the snow from around the hole for at least 6 feet (2 meters) in each direction. Have the individuals take the Secchi disk depth a second time. If there is a difference, ask them why? This exercise will be used later to introduce the concept of photosynthesis and to explain some of the winter ecology of fish. Have the members record the data.

13. Using the same hole, have the youth measure the water temperature and depth. Have them repeat the temperature measurements at regular intervals (5, 10, or 20 feet depending on depth). There is a place to record this data on the Water Temperature Activity Record Sheet.

14. Remember--make this a short fishing trip to avoid cold injury. During the trip, circulate amongst the group to make sure everyone is warm enough.

Wrap-Up

1. Get the group indoors and warmed up.

2. Have the participants look at the fish scales. Scales are easily read using inexpensive hand-held microscopes, or they can be pressed between two microscope slides and viewed with a microscope.

3. Trained biologists can determine the age of a fish by looking at the number of "checks" or areas where rings are laid close together. Growth is slowed in winter due to a slowing of the fish's metabolism, primarily because of the lower winter-time temperatures.

4. Have the group look at a couple of scales from each fish and complete the Fish Scales Activity Record Sheet. Have them relate the growth of the fish to the patterns of rings laid down in their scales. Help the youth understand that during the winter, fish growth slows and the rings in their scales are laid down closer together. The group may want to try to age the fish using the scales. Ask the youth why the growth slows down during the winter.

5. While part of the group is looking at the scales, have another half graph the water depth and temperature data they collected earlier using the Water Temperature Activity Record Sheet (These graphs should show that the warmest water is on the bottom of the lake). Ask the participants why the fish were caught in relatively deep water. Where is the warmest water? What would happen if water froze from the bottom of the lake up? Remember that all other liquids do freeze from the bottom up.

6. Introduce the idea of cold-blooded and warm-blooded animals. A fish's activity is limited by its body temperature. When fish are cold they slow down; as they warm up they become more active. Where in the lake are fish more likely to be most active during the winter?

7. If the group has already taken Secchi disk depths in a lake on summer fishing trips, have them compare those measurements with the wintertime depths they just measured. Does ice on a lake reduce the amount of light entering the water? What about the snow on top of the ice? What effect would this have on the aquatic plants growing in the lake? Explain that plants, through the process of photosynthesis, use light, carbon dioxide, and water to produce food and oxygen.

A simplified chemical reaction for photosynthesis is:
light + carbon dioxide + water --> sugars + oxygen

What would happen to amount of oxygen in the lake if the amount of light was reduced? Could lower oxygen levels affect fish? Explain how heavy snow cover (reducing light entering the water, thereby reducing photosynthesis) sometimes reduces the oxygen so drastically that fish suffocate. This is called winter kill and is usually only a problem in small ponds.

8. Preview the next meeting with the group. Discuss what the activities will be, whether they will be outdoors, and how they can prepare for the meeting. Always try to end a meeting with the participants more excited and enthusiastic about the New York State 4-H Sport Fishing Project than before the meeting started.

ACTIVITY 7: Background Materials

Fish Growth

Unlike mammals, most fish will grow continuously throughout their lives. The growth rate of fish is variable, and may be influenced by a number of factors. In general, fish grow rapidly in early life. This growth rate usually slows dramatically as fish reach reproductive maturity.

The most important factors controlling a fish's growth rate are genetics, food supply, water temperature, and dissolved oxygen. Ultimately, the genetic blueprint of a fish will limit its growth rate even if all the other growth controlling factors are optimum. A plentiful, good-quality supply of food is needed to ensure good growth. The food supply is especially important in the early rapid growth stage of a fish's life.

Another important factor is water temperature. Every species of fish has a temperature range best suited for its metabolism. At temperatures above or below this range, the growth rate will slow or stop. In northern New York, most fish grow very slowly if at all during the winter months. This is because fish are cold-blooded and have very sluggish metabolisms in cold water.

Dissolved oxygen levels are also important for growth. Oxygen is needed to fuel the chemical reactions that turn food into flesh. If the levels of oxygen are too low for a fish, it will be unable to grow well, if at all.
During periods of reproductive or spawning activities, fish also grow slowly. Spawning periods are usually hard on fish. A large energetic demand is placed on their bodies to produce eggs, guard nests, or migrate to spawning grounds. In addition, many fish feed very little during these times.

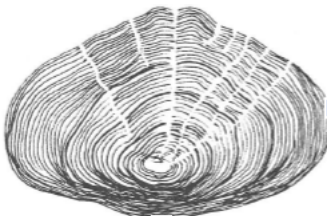
Aging Fish

Scientists have found several ways to estimate the age of a fish. One common method is reading fish scales. The scales of a fish grow along with the rest of its body. Each winter, when there is a period of slow or no growth, the scale will put down a ring or check. These checks are much like the rings on the trunk of a tree.

One result of the fluctuating growth of the fish is difficulty in determining age. In addition to winter months, there are often several other periods of poor growth each year. This causes many checks on a scale within a single year. Multiple checks make it difficult for an inexperienced person to correctly age fish.
Some species of fish, such as bullhead or catfish, have no scales. In these fish, the bones or spines can be used in much the same way as the scales of other fish.

Environmental factors, such as food availability, water temperature and dissolved oxygen, can cause dramatic differences in the size of fish of the same species. For example, a trout in a large lake with plentiful baitfish will quickly attain a large size. The same fish in a small stream would live out its entire life and never reach anywhere near the size of the lake fish. Due to the year-round warm temperatures in southern waters, largemouth bass in the south grow much larger than they could in New York waters.

Growth rates are important in determining legal size limits and possession limits. To maintain healthy fish populations, it is important to allow each fish to spawn at least once in its life. Size limits are aimed at that goal. The number of fish anglers can take from a body of water depends on how fast the fish can grow to spawning size. If the fish reach this size quickly, more of them can be harvested each year. If the fish grow very slowly, as in far northern lakes, then very few fish can be taken each year without harming the population.



ACTIVITY 7: Background Materials

Measuring Water Temperature

Introduction

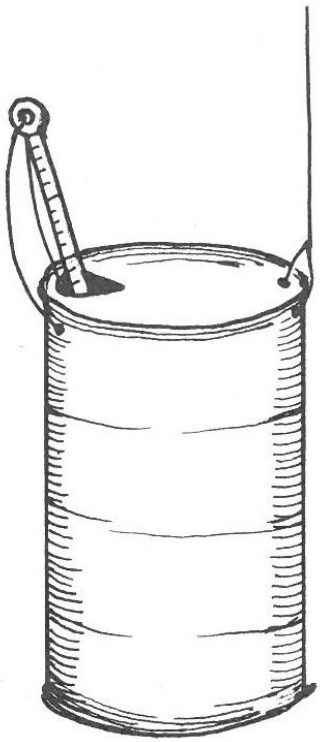
You can measure water temperatures easily in shallow water or at the surface using a weather thermometer tied to a string. However, water temperature in deep water generally differs greatly from that of surface water. Therefore, it will be fun to measure the temperature of deep water and compare it to the temperature of shallower water. To take water temperature, you will need to make a weighted thermometer.

Materials & Equipment

- Empty soda can
- Sand or pebbles
- Short piece of wire or string (10 inches [25 cm])
- Laboratory thermometer with an open loop at one end
(must be able to read temperatures as low as 32oF [0OC])
- Can opener
- Long piece of sturdy string (length depends on the depth to which you plan to sample)
- Waterproof markers, 2 different colors
- Tape measure or yardstick

Building the Weighted Thermometer

1. Put some sand or pebbles into the empty soda can so it will sink.
2. Make a hole on the side of the can near the hole where the can was originally opened.
3. Pass the short piece of string or wire through the loop of the thermometer.
4. Place the thermometer in the can and tie or wire it securely to the can by passing the short piece of string or wire through the holes.
5. Make two small holes in the can with the can opener. One hole should be on the top opposite the thermometer. The other hole should be just below that hole, on the side of the can.
6. Tie the long string securely to the can through the holes. Starting at the can, mark off the long string every foot (or every 25 cm) with waterproof markers. This will help you to determine the depth at which the temperature is taken.



Using the Weighted Thermometer

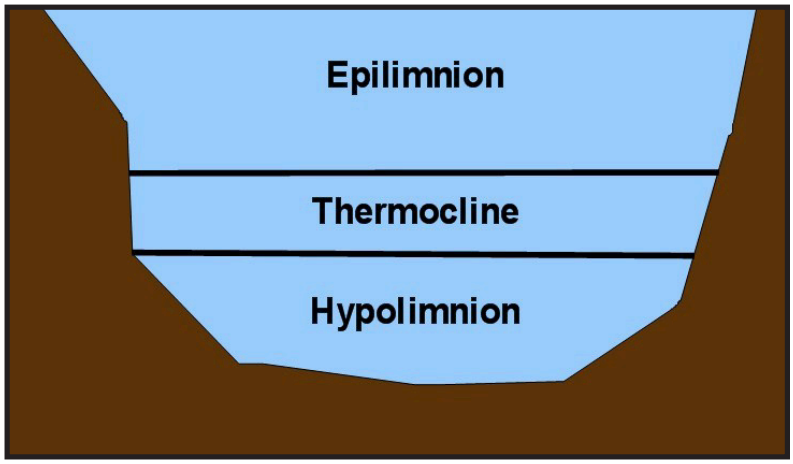
1. Lower the weighted thermometer into the water and let it remain there for five minutes.
2. While waiting to bring the weighted thermometer out of the water, one of the club members can record the depth at which the temperature is being taken.
3. Bring the can to the surface quickly and read the thermometer. Make sure the tip of the thermometer remains in the water in the can.
4. Record the temperature of the water on your Measuring the Physical Environment Activity Record Sheet.
5. Take the water temperature at several different depths and places in the water, and record the temperatures on your Activity Record Sheet.

ACTIVITY 7: Background Materials

Water Temperature and Oxygen

Assuming there is adequate oxygen, water temperature is the most important factor determining where fish will be within a body of water. Like all cold-blooded animals, fish have preferred temperatures in which their bodies function most effectively. Most anglers are aware of the difference between warmwater species such as smallmouth bass and bluegills, and coldwater species such as trout and salmon. In addition to variations in temperature between different bodies of water, there are important temperature variations within a single lake, pond, or stream, both seasonally and from one spot to another. Anglers who know the preferred water temperature of the fish they seek can measure the water temperature during different times of year and at different locations to determine the most likely location for those fish.

In the summertime, the sun warms the surface of lakes, ponds, rivers and oceans. In smaller bodies of water, the waters are mixed by wind so temperatures remain fairly constant throughout. In larger bodies of water, the water becomes stratified into three different layers. The warm surface layer is called the epilimnion. The deeper water remains cool, forming a layer called the hypolimnion. In between the layers of warm surface water deep cool water is a layer characterized by a rapid drop in temperature. This layer is called the thermocline. Anglers can locate a thermocline by taking temperature readings at various depths until a rapid change (0.5 oF [0.3°C] every foot of depth) is noted.



Summertime Stratification of a Lake

During the wintertime in areas covered in ice, the surface water is actually the coolest layer instead of the warmest. This occurs because of a property of water that is unique among liquids. Similar to other liquids, water becomes heavier and more dense as it cools. However, unlike other liquids which are heaviest at their freezing point, water is heaviest at 39oF (4oC), a temperature just above its freezing point. Because water at 39oF is heavier than frozen water or ice, it will sink below water that is freezing. This causes ice to form from the surface of lakes downwards. Except for very small ponds, the water will not freeze all the way down to the bottom, since warmer water sits at the bottom. Therefore fish live in the bottom of lakes during the winter.

During the spring and fall, the stratified cold and warm layers mix together as the surface layer changes temperature. Because the water is not separated into layers of different temperature, fish tend to be more scattered throughout the lake during these times of year.
Similar to water temperature, oxygen content has an important influence on the location of fish. During the summer, fish may move to the deeper cool water which holds more oxygen. However, towards the end of the summer, oxygen may become depleted in the deep water, causing fish to move up to the thermocline.

Towards the end of the winter, oxygen may also become depleted. Lack of oxygen in late-thaw years may cause significant fish mortality. Fortunately, the spring and fall mixing of water helps restore oxygen to deeper waters every year.

ACTIVITY 7: Background Materials

Measuring Water Turbidity

Introduction

New York State 4-H Sport Fishing Project participants can determine the turbidity or clarify of a pond, lake or ocean using a Secchi disk. Waters that are very murky are called turbid. The turbidity of a lake has an important effect on plant and fish life. You may want to take a Secchi disk along on several fishing trips so that you can compare the turbidity on a number of different lakes or ponds. It may also be interesting to measure the turbidity of a lake or pond during different times of the year.

Materials & Equipment

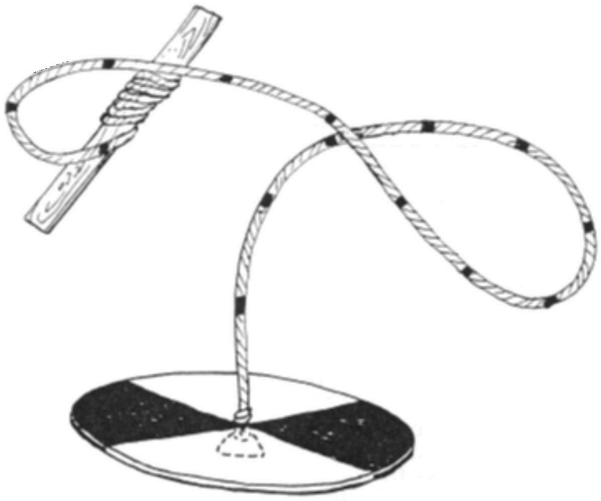
- Metal or plastic disk, 6-8 inches (15-20 cm) diameter (the top of a paint can or metal pie plate will work)
- Hand drill
- Black and white paint
- Long piece or heavy string or light rope (about 10 feet or 3 m)
- One or more large lead weights (equal to or heavier than 1 ounce [30 grams])
- Stick or wooden dowel (about 1 foot or 0.3m)
- Waterproof marker
- Yardstick or ruler

Building the Secchi Disc

1. Drill a hole large enough for the rope to pass through in the center of the metal or plastic disk.
2. Divide the disk into quarters and paint alternating sections black and white.
3. Thread the rope through the hole in the disk and attach the weights to the end of the rope on the unpainted side of the disk.
4. With the disk against the weight(s) tie a knot in the rope that is snug against the painted side of the disk.
5. Tie the free end of the rope to the stick of wooden dowel.
6. Using the marker and ruler, make a mark on the rope every 6 inches (10 cm) staring at 6 inches (10 cm) above the disk.

Using the Secchi Disc

1. Hold onto the stick and rope, and lower the Secchi disk into the water until you no longer can see the painted surface.
2. Using the marks on the rope, determine how deep the Secchi disk is when you loose sight of the black and white pattern.
3. The depth is your measure of your turbidity. You can record it on your Measuring the Physical Environmental Activity Record Sheet.



ACTIVITY 7: Background Materials

Water Turbidity

Water clarity is affected by many things, including the presence of silt, plankton, algae, and nutrients. Some waters such as those of Oneida Lake are naturally turbid because lands surrounding the lake supply a steady flow of nutrients which stimulate the growth of algae. Other waters become turbid through pollution caused by humans. Erosion from construction, logging, or farming practices may increase the silt content of a body of water. High-phosphate soaps and fertilizers running into water may dramatically increase the growth of plankton.

Water turbidity may provide a hint regarding what fish are present. Where waters are constantly turbid from silt, bass, walleye, and other species which depend upon vision to capture their food may be replaced by bullhead and other fish which feed by touch and odor. Turbidity caused by excess algae may indicate depleted oxygen levels. In this type of water, only fish that survive in low oxygen environments, such as carp and certain members of the catfish family, may be present.

NOTES

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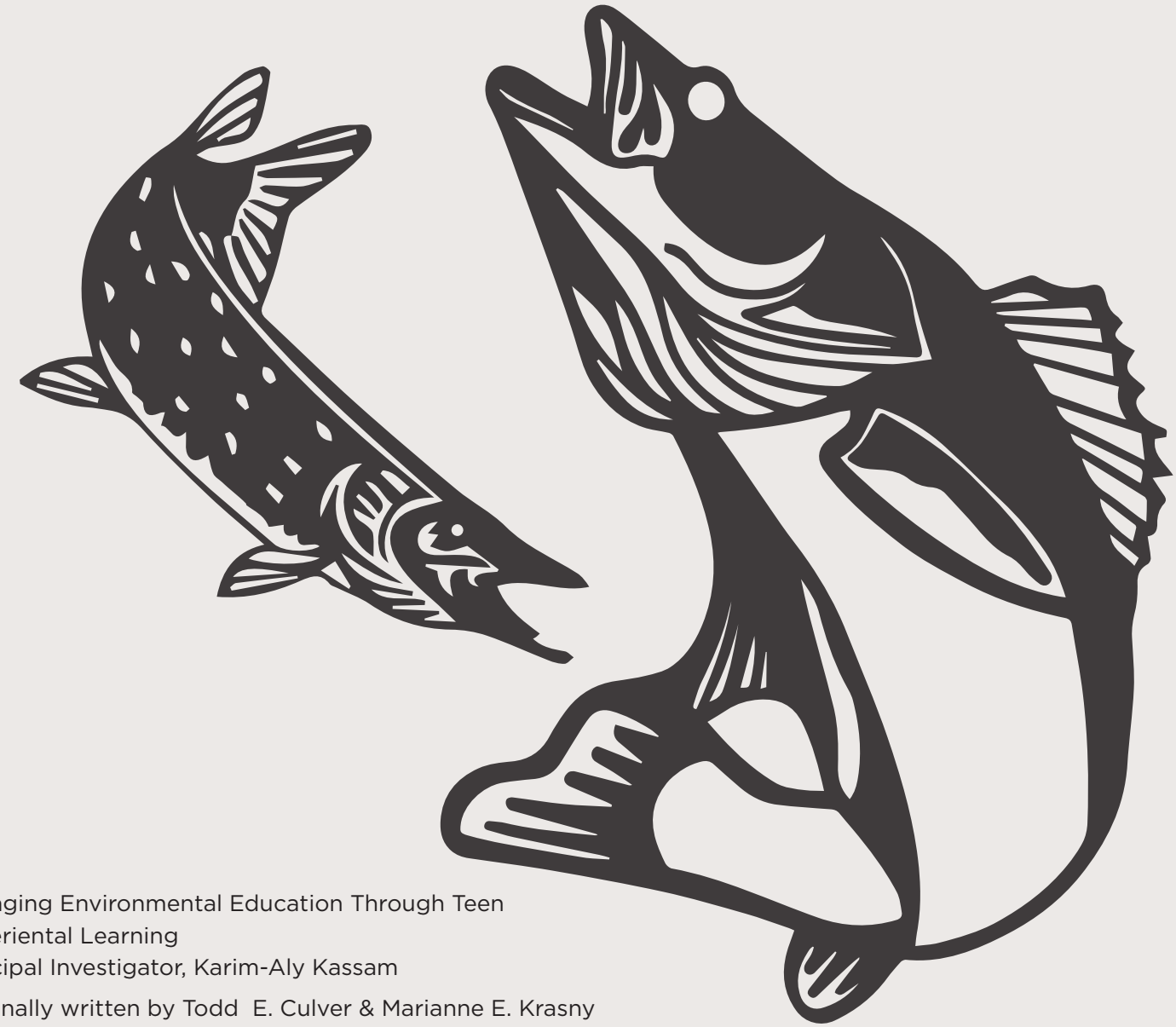
New York State 4-H
SPORT FISHING PROJECT

Ice Fishing FUNdamentals

Activity 7

Member Guide



Engaging Environmental Education Through Teen Experiental Learning
Principal Investigator, Karim-Aly Kassam

Originally written by Todd E. Culver & Marianne E. Krasny
Illustrations by Tamara R. Sayre
Revised by Linda C. Brosch, 2018

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NEW YORK STATE 4-H

Revised by Linda Brosch, Oswego County Cooperative Extension, 2018

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John Bowe, Warren County Cooperative Extension;
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Jenn Bassman, Communications & Events Administrator, New York State 4-H

PREFACE

Ethic of Stewardship through Environmental Education

To whom much is given, much is expected! It is with this outlook; young people are asked to engage in both the learning objectives and activities of environmental education. This curriculum for ***Ice Fishing FUNdamentals*** opens a window of curiosity and wonder into the habitat for the 4-H youth.

We do not exist outside of "nature" because it is all around us and we, ourselves, are fundamentally "natural"! We breathe, feed, live, reproduce, and die like other beings. In other words, the habitat consists of communities of living beings all around us. The word 'animal' derived from the Latin root animus meaning that which is endowed with will, spirit, or mind carries with it the understanding that we are part a larger community of beings. The world around us is animate, a source of deep wonder through observation and reflection, and through direct engagement with it, the basis of boundless insight. By mindfully participating in our habitat, we learn as much about it as we do about each other and ourselves.

The Greek word oikos, "household," is the root of the prefix 'eco' in both ecology and economics. In the twenty-first century, we grasp the complex connectivity of geophysical, biological and sociocultural systems, in which the planet is truly our oikos: it is the dwelling place of humanity. However, to understand it, we must begin locally with our habitat, our home.

The objectives of this revised and updated curriculum for the 4-H youth are:

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These objectives, while distinct, are not mutually exclusive because they work in tandem to achieve environmental education among youth. For instance, appreciation of ones habitat occurs only when a young person acquires knowledge about it. This knowledge creates wonder and curiosity that act to widen a youth's perception and understanding of their natural environment – to create a wider sense of community. Furthermore, knowledge is firmly grounded among the youth through guided experiential learning by undertaking activities outside. Book learning is not sufficient, as it must be accompanied by direct experience. This engagement, in turn, creates appreciation. Only when one appreciates, does a young person develop a sense of responsibility to care for ones habitat. At its core, this process creates informed and committed youth to environmental stewardship.

Responsibility for ones habitat is at the core of the ethic of stewardship. The word 'steward' combines the two active roles: of being 'in charge' on the one hand; and 'to serve' on the other. Humanity and by extension the 4-H youth are both 'guardians of' and 'servants to' life on this planet. Both ideas are commensurate, equally relevant, neither can be compromised. For 4-H youth, this means inculcating through this curriculum the value of responsibility by demonstrating how a human being is simultaneously in charge of their habitat and by knowledgeable action serves its wellbeing. The specific activities should engender a sense of mutual relationship where the youth benefits from and conserves their habitat.

A human ecological perspective informed by the ethic of stewardship is not only desirable, rather it is a necessary value in the twenty-first century. As a result of engaging (Place the name of the specific curriculum here), over the lifetime of the 4-H youth we should expect:

- An expanded ethic of stewardship encompassing all lands and waters whether they are urban or rural;
- A desire to work collaboratively with employers and employees, educators, artists, clergy and laypeople, young and old alike – to achieve a future that is sustainable;
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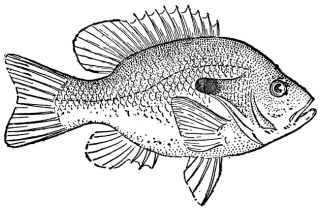
- An embrace of the ethic of stewardship throughout their adult life.

In short, it is important that the 4-H youth understands that: once you know about ***Ice Fishing FUNdamentals***, you become responsible for your habitat!

Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

INTRODUCTION



Ice fishing is truly a unique way to catch fish. Imagine walking on water... well maybe on *hard* water! In the right spot at the right time, fishermen and woman can easily out-fish many mammals and birds during the winter months. And ice fishing offers some great opportunities to collect more clues about the lake itself. New York State 4-H Sport Fishing Project detectives can take advantage of the ice to explore lakes at all depths instead of just from the shoreline.

Before you get started with the ice fishing activity you need to be sure you're dressed properly for the weather. There's nothing worse than having to decide between walleye bite or frostbite!

Safety on the ice is important as well, and your group will be spending some time discussing this before going out. How thick is the ice? If it is five inches thick in one place, will it be five inches everywhere on the lake? As they say, and ounce of prevention is worth a pound of cure. Nowhere is this more true than when getting ready to fish through the ice.

Have you ever thought about why is it that ice freezes on a lake from the top down instead of bottom up? Would it make any difference to the fish and other animals and plants if the ice froze from the bottom up? While ice fishing you will have a chance to explore the water temperature under the ice.

Have you ever thought about how a lake "breathes?" Like you, fish and other underwater animals need oxygen to survive. When there is no ice the lake gets a lot of oxygen at the surface through wind and waves, rain, and rivers and streams flowing into it. Underwater plants also produce oxygen if light is present. What do you suppose happens to the oxygen supply when the surface ices over, and snow cover cuts down on sunlight underwater? What clues does all this offer about catching fish?

Have you ever been caught in a "white-out?" A white-out occurs when snow falls or is blown so fast and hard that you can't see anything but white. Lakes with their large, flat surfaces are ideal spots to experience a white-out. What would you do if you were a mile out and a white-out occurred? Would you be able to find your way back to where you started? A compass can help you, but first you need to know how to read it. A compass is an important piece of gear for a hard water angler.

Do you know what seasons are open, or what types of restrictions exist for the lake where you will be fishing? Is there public access to the lake or will you need to ask permission to cross someone's property to get on the ice? New York's climate guarantees that nearly everyone in the state will be near some ice fishing during at least part of the winter. For many, that ice fishing season could last for up to five months. Ice fishing is a great cure for cabin fever, something most outdoor people get more than enough of in winter. See you out there! And dress warmly! Successful anglers also respect the environment. They practice environmental stewardship, which is the **responsible use and protection of the environment** through conservation and sustainable practices both at home and while fishing. It is with the help of such caring and mindful practices that fish population will continue to thrive and grow.

In your Ice Fishing FUNdamentals activity, you will:

- Build a weighted thermometer and a Secchi disk if you haven't already. (See Activity 1 and Activity 3 for directions.)
- Measure water temperature at several depths and use your knowledge of temperature to figure out where the fish might be.
- Complete the Water Temperature and Depth Activity Record Sheet.
- Take a Secchi disk reading with and without snow around your ice fishing hole.
- Complete the Secchi Disk Activity Record Sheet.
- Record your fishing experience, including temperature and Secchi disk readings in your Fishing Journa
- Dress warmly on your fishing trip and have fun!

ACTIVITY RECORD SHEET: Activity 7, Ice Fishing FUNdamentals

Water Temperature & Depth

Start by measuring the depth and temperature on the lake's bottom. Work your way toward the surface, measuring the depth and temperature at regular distances.

WATER DEPTH (ft. or m., circle one)	TEMPERATURE (^{0}F or ^{0}C, circle one)	
_____	_____	LAKE BOTTOM
_____	_____	
_____	_____	
_____	_____	
_____	_____	
_____	_____	
_____	_____	LAKE SURFACE

At what depth was the water the coldest? _____

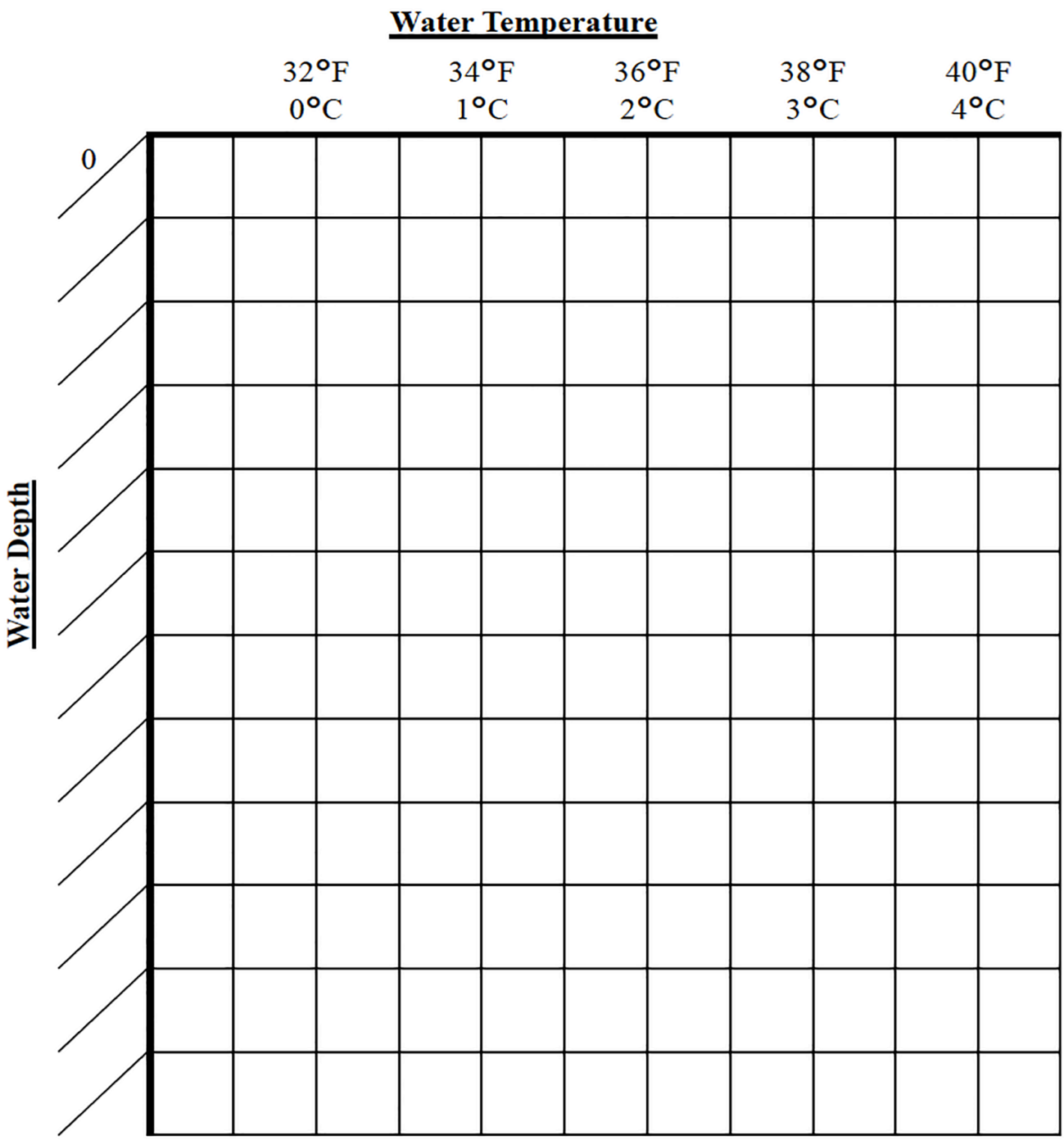
At what depth was teh water the warmest? _____

At what depth did you catch fish?_____

ACTIVITY RECORD SHEET: Activity 7, Ice Fishing FUNdamentals

Water Temperature & Depth

Graph the data you collected below. Ask your leader for help if you have any questions.



ACTIVITY RECORD SHEET: Activity 7, Ice Fishing FUNdamentals

Secchi Disk

1. Ice thickness at the sample site: _____ inches (cm)

2. Is there any snow on the ice? ☐ YES ☐ NO

   If YES, how deep is it? _____ inches (cm)

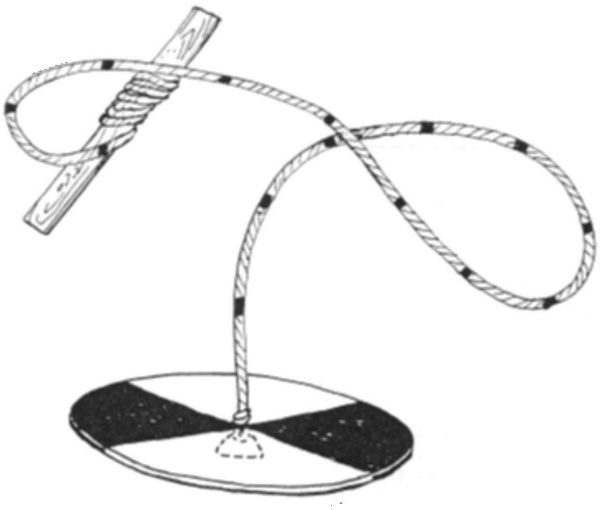
3. How deep was the Secchi disk when you couldn't see it anymore? _____ feet (m)

Clear any snow away from the hole at least six feet (2 m.) in every direction and measure again.

4. How deep was the Secchi disk when you couldn't see it anymore? _____ feet (m)

5, Removing the snow: ☐ ALLOWED MORE LIGHT TO PASS TO THE WATER

☐ ALLOWED LESS LIGHT TO PASS TO THE WATER



ACTIVITY RECORD SHEET: Activity 7, Ice Fishing FUNdamentals

Reading a Compass

Name of Lake or Pond: _____

A compass can be very handy for an ice angler who stays out too late (maybe the fish are really biting) or gets caught in a "white-out." White-outs occur when it snows really hard or when the wind is strong enough to blow the snow off the ice.

Most compasses have a needle that turns on a point inside a round chamber that is filled with liquid. One end of the needle always points towards the Magnetic North Pole. This floating needle is specifically marked, usually in red paint. The edge of this chamber is a dial which is marked with 360 degrees. This is the circle of directions. This dial is called the compass housing.

Before you go out on the lake, always take a compass reading or bearing so you will know which way to return even if you can't see the shore. Follow the directions below to take a compass reading or bearing.

To Read Your Compass

1. Hold the compass level so that the needle swings freely. The needle is now pointing to magnetic north (not exactly true north, but close enough).

2. Holding the compass parallel to the ground, turn your entire body until you are facing in the direction of where you want to go.

3. When you do this, the direction of travel arrow on the compass base will point directly at where you want to go.

4. Turn the compass housing until the housing arrow lines up with the magnetic needle (pointing to magnetic north).

5. Read the bearing on the compass housing. The bearing is the number that is now at the top of the dial and lines up with the direction of travel arrow. The bearing is the direction of where you want to go. Write it down.

6. To return in a white-out, add 180° to the original bearing if the bearing is less than 180°, or subtract 180° if the bearing is more than 180°. This number is your return bearing. Write it down.

7. Set your return bearing by turning the compass housing until the new bearing lines up with the direction of travel arrow. When you are ready to return, turn your body until the magnetic needle and housing arrow are aligned. The direction of travel arrow on the back of the compass base will point you back to your starting point.

ACTIVITY RECORD SHEET: Activity 7, Ice Fishing FUNdamentals

Reading a Compass

Compass Bearing going out: _____ degrees

You can also record this information as a compass direction such as North, Northeast, or West.

Compass Bearing going out: _____ degrees

To find your way off the lake and back to the car, you need to go in the opposite direction.

If your original compass bearing was less than 180 degrees, calculae the return compas bearing by adding 180 to the original reading.

Compass Bearing coming back: _____ degrees

+ _____180_____ degrees

_____ degrees

If your original compass bearing was more than 180 degrees, calculae the return compas bearing by subtracting 180 from the original reading.

Compass Bearing coming back: _____ degrees

- _____180_____ degrees

_____ degrees

ACTIVITY RECORD SHEET: Activity 7, Ice Fishing FUNdamentals

Fish Growth

Remove a scale from a fish following the directions of your leader.

Species Name: _____

Length:_____

Weight:_____ (if measured)

Draw the pattern of rings seen on the fish scale in the box below. Look carefully at the spacing between the lies on the scale.

How many areas do you see where the lines are close toghether?

The lines in fish scales get closer together when the growth of the fish slows down. Name some things that might cause a fish's growth to slow.

One factor that often slows the growth of fish is cold weather in winter. If each winter the lines on the scale get closer together, how old do you think this fish is? One factor that often slows the growth of fish is cold weather in winter. If each winter the lines on the scale get closer together, how old do you think this fish is?

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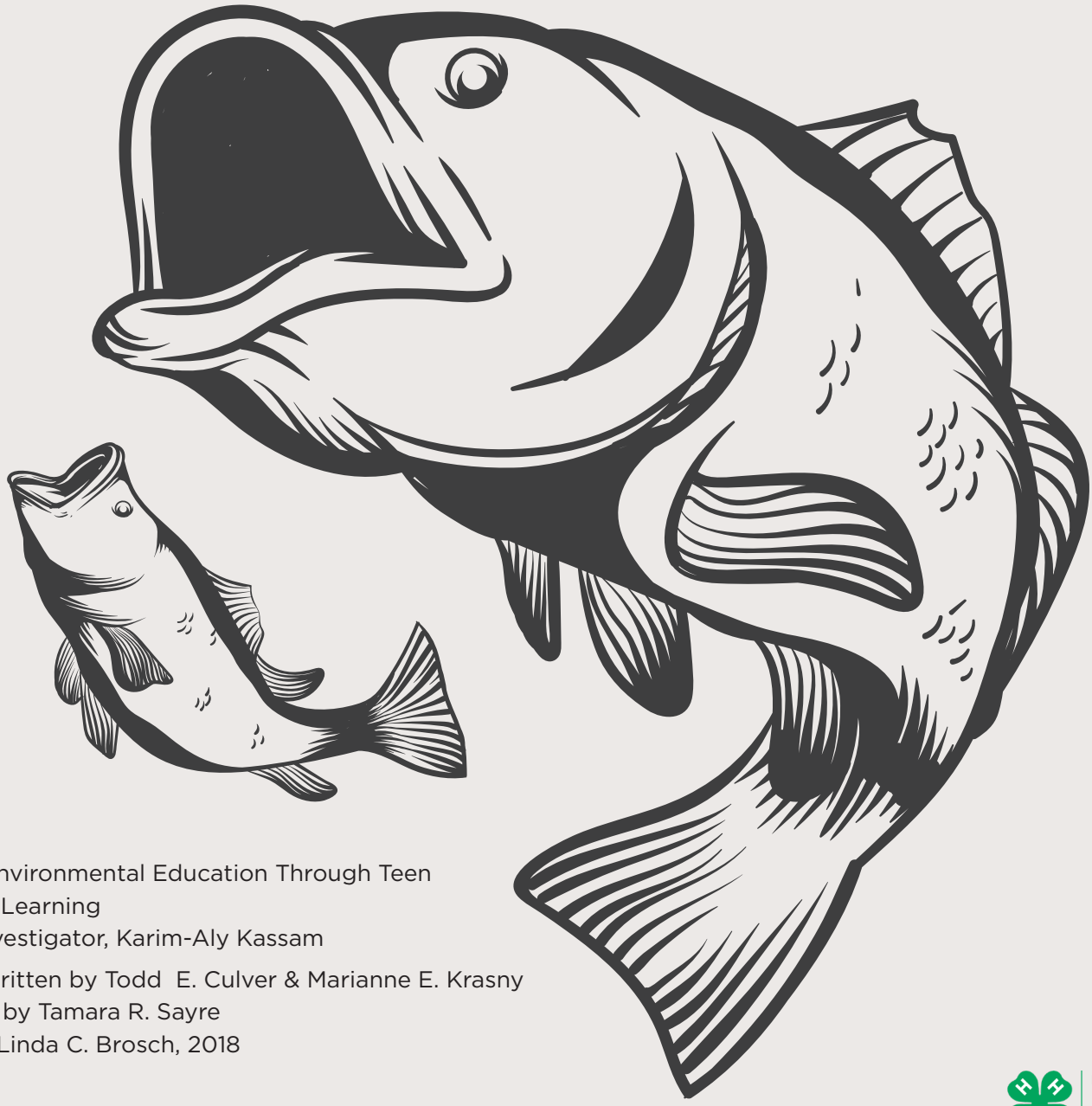
New York State 4-H
SPORT FISHING PROJECT

Fish Biology & Identification

Activity 8

Leader Guide



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Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

INTRODUCTION

Being able to identify fish is an important aspect of the New York State 4-H Sport Fishing Project fishing trip. It allows youth to quickly and accurately confirm that they have caught the kind of fish they were seeking. In addition, knowing about the fish they have caught may help them determine other species of fish that may be present. For example, if a person has just reeled in a bluegill from a warmwater lake, it is possible that largemouth bass (who prey on bluegills) also inhabit the water. By being good at identifying fish, an angler can better understand the ecosystem they enjoy so much. In order to identify a fish, the angler must look carefully at its features. Characteristics used to identify fish, such as mouth shape and size, color, and body form, also give the angler clues to how a fish feeds, where it lives, and what it eats. Therefore, identifying fish can help the angler learn about a fish's lifestyle and habits. This knowledge, in turn, will improve the angler's success.

Anglers must also be familiar with local fishes to comply with fishing regulations. There are laws governing what fish you can keep, what size they must be to keep them, when you may catch them, what methods you can use, where you may fish, and how many you are allowed to keep!

There are a number of ways to learn how to identify fish. Experienced anglers can look at a fish and "know" what it is. Unfortunately, unless they can explain to others how they know, their knowledge is of little help to the inexperienced angler. The key to teaching youth how to identify fish is to get them looking at the features of fish that are important in identification.

Once anglers have learned to look at the features of fish, they can compare these features with those in a fish identification book or pamphlet. However, if there are a great many fish to identify, it may become tedious to look through all the pictures in a book. In that case, you may want to use a dichotomous key to identify fish.

In this activity, participants will learn about some of the features of fish that are used in identification and that tell us about fish habits. In addition, participants will learn how to identify fish. Although the activities are planned for indoors, once your club members are familiar with the principles of identifying fish, you can encourage them to identify the fish they catch right after they reel them in. Discussions about population levels and species diversity can also be held anywhere any time.

Objectives

Fish Biology & Ecology

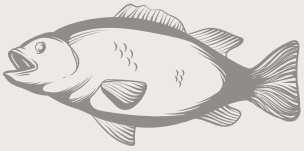
Youth will:

- Understand how to use a key to identify fish.
- Become aware of some of the important features used in identifying fish.
- Be able to relate some of the important features of fish to their function.

Environmental Stewardship

Youth will:

- Learn responsible use and protection of the natural environment through conservation and sustainable practices.



New York State P-12 Science Learning Standards*

2- LS4-1
3- LS4-3
MS-LS4-6

*Effective July 1, 2017

Website Resources for Fish Identification

NYS DEC Fish:
http://www.dec.ny.gov/animals/269.html

Inland Fishes of New York Directory by Cornell University:
http://www2.dnr.cornell.edu/cek7/nyfish/index.html

MATERIALS AND EQUIPMENT

- Frozen fish (from previous fishing trips or su permarket), a minimum of five different species
- *Guide to Freshwater Fishes of New York* or New York Fishing, Hunting & Wildlife app
- Large sheet of paper
- Marker
- Paper and pencil for each member

WHAT TO DO

1. Place the frozen fish on a table and number them. Ask the group to gather around the fish and to name features which distinguish the fish from each other. Record the features (such as body form, mouth shape, and color) for everyone to see.

2. Have the participants turn to the Fish Showing Identification Characteristics Activity Record Sheet. After the students have looked over the illustration, ask them if they have anything to add to their list of distinguishing features. Add these additional features to the first ones.

3. Explain to the group that fish can be identified by using a key. Explain that a key is a series of questions, each one about a certain feature of the fish. By answering the questions, they can narrow down the selections and identify which fish they're looking at.

4. Have the youth choose one of the catfish from the Members of the Catfish Family Activity Record Sheet illustrations and identify it using the Example of a Key to Identify Fish Activity Record Sheet.

5. Break the group into teams of two or three youths. Using the list of features the participants have come up with, ask them to write a "key" to the frozen fish. Instead of giving a name of a fish at the end of a selection in the key, the individual will give a number. Once the teams have made their keys, ask them to trade keys between teams. Then see if the teams can identify the fish to number, using another team's key.

6. Explain to the youth that in addition to using keys, fish can be identified by trying to match up a fish with a picture of that fish. Have half the youth try to find the real names of the frozen fish using the key in *Guide to Freshwater Fishes of New York or* New York Fishing, Hunting & Wildlife App. Have the other half identify the fish using the pictures in field guides.

7. Ask the participants to compare the results of using the two methods of fish identification. What are the advantages and disadvantages of both? Check the results of the identifications to make sure the youth know the right names of the fish.

8. Ask the participants to choose one feature of a fish. How might that feature help the fish to survive? What does that feature say about the habits of the fish? The "whiskers" or sensory barbels on catfish are used to locate food in the dark. They are a clue to the life habits of catfish, can live on the bottom of murky streams, ponds and lakes, and locate food at night.

9. Have the youth complete the Fish Identification and Biology Activity Record Sheet:. They can use the Generalized Fish Showing Some Identification Characteristics Activity Record Sheet to help them identify fish body parts.

ACTIVITY 8: Background Materials

Fish Features and their Functions

Body Form

The shape of a fish's body is a clue to its life habits. Nature has tailored each species to a form that enables it to survive. For example, a trout that spends most of its life in moving waters is streamlined, so that flowing water will pass around it with minimal friction. Compare the trout to the largemouth bass. Because bass live in still ponds and lakes, they can afford to have chunky bodies and broad flat tails. These features make them highly maneuverable, allowing them to swim around stumps and between the stalks of lily pads. Bluegills and other members of the sunfish family also maneuver well in tight places, due to their compressed body shape.

The most efficient design for speed through water is the torpedo shape in which the greatest body girth is about one-third the distance from snout to tail. Tunas are a prime example of this. However, a shape designed for speed generally has little maneuverability. The slender body of a pike, with fins set well back near the tail, spells ambush. This shape is well-suited for quick starts and great speeds over short distances. Flat fish, such as rays and flounders, are bottom dwellers. The shape of a catfish also indicates a bottom dweller. Catfish and bullheads have flat broad heads which help them burrow into muddy lake and pond bottoms

Fins

A fish's dorsal fin extends upward from its back, usually starting behind the gill cover or "operculum." Some fish, such as bass, are spiny-rayed; others such as trout are soft-rayed. Fish may have one, two or three dorsal fins, which may or may not be connected. The fins can be a combination of spiny and soft. The dorsal fin, along with the anal or ventral fin located just behind the anus, aids fish in maintaining balance. In some species, these fins also help in maneuvering tight places.

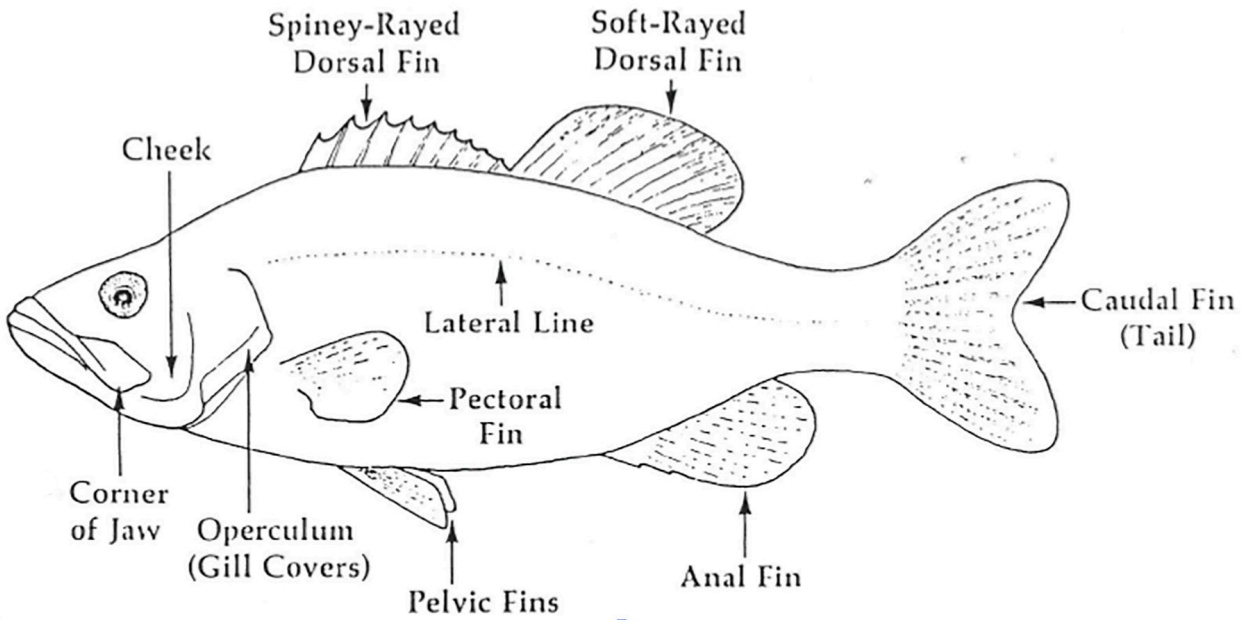
Pectoral fins are found right behind the gill covers (one on each side). They are used for staying in one place and for fine tuning a fish's position. On fast moving species, such as tuna, pectoral fins serve as bow planes, helping the fish dive or surface.

Pelvic fins, located on the bottom of the fish, correspond to animal legs and sometimes have special functions such as holding, grasping, or even crawling. On most fish, they aid in positioning and balance. Species that move with great speed, such as tuna, are often able to pull the pectoral and pelvic fins tightly against the body.

The caudal fin, or tail tells a great deal about the speed and maneuverability of a fish. Any species with a forked tail is a fast swimmer. Forked tails are hard on the outer edges like a skin diver's flipper and soft and flexible in the inside. Broad, flat tails, such as those of bass, indicate the ability to turn quickly and to start swimming instantly.

Scales

In most species, the body is covered with scales that serve as protective plating to prevent abrasions or skin diseases. The number of scales on a given fish remains constant; it does not change as the animal gets larger. Like the cross-section of a tree trunk, scales show rings for growth and are a tool for scientists trying to determine the age of a fish. The size and shape of a fish's scales tell us something about the fish's lifestyle. For example, some of the fastest swimming fishes, such as tuna, trout, salmon, and mackerel, have very tiny scales. Sedentary fish, such as carp and drum, have large plate-like



Slime

Slime coats the body of most fish, serving as protection against disease, fungi, and parasites. It also aids in reducing friction. In handling a fish prior to its release, extreme care must be taken to minimize the damage to the slime, such as using rubber nets instead of nylon nets, and wetting one's hands before handling the fish.

Coloration

Coloration in fish serves a variety of purposes, from concealment and camouflage, to recognition by schoolmates and mating partners. Every hue imaginable appears in one species or another, and some fish even have the ability to change color. When sunfish get excited, a color change often occurs with portions of the shading becoming much more vivid in appearance. In fish such as salmon, the color becomes more brilliant during the spawning season in order to attract a mate.

Almost every species is countershaded, or dark across the back and light on the belly. This is an effective form of camouflage. When a predator looks down on the dark back, the fish is difficult to detect. Viewed from below, the light belly blends with the sky and clouds.

Fish are marked in a variety of ways, depending on their life habits. Bottom dwellers, such as bullheads are usually mottled, whereas open water species, such as trout and salmon, are silvery or relatively light. The pattern of a northern pike resembles sunlight filtering through a weedbed.

ACTIVITY 8: Background Materials

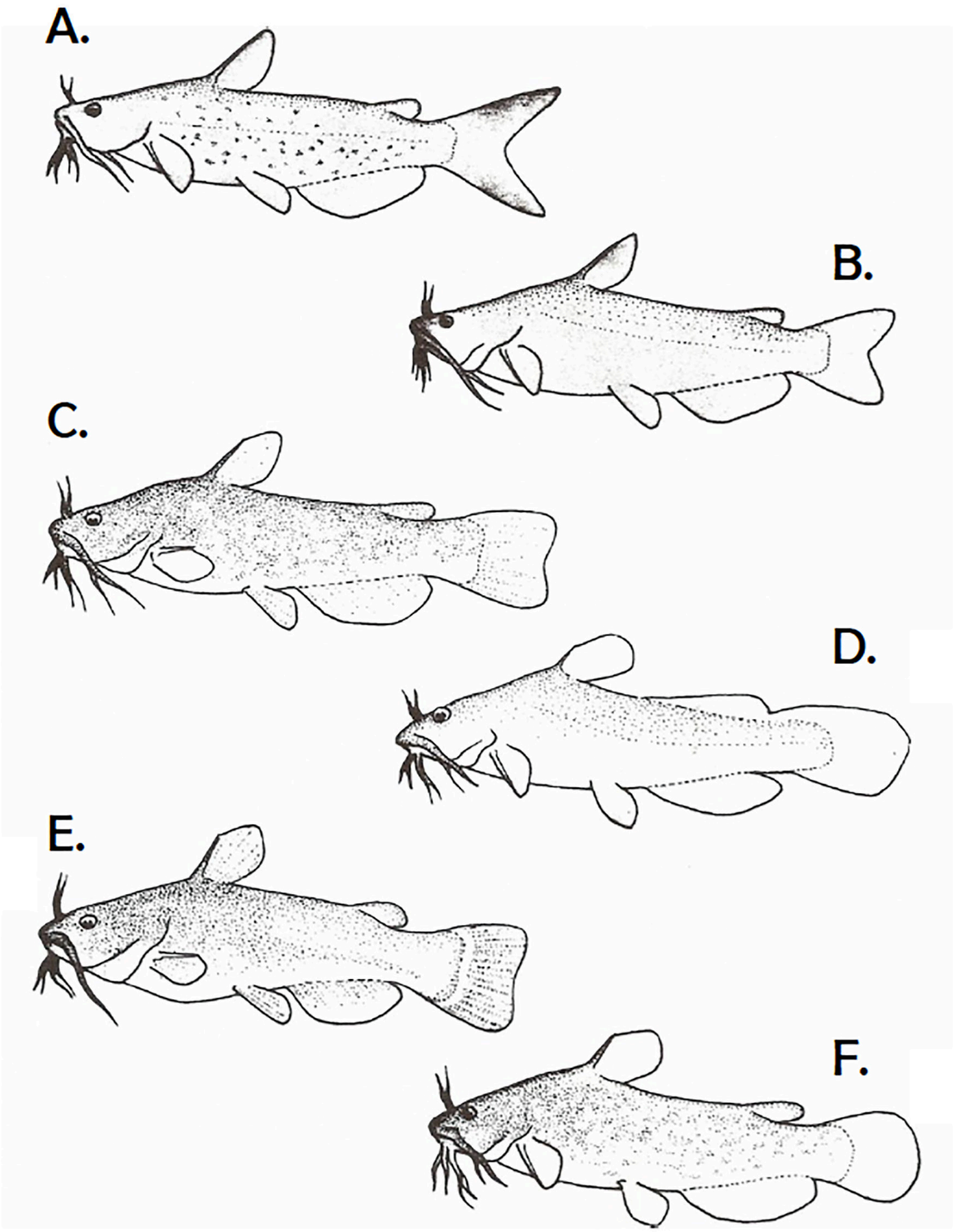
Examples of Fish Features and their Functions

FEATURE	FUNCTION	EXAMPLE
Mouth		
Sucker-shaped mouth	Feeds on very small plants/animals	Sucker, carp
Elongated upper jaw	Feeds on prey it looks down on	Spoonbill, sturgeon
Elongated lower jaw	Feeds on prey it sees above	Barracuda, snook
Duck-bill jaws	Grasps prey	Bass, grouper
Body Shape		
Torpedo shaped	Fast moving	Trout, salmon
Flat bellied	Bottom feeder	Croaker, drum, puffer
Vertical disk	Feeds above or below	Tuna, butterfish
Horizontal disk	Bottom dweller	Flounder, halibut
Hump-backed	Stable in fast current	Sockeye salmon
Coloration		
Light-colored belly	Hard for predators to see from below	Tuna, mackerel
Dark upper side	Hard for predators to see from above	Barracuda, flounder
Vertical stripes	Can hide in vegetation	Muskellunge, pickerel
Horizontal stripes	Can hide in vegetation	White bass, snook
Mottled coloration	Can hide among rocks and on bottom	Trout, grouper, rock bass
Reproduction		
Eggs deposited on bottom	Hidden from predators	Trout, salmon
Eggs deposited in nests	Protected by adults	Bass, sunfish
Floating eggs	Dispursed in high numbers	Striped bass
Eggs attached to vegetation	Stable until hatching	Perch, northern pike

SOURCE
Project Wild Aquatic

ACTIVITY 8: Background Materials

Members of the Catfish Family



ACTIVITY 8: Background Materials

Example of a Key to Identify Fish

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2b. Is the tail moderately forked, with lobes of tail fin rounded? Do the sides of the fish not have any black spots? If yes, the fish is a **White Catfish**. Stop here.

3a. Is the adipose fin free, not connected to the tail fin? If yes, go to 4.
3b. Is the adipose fin not free but connected to the tail fin or separated by a slight or incom-plete notch? If yes, the fish is a **Madtom or Stonecat**. Stop here.

4a. Is the tail fin rounded? Are the barbels on the chin white? If yes, the fish is a **Yellow Bullhead**. Stop here.
4b.Is the tail fin squared or slightly forked? Are the barbels on the chin gray or black? If yes, go to 5.

5a. Is the rear edge of the pectoral spine strongly serrated, with saw-toothed appearance? Does the base of the trail fin lack a light bar? Are the fin membranes a color other than black? If yes, the fish is a **Brown Bullhead**. Stop here.
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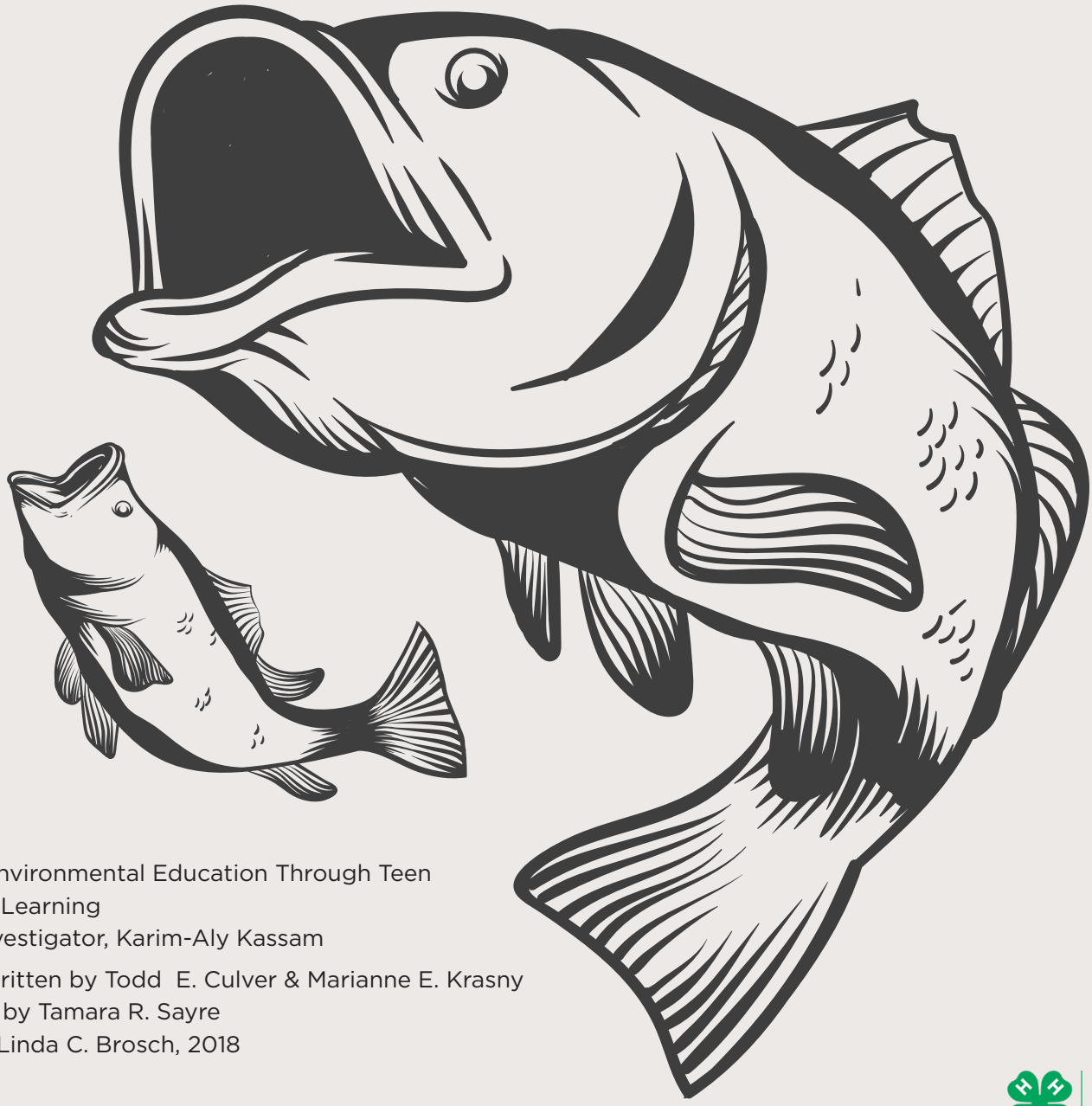
New York State 4-H
SPORT FISHING PROJECT

Fish Biology & Identification

Activity 8

Member Guide



Engaging Environmental Education Through Teen Experiental Learning
Principal Investigator, Karim-Aly Kassam

Originally written by Todd E. Culver & Marianne E. Krasny
Illustrations by Tamara R. Sayre
Revised by Linda C. Brosch, 2018

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NEW YORK STATE 4-H

Revised by Linda Brosch, Oswego County Cooperative Extension, 2018

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— Lucinda A. Noble, Director

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PREFACE

Ethic of Stewardship through Environmental Education

To whom much is given, much is expected! It is with this outlook; young people are asked to engage in both the learning objectives and activities of environmental education. This curriculum for ***Biology & Fish Identification*** opens a window of curiosity and wonder into the habitat for the 4-H youth.

We do not exist outside of "nature" because it is all around us and we, ourselves, are fundamentally "natural"! We breathe, feed, live, reproduce, and die like other beings. In other words, the habitat consists of communities of living beings all around us. The word 'animal' derived from the Latin root animus meaning that which is endowed with will, spirit, or mind carries with it the understanding that we are part a larger community of beings. The world around us is animate, a source of deep wonder through observation and reflection, and through direct engagement with it, the basis of boundless insight. By mindfully participating in our habitat, we learn as much about it as we do about each other and ourselves.

The Greek word oikos, "household," is the root of the prefix 'eco' in both ecology and economics. In the twenty-first century, we grasp the complex connectivity of geophysical, biological and sociocultural systems, in which the planet is truly our oikos: it is the dwelling place of humanity. However, to understand it, we must begin locally with our habitat, our home.

The objectives of this revised and updated curriculum for the 4-H youth are:

- to generate an appreciation for their natural habitat;
- to provide knowledge about specific aspects of that habitat;
- to directly engage the habitat through guided activity; and
- to develop an ethic of stewardship through responsibility, recognizing that one's community includes the living habitat.

These objectives, while distinct, are not mutually exclusive because they work in tandem to achieve environmental education among youth. For instance, appreciation of ones habitat occurs only when a young person acquires knowledge about it. This knowledge creates wonder and curiosity that act to widen a youth's perception and understanding of their natural environment – to create a wider sense of community. Furthermore, knowledge is firmly grounded among the youth through guided experiential learning by undertaking activities outside. Book learning is not sufficient, as it must be accompanied by direct experience. This engagement, in turn, creates appreciation. Only when one appreciates, does a young person develop a sense of responsibility to care for ones habitat. At its core, this process creates informed and committed youth to environmental stewardship.

Responsibility for ones habitat is at the core of the ethic of stewardship. The word 'steward' combines the two active roles: of being 'in charge' on the one hand; and 'to serve' on the other. Humanity and by extension the 4-H youth are both 'guardians of' and 'servants to' life on this planet. Both ideas are commensurate, equally relevant, neither can be compromised. For 4-H youth, this means inculcating through this curriculum the value of responsibility by demonstrating how a human being is simultaneously in charge of their habitat and by knowledgeable action serves its wellbeing. The specific activities should engender a sense of mutual relationship where the youth benefits from and conserves their habitat.

A human ecological perspective informed by the ethic of stewardship is not only desirable, rather it is a necessary value in the twenty-first century. As a result of engaging (Place the name of the specific curriculum here), over the lifetime of the 4-H youth we should expect:

- An expanded ethic of stewardship encompassing all lands and waters whether they are urban or rural;
- A desire to work collaboratively with employers and employees, educators, artists, clergy and laypeople, young and old alike – to achieve a future that is sustainable;
- An understanding that economic and ecological matters relating to their habitat or home (oikos) are not unrelated, but are profoundly interconnected;
- Valuing of local place-based and indigenous knowledge about landscapes and natural resources; and
- An embrace of the ethic of stewardship throughout their adult life.

In short, it is important that the 4-H youth understands that: once you know about ***Biology & Fish Identification***, you become responsible for your habitat!

Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

INTRODUCTION

How important is it to know about fish in order to catch them? By now, this probably sounds like a foolish question to you. You have seen how you can catch more fish by understanding them and the places where they live. How would you like to learn even more about fish identification and biology?

What can the presence or absence of certain kinds of fish tell you about the fishing and the environment (remember the canary in the mine)? How can understanding the way a fish is built help you to catch it? How can you get clues about where a fish lives, what it eats and how its feeds just from looking at it?

As you examine a fish, see if you can find a relationship between the way it is shaped and what it does. By doing so, you can gather important clues about how to find and catch fish.

You will learn how to tell look-alike fish species apart. Fish like chain pickerel, northern pike, and muskellunge are very similar in appearance. You would not want to be stuck trying to explain to a conservation officer that you thought the undersized muskie on your stringer was really a chain pickerel.

Some fish, like brown trout and an Atlantic salmon, look so much alike each other that it may take a trained fisheries biologist to tell them apart. In fact, there is an on-going argument about whether the "brown trout" that was the world-record holder for largest trout may in fact have been a Atlantic Salmon. The fact that the fish in question was caught in Scotland over 100 years ago does not help the matter! The question was finally put to rest, at least partly, when a young Arkansas angler caught a bigger brown trout, and now has the undisputed world record brown trout weighing in at 37 pounds!

Successful anglers also respect the environment. They practice environmental stewardship, which is the **responsible use and protection of the environment** through conservation and sustainable practices both at home and while fishing. It is with the help of such caring and mindful practices that fish populations will continue to thrive and grow.

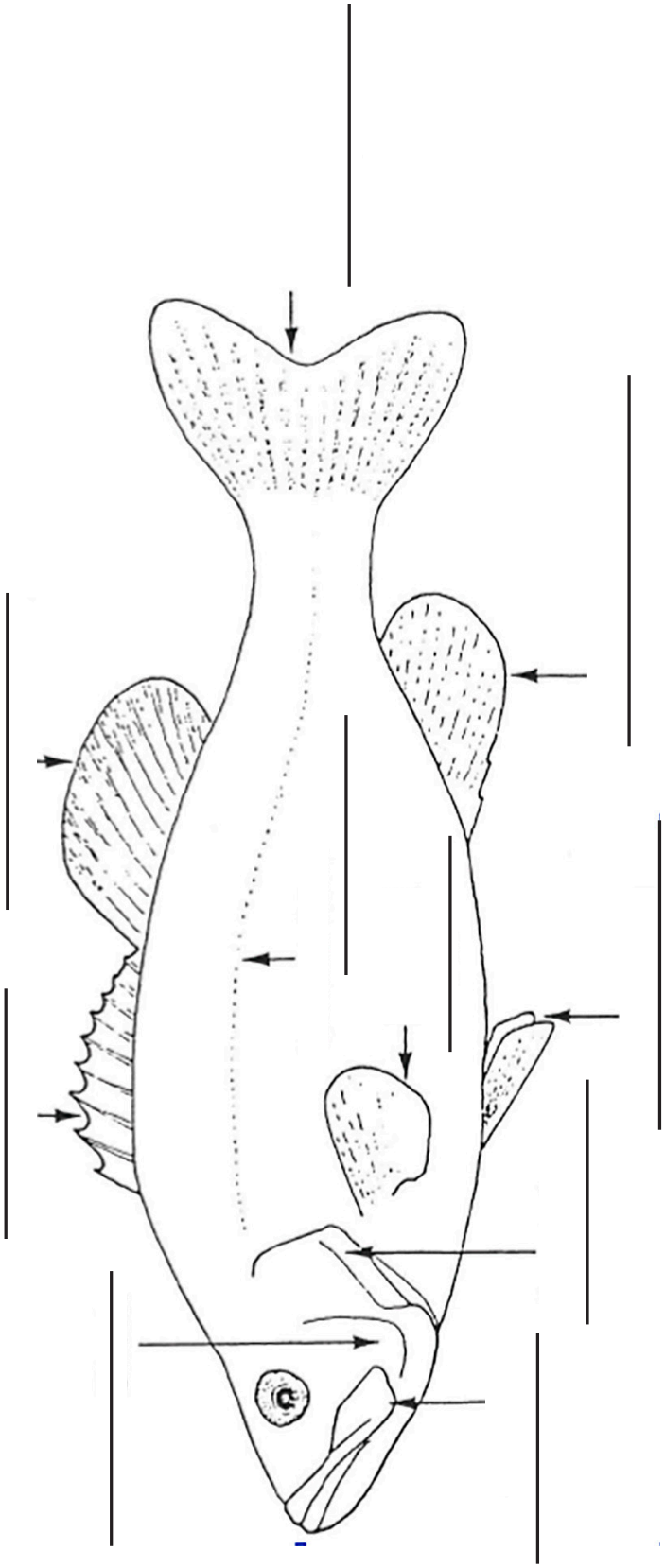
In your Fish Biology & Identification activity, you will:

- Complete the Fish Showing Identification Characteristics Activity Record Sheet.
- Complete the Fish Identification and Biology Activity Record.
- Identify a fish on the Members of Catfish Family Background Sheet using the Example Key to Identify Fish.

ACTIVITY RECORD SHEET: Activity 8, Fish Biology & Identification

Generalized Fish Showing Identification Characteristics

Label as many parts of the fish as you can. Ask for help in completing the labeled fish if necessary. When you finish, check the answer with the leader.



ACTIVITY RECORD SHEET: Activity 8, Fish Biology & Identification

Fish Showing Identification and Biology

The group leader will provide directions to help complete this record sheet.

1. Draw your fish in the space below. Label all the fins and other parts that you notice.

2. Feel the surface of the skin. What does it feel like?

3. How might a slimy surface help a fish?

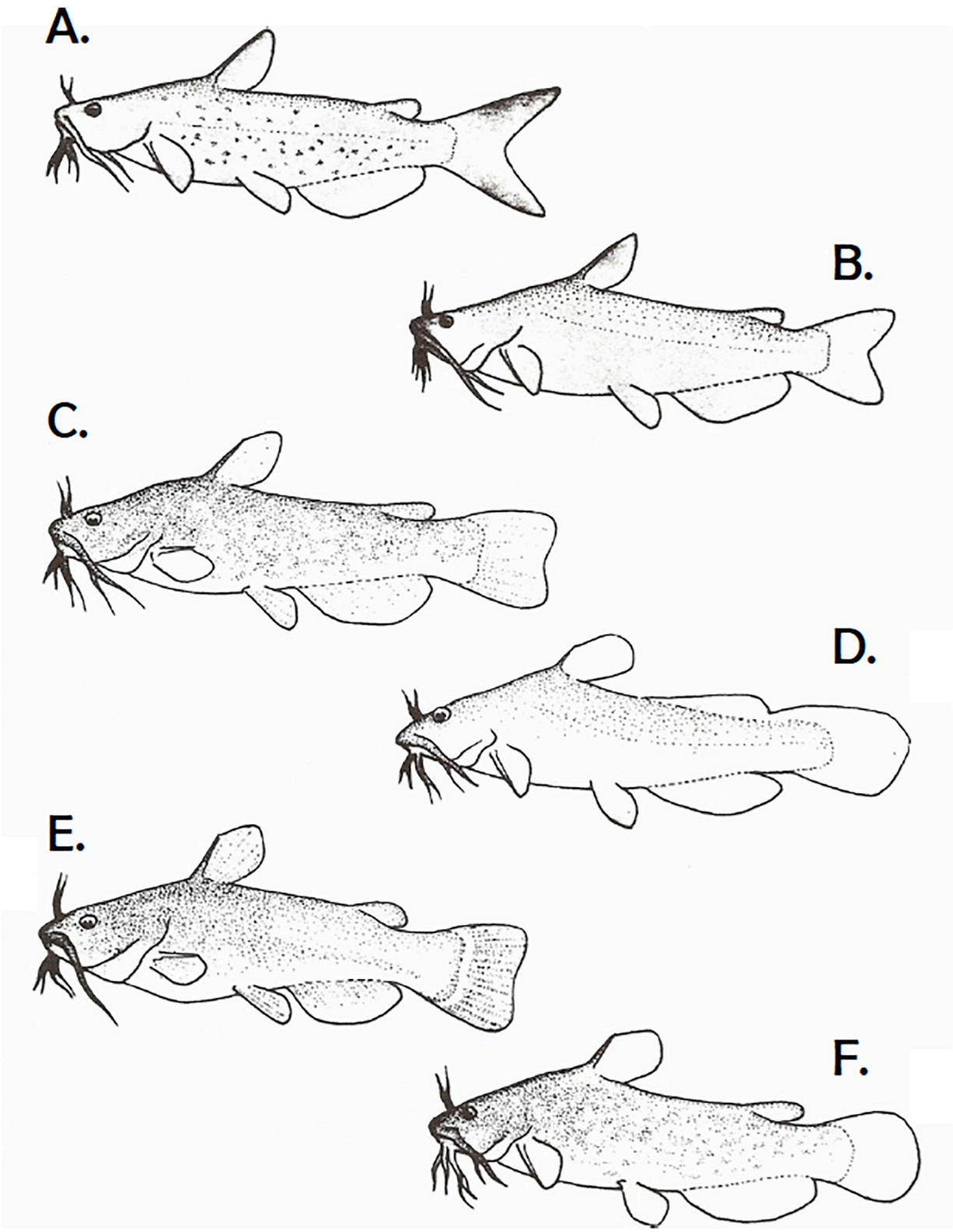
4. What color is your fish?

5. How might a fish's color help the fish?

6. Are your fish's markings arranged in a particular pattern?

ACTIVITY RECORD SHEET: Activity 8, Fish Biology & Identification

Members of the Catfish Family



ACTIVITY RECORD SHEET: Activity 8, Fish Biology & Identification

Example of a Key to Identify Fish

Choose one of the catfish from the previous page. Then identify it by answering the questions below.

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New York State 4-H
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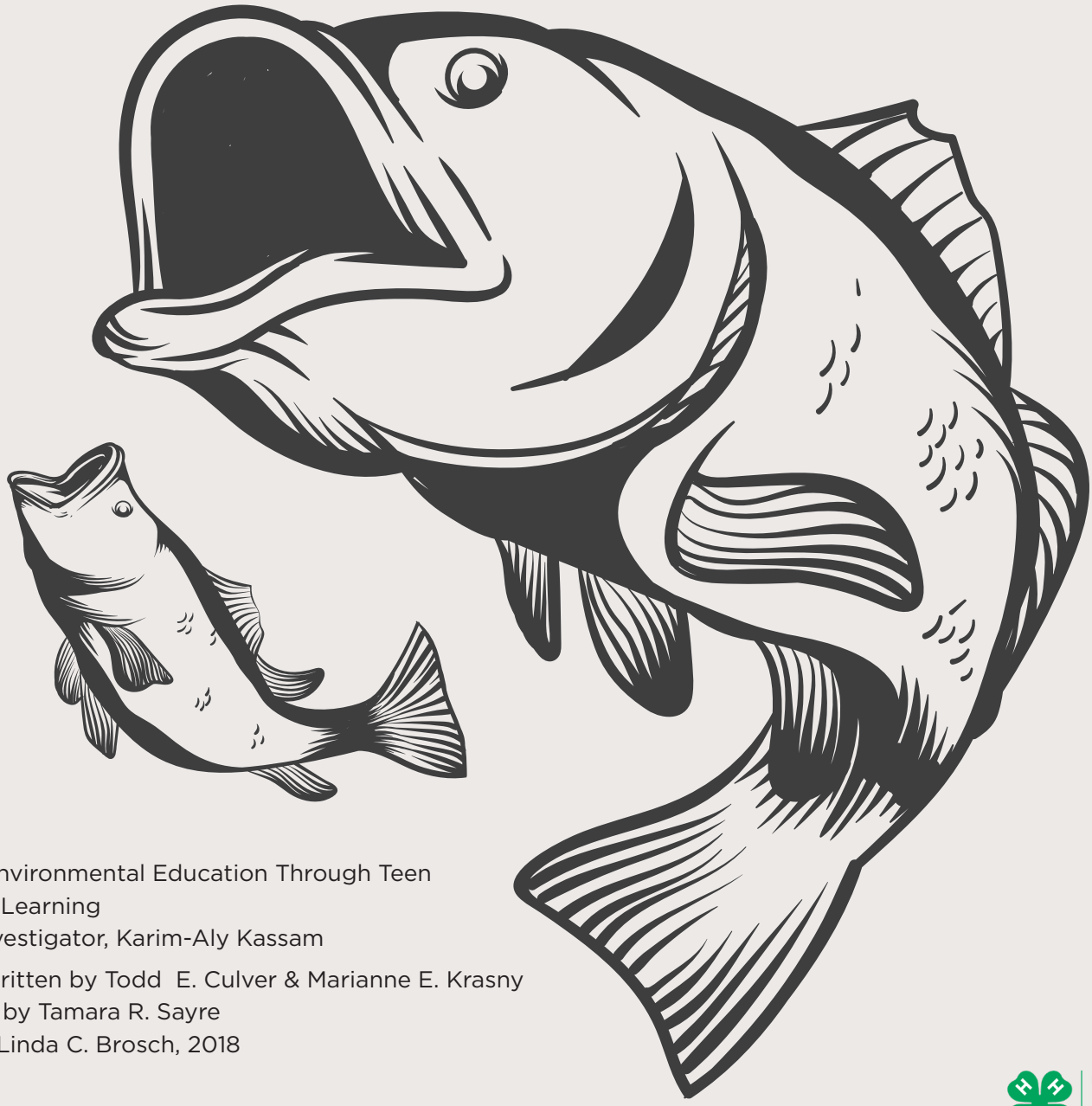
Youth Journal



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Karim-Aly Kassam,
Principle Investigator, Engaging Environmental Education through Teen Experiential Learning Programs

Trip 1

Date:	**Name and Description of Water Fished**
Time Begin: **Time End:**	**Species Fishing For:**
Air Temperature	**Weather**
Water pH	**Secchi Disc Depth** **Current Speed**
Time of Tides **(if applicable):** **High Tide:** **Low Tide:**	

Water Temp: Water Depth:	Water Temp: Water Depth:
Water Temp: Water Depth: Time:	Water Temp: Water Depth: Time:

Trip 1

Method Used to Catch Fish	
Bait (state type)	Plugs (state type)
Spinners (state type)	Flies (state type)
Spoons (state type)	

Record of all Fish Caught

Fish Species	Total Length	Bair or Lure	Kept

Trip 1

When did you catch most of the fish? What time of day was it?

Where did you catch most of the fish?

What bait or lure caught the most fish?

How did you use the bait or lure?

Draw or describe any aquatic organisms you caught in your sampler: (seine net, D-net. Stream sampling net, or minnow trap) circle one

Draw or Describe stomach contents

Trip 1

Notes and remarks on anything you want to remember about this fishing or science trip.

I had fun because...

Today I liked...

Next time I will...

Trip 2

Date:	**Name and Description of Water Fished**
Time Begin: **Time End:**	**Species Fishing For:**
Air Temperature	**Weather**
Water pH	**Secchi Disc Depth** **Current Speed**
Time of Tides **(if applicable):** **High Tide:** **Low Tide:**	

Water Temp: Water Depth:	Water Temp: Water Depth:
Water Temp: Water Depth: Time:	Water Temp: Water Depth: Time:

Trip 2

Method Used to Catch Fish	
Bait (state type)	Plugs (state type)
Spinners (state type)	Flies (state type)
Spoons (state type)	

Record of all Fish Caught

Fish Species	Total Length	Bair or Lure	Kept

Trip 2

When did you catch most of the fish? What time of day was it?

Where did you catch most of the fish?

What bait or lure caught the most fish?

How did you use the bait or lure?

Draw or describe any aquatic organisms you caught in your sampler: (seine net, D-net. Stream sampling net, or minnow trap) circle one

Draw or Describe stomach contents

Trip 2

Notes and remarks on anything you want to remember about this fishing or science trip.

I had fun because...

Today I liked...

Next time I will...

Trip 3

Date:	**Name and Description of Water Fished**
Time Begin: **Time End:**	**Species Fishing For:**
Air Temperature	**Weather**
Water pH	**Secchi Disc Depth** **Current Speed**
Time of Tides **(if applicable):** **High Tide:** **Low Tide:**	

Water Temp: Water Depth:	Water Temp: Water Depth:
Water Temp: Water Depth: Time:	Water Temp: Water Depth: Time:

Trip 3

Method Used to Catch Fish	
Bait (state type)	Plugs (state type)
Spinners (state type)	Flies (state type)
Spoons (state type)	

Record of all Fish Caught

Fish Species	Total Length	Bair or Lure	Kept

Trip 3

When did you catch most of the fish? What time of day was it?

Where did you catch most of the fish?

What bait or lure caught the most fish?

How did you use the bait or lure?

Draw or describe any aquatic organisms you caught in your sampler: (seine net, D-net. Stream sampling net, or minnow trap) circle one

Draw or Describe stomach contents

Trip 3

Notes and remarks on anything you want to remember about this fishing or science trip.

I had fun because...

Today I liked...

Next time I will...

Trip 4

Date:	**Name and Description of Water Fished**
Time Begin: **Time End:**	**Species Fishing For:**
Air Temperature	**Weather**
Water pH	**Secchi Disc Depth** **Current Speed**
Time of Tides **(if applicable):** **High Tide:** **Low Tide:**	

Water Temp: Water Depth:	Water Temp: Water Depth:
Water Temp: Water Depth: Time:	Water Temp: Water Depth: Time:

Trip 4

Method Used to Catch Fish	
Bait (state type)	Plugs (state type)
Spinners (state type)	Flies (state type)
Spoons (state type)	

Record of all Fish Caught

Fish Species	Total Length	Bair or Lure	Kept

Trip 4

When did you catch most of the fish? What time of day was it?

Where did you catch most of the fish?

What bait or lure caught the most fish?

How did you use the bait or lure?

Draw or describe any aquatic organisms you caught in your sampler: (seine net, D-net. Stream sampling net, or minnow trap) circle one

Draw or Describe stomach contents

Trip 4

Notes and remarks on anything you want to remember about this fishing or science trip.

I had fun because...

Today I liked...

Next time I will...

Trip 5

Date:	**Name and Description of Water Fished**
Time Begin: **Time End:**	**Species Fishing For:**
Air Temperature	**Weather**
Water pH	**Secchi Disc Depth** **Current Speed**
Time of Tides **(if applicable):** **High Tide:** **Low Tide:**	

Water Temp: Water Depth:	Water Temp: Water Depth:
Water Temp: Water Depth: Time:	Water Temp: Water Depth: Time:

Trip 5

Method Used to Catch Fish	
Bait (state type)	Plugs (state type)
Spinners (state type)	Flies (state type)
Spoons (state type)	

Record of all Fish Caught

Fish Species	Total Length	Bair or Lure	Kept

Trip 5

When did you catch most of the fish? What time of day was it?

Where did you catch most of the fish?

What bait or lure caught the most fish?

How did you use the bait or lure?

Draw or describe any aquatic organisms you caught in your sampler: (seine net, D-net. Stream sampling net, or minnow trap) circle one

Draw or Describe stomach contents

Trip 5

Notes and remarks on anything you want to remember about this fishing or science trip.

I had fun because...

Today I liked...

Next time I will...

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