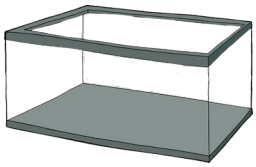
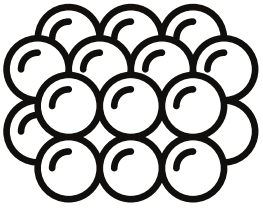
Fish Friends

CURRICULUM 2023

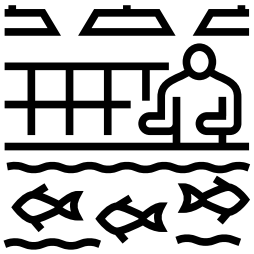


Tank Set Up

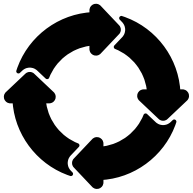
Habitat



Getting Redd-y

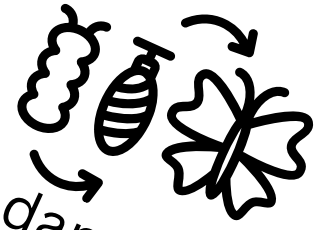


Mactaquac Biodiversity Facility

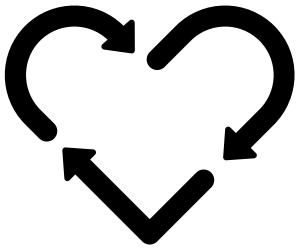


Salmon Lifecycle

Freshwater



Adaptation



Sustainability

Migration

Stewardship

Fish Friends

INTRODUCTION

Developed in the mid 1990s by the Atlantic Salmon Federation (ASF), the program is designed to be a long-term conservation program aimed at educating the next generation of environmental stewards. The New Brunswick Salmon Council (NBSC) took the lead role in delivering the Fish Friends program in New Brunswick in 2011. The NBSC continues to focus on maintaining the sustainability of the program by including new schools and re-involving schools that once participated.

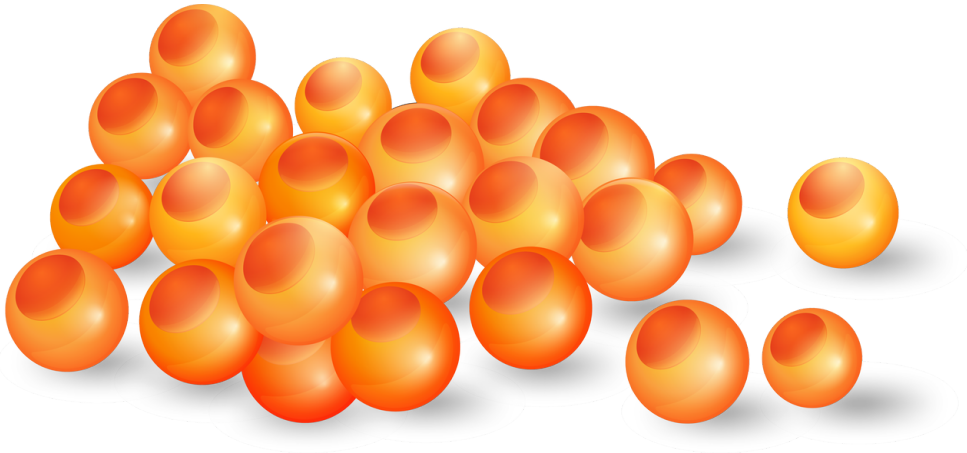
Students will carry the knowledge gained with them as they venture into nature, into further studies, and eventually into society as young adults. Learning about wild Atlantic salmon and other fish species in our rivers and seas is fundamental to caring for them. Effective public education and opportunities for hands-on learning are vital to making the right decisions on the balance between use of land, water and air and the health of living things and their environment. Students will likely use the insights they gain from the varied and entertaining activities of Fish Friends throughout their lives. Carefully crafted lessons allow students to appreciate the sensitivity of fish to environmental degradation and the importance of our recreational fisheries to society. It is essential that we persuade tomorrow's adults to care enough never to poach, pollute waters or destroy habitat.

A core mandate of the Hammond River Angling Association (HRAA) is education, both through conservation and community interaction, particularly regarding Atlantic salmon conservation. The HRAA has been involved in the Fish Friends program since the beginning. We believe that the Fish Friends program is an extremely valuable program for our future environmental leaders, which is why we have updated the original curriculum. The goal is to redesign the program to compliment the new learning styles of children while pivoting to include an online format. We have added educational videos to accompany each lesson on our website, as well as activity sheets for educators to choose from, making the program more inclusive to classrooms that may not have Fish Friends tanks, homeschool learners, and curious public members.

We hope you enjoy the revamped Fish Friends Program!

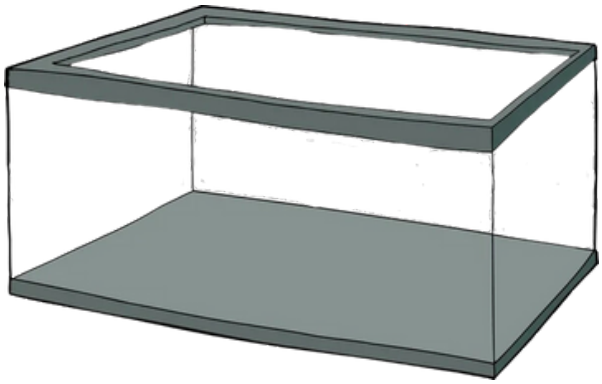
Sarah Blenis, Melissa Crilley & Sophie Hebert- HRAA Staff 2023

Fish Friends



Lesson 1

Setting Up Your Fish Friends Tank



Fish Friends

Lesson 1
Tank Set Up

Supplies Needed:

1 Tank
1 Chiller Unit
6 Sheets of Styrofoam (bottom, top, and 4 sides)
1 Power Filter
1 Foam filter, 1 charcoal insert/carbon insert
1 piece of nylon or mesh + elastic band
Small rocks
1 small net to scoop out any deceased eggs/fish

Set Up Instructions:

1) Thoroughly clean and sterilize the aquarium, rocks, filter, coil, etc.
2) Set the tank on a very sturdy table. Remember that the tank full of water weighs several hundred pounds.
3) Make sure that when you're choosing your location to set up your tank that it is not near heaters or heat sources- this can impact the water temperature.
4) Set the tank on a base of insulating Styrofoam. It must be insulated on all sides. Insulating on all sides provides two benefits: it stabilizes water temperature and prevents the chiller from working too hard and provides darkness for the eggs which is very important at this stage of development.
5) Check the chiller air intake screen to make sure it is clean. When clogged with dust, this can overwork the chiller making it difficult to maintain temperatures. If necessary, clean the air intake screen with a vacuum cleaner.
6) Ensure that the chiller is properly supported such that it is not hanging by the coil, which puts weight on the glass side of the tank.
7) Gently place the rocks on the bottom of the tank.
8) Add enough water into the tank to cover the coil (fill tank with water approximately 3-5 inches below the top of the tank).
9) Add your foam filter on the bottom of the power filter tank, then your activated charcoal and carbon filters on top.
10) Add nylon pantyhose or fine mesh on the water intake of the power filter with an elastic band to prevent the fry from getting pulled into the filter unit.
11) Set the power filter into the tank and plug it in. You will need to prime the power filter pump by pouring water into the top of the power filter.
12) Plug in the chiller unit and set the temperature at 4°C.
13) Let the system run for a week in preparation for the delivery of the eggs- if any issues arise, please reach out to the HRAA.

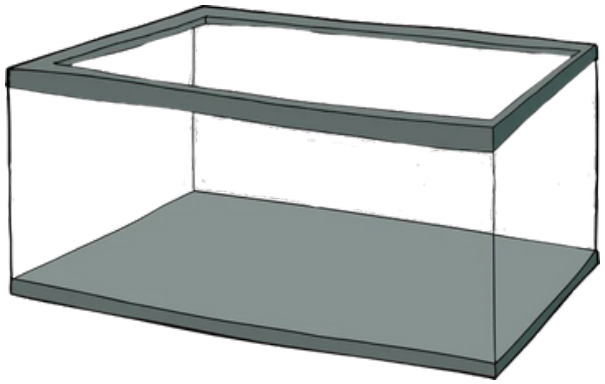
Fish Friends

LESSON 1 ACTIVITY SUMMARY

Check out the video on how to set up your Fish Friends Tank! We have tried to make this as easy to follow as possible, but if you have any issues during your tank set up, please reach out to us at projects@hraa.ca with your questions.

This is a great opportunity to watch this video with your class and have them assist you in setting it up! Students will learn about why we use filters, what temperature the eggs should be kept at, why the rocks are important, and why we cover the tank in Styrofoam.

Class Activity: Design your own tank cover! Lots of schools Styrofoam covers are old and dingy- we are looking for new designs that we can custom order to help jazz up your tank! Once your class is finished with the design, send the picture to us and she'll take care of it from there! Don't have any Styrofoam for your tank? Let us know, and we can help you out!



Fish Friends

Lesson 2

Mactaquac

Biodiversity Facility

Fish Friends

Lesson 2
Mactaquac

Objectives:

The students will be introduced to the concept of habitat by first examining their own world, where they live, play and go to school. They then design a research task to determine the diversity of living things that share their habitat. They will apply their understanding of the concept of habitat in future lessons.

Lesson Overview:

Our habitat is our home, the geographic location where we live and where our needs are met. Our habitat is also a community because we share it with other living things. Most living things can tolerate changes in their habitat, but to survive, their needs must continue to be met. A habitat is the natural abode or locality of an animal, plant, or person. It also includes all features of the environment in a given locality. Frequently, the terms "habitat" and "environment" are used primarily for physical features such as topography, water supplies, and climate, but the terms are not confined to physical features, for vegetation and other animals also form major components of any given habitat or environment.

The Mactaquac Biodiversity Facility was built shortly after the construction of the Mactaquac Dam in 1968. The site is 5.3 hectares large, that's the size of almost 10 football fields! The main salmon hatchery uses up to 70 million liters of well and river water every day to rear over 2 million eggs and up to one million fish of various life stages. This facility raises salmon from eggs all the way to full grown adults. While they are growing, fish are held in troughs. To ensure the fish are healthy, workers at the facility need to check on the salmon's health regularly to see any changes or if there is anything out of the ordinary. The fish are retrieved using a basket called a braille that is controlled with hoists to move the passageway which you can handle the fish individually. Information is gathered, for examples if they are male or female, whether they are a grilse or a salmon and collecting a tissue sample and a scale sample for aging.

The facility is located on the Wolastoq River, also known as the Saint John River. This river has been known for the special relationship between it and the people around it. The Wolastoq is a beautiful place that First Nations have inhabited for millennia. The Wolastoqiyik knew their homeland inside and out. First Nations people took what they needed from the land and gave thanks to the creator with medicine for everything that they took. The river provided an abundance of food, materials and medicines. Because of the way they lived, they had minimal environmental impact on the land. The river helps them to develop and sustain these communities as a separate and unique nation. Today, there are approximately 4,000 Wolastoqiyik living in the six communities within the region.

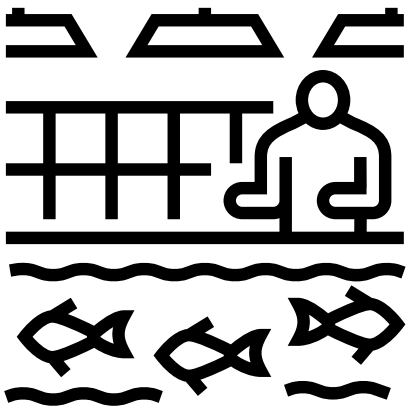
Fish Friends

LESSON 2 ACTIVITY SUMMARY

The students will be introduced to the concept of habitat by first examining their own world, where they live, play and go to school. They then design a research task to determine the diversity of living things that share their habitat. They will apply their understanding of the concept of habitat in future lessons. The students will also learn about where their Fish Friends eggs came from- the Mactaquac Biodiversity Facility!

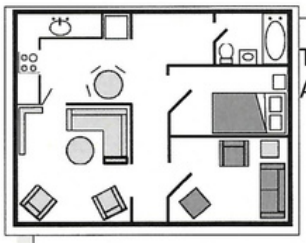
Class Activities:

1. My Home Activity Sheet - Kindergarten - Grade 5. Beginning principals on the concept of “habitat”, where students draw their own house, and then create riddles on different types of habitat!
2. My Habitat Activity Sheet - Grades 3 - 5. A writing assignment in which students will expand on the concepts of habitat to examine the world around them.
3. What I Know About Salmon Activity Sheet - Grades 3 - 5. This is a writing assignment to see how much students already know about Atlantic salmon! By the end of the unit, educators can see how much students have learned over the course of Fish Friends!
4. If I Were A Salmon Activity Sheet- Grades 3 - 5. A writing assignment designed to inspire imaginations! Students will write about what it would be like to be an Atlantic salmon, incorporating key words from a word box.



Lesson 2 Activity 1

My Home



This is a bird's-eye view of a house. Can you find a bedroom? A bathroom? A kitchen? What does your home look like? Draw it here.

What am I?

The answer to each riddle is something we need to survive. Where is each need met in your home?

1. Over your head and under your feet
   I'm the safe place where you live and you sleep.
2. Without me you wouldn't even be here
   Your stomach is hoping I'll always be near.
3. I come from the clouds, I'm clean, I'm bright
   I sit in a glass by your bedside at night.
4. You breathe me in and breathe me out
   So do the dogs, the bees and trout.
5. Most people throw me right out of their place
   I'm one of the biggest problems you face.

Now it's your turn

Write a riddle about something else that's an important part of your home. Exchange riddles with your classmates.

Lesson 2 Activity 2

Name:

What is my Habitat?

Animals that live near me:

Insects/Arthropods that live near me are:

Climate in my habitat is:

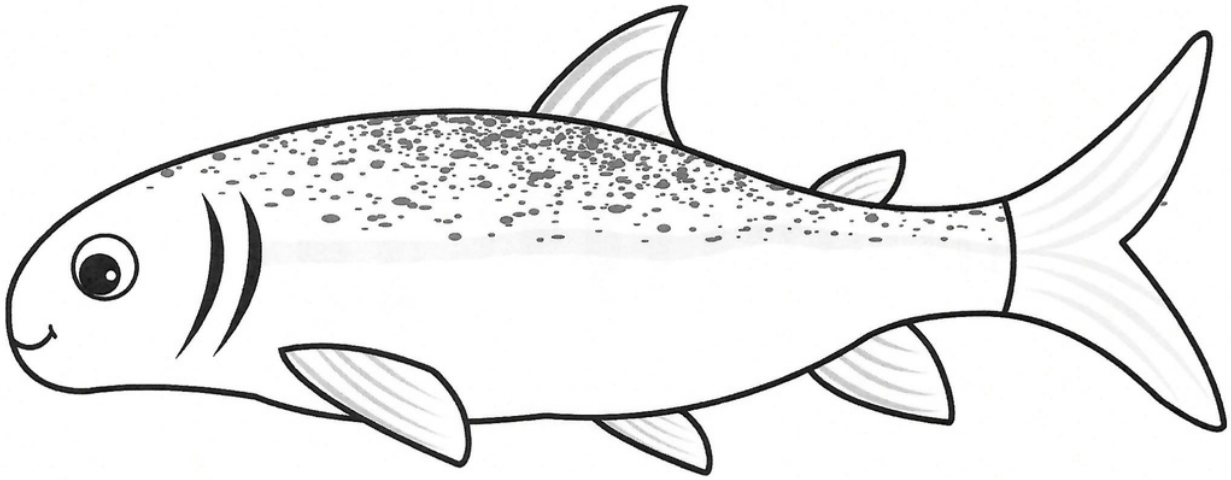
How do the plants and animals interact?

Describe the water near you: ***(ocean/river/lake/marsh/pond/stream...)***

My habitat is: _____

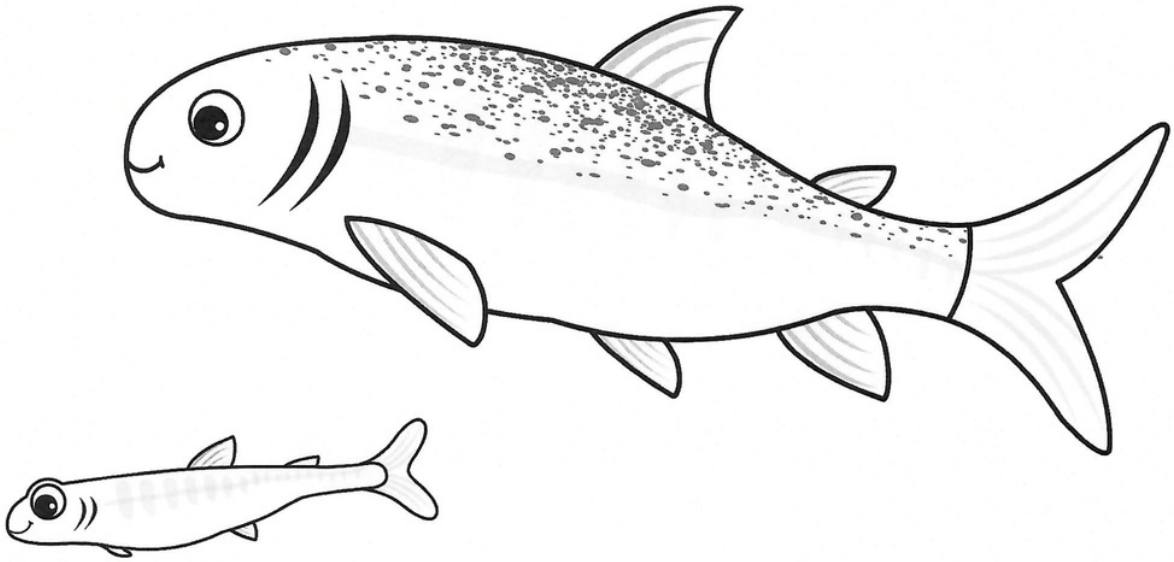
Lesson 2 Activity 3

What I know about Salmon



Lesson 2 Activity 3

What I want to learn about Salmon



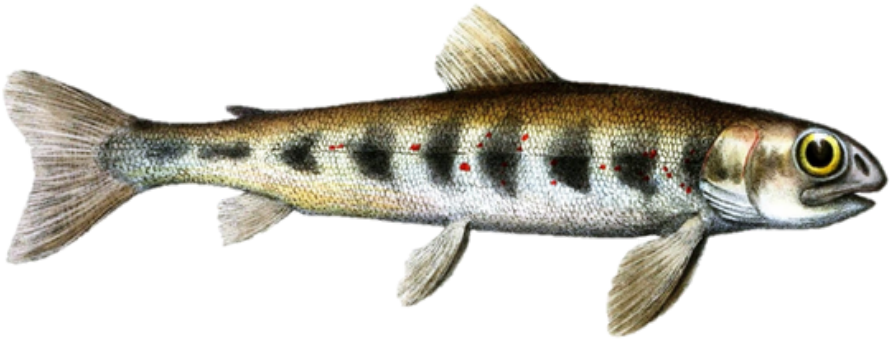
Lesson 2 Activity 4

If I were a Salmon...

salmon	water	river	swim
eggs	alevin	journey	birth
hunted	re-adapt	upstream	groups

Using the words above write some sentences about what you would do if you were a Salmon.

Fish Friends



Lesson 3

Habitat

Fish Friends

Lesson 3
Habitat

Objectives:
In this lesson, the students will apply their understanding of habitat from the previous lesson to the habitat of a fish. Through a reading activity, they will reflect on how the needs of fish are met. They are encouraged to make comparisons with their own needs and habitat.

Lesson Overview:
The environment in which fish live is quite different from ours, but they have the same basic needs as humans: oxygen, food, shelter, water and ways to eliminate waste. In order for fish to survive, their needs must be met in a habitat that is shared with many other living things. The preferred habitat of fish varies depending on many factors. The young of some fish, like salmon and trout, prefer shallow streams with clean gravel bottoms. In later stages, they travel to deeper rivers with shaded protected pools. Other species like bass, catfish and eels prefer the deeper murky waters of ponds and lakes.

A fish's habitat must meet these needs in the same way that our habitat meets our needs. The main difference in the fish's habitat is obvious, it's made of water. Fish do not breathe air in the same way we do. They breathe by taking water into their mouths where it passes over their gills and absorbs oxygen through the water. This means that the oxygen must be dissolved in the water. It also means that the fish is very vulnerable to drought and pollution.

The decline of fisheries for salmon coincided with the coming of the Industrial Revolution at the end of the eighteenth century. The revolution radically affected the economic structure of society around the world. The revolution caused an explosion of economic activity which resulted in an increase in population and the growth of towns and cities. The thinking behind the Industrial Revolution was that an increase in material wealth was good, regardless of its effect on the environment. Thus, in North America, particularly in New England, the best rivers were affected. They were polluted, dammed, and eventually ruined by the detrimental effects of industrial growth.

History has revealed a change in attitude regarding natural resources. Today, we want to be very careful to ensure that our actions are not harming the wildlife around us, especially the freshwater species. Freshwater habitats are already limited so its super important that we take care of them and keep the fish healthy.

Fish Friends

LESSON 3 ACTIVITY SUMMARY

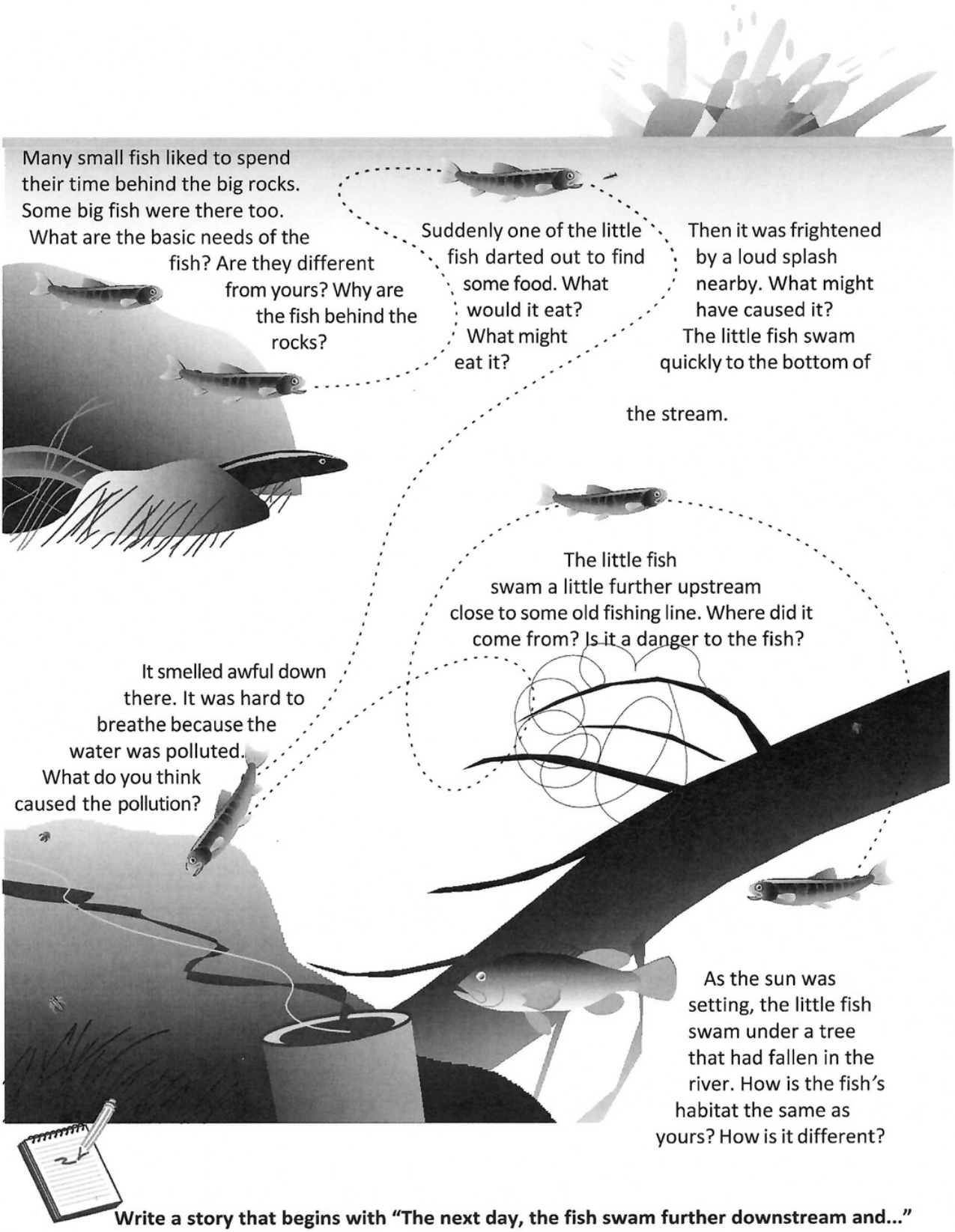
In this lesson, the students will apply their understanding of habitat from the previous lesson to the habitat of a fish. Through a reading activity, they will reflect on how the needs of fish are met. They are encouraged to make comparisons with their own needs and habitat.

Class Activities:

1. A Day In The Life of a Salmon Activity Sheet - Kindergarten - Grade 5. Teachers can read the story aloud to the class and have all students participate in what they think happens next in the story. For older grades, students can write out the rest of their story.
2. Habitat Activity Sheet - Kindergarten - Grade 5. For younger grades, students can draw what they think their home habitat is like, and what a salmon habitat is like. For older grades, students can use the free space to write the comparison between their own habitats and that of salmon!
3. Aquatic Habitat Activity Sheet - Kindergarten - Grade 5. For younger grades, students can draw what the interactions between the 4 items and their habitats. For older grades, they can write the interactions between the 4 items and their habitats.
4. Environment Words Activity Sheet - Kindergarten - Grade 5. Students are challenged to make as many words as possible out of the word ‘environment’. For an added bonus, set a timer and see how many words they can come up with in a short time!

Lesson 3 Activity 1

A Day in the Life of a Fish



Write a story that begins with "The next day, the fish swam further downstream and..."

Lesson 3 Activity 2

Habitat drawing and details

Describe your human habitat. What do you need for survival?

Describe your salmon habitat. What do they need for survival?

Lesson 3 Activity 3

Name:

Aquatic Habitat

An aquatic habitat has both living and non living things that interact. The living things need the non living things to live and grow.

Explain how the living and non living things in the aquatic habitat interact.

Plants

Water

Temperature

Sun

Lesson 3 Activity 4

Make a Word

Name: _____

How many words can you make from:

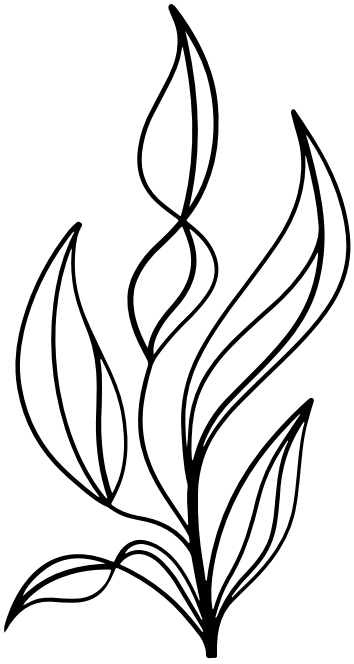
ENVIRONMENT

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____

11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____

Fish Friends

Lesson 4
Life in Freshwater



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Lesson 4
Life in Freshwater

Objectives:
In this lesson, the students begin to examine biodiversity and its importance to survival of a habitat. They first describe the variety of organisms living in freshwater and then examine some of the interactions among them.

Lesson Overview:
Most habitats contain a great variety of living things- we call this biodiversity. Plants and animals of different species, sizes and shapes along with microscopic organisms are commonly found together, sharing the same habitat and interacting with each other in complex relationships.

Diversity is important for the survival of living things in any habitat. In the absence of diversity, the loss of one or two key species can result in the collapse of all life in the habitat. Life in a local habitat struck down by a passing storm can spring back quickly because enough diversity still exists. Something resembling the original state of the environment will be restored.

Every habitat, from the Brazilian rain forest to the Antarctic Bay, has a unique combination of living things. Each kind of plant and animal living there is linked to only a small part of the other species. Eliminate one species, and another increases in number to take its place. Eliminate many species, and the local habitat starts to visibly decay.

All of these interactions between species form an “ecosystem”. The term “ecosystem” describes a system in which there are living organisms, non-living components, and a primary source of energy. The sun is the “engine” driving the rest of the system. How big is an ecosystem? The entire planet is sometimes referred to as an ecosystem; this ecosystem is termed the global ecosystem or biosphere. Ecosystems with simple interactions are usually more vulnerable to drastic change than are ecosystems with complex interactions.

Why do we need so many different kinds of plants and animals? What if a few of them do become extinct? The answer lies in complex ecological principles. There may be no immediate catastrophe if a certain species does disappear, but the system is thereby changed from its natural state and is more vulnerable to ecological instability. By conserving diverse habitats, we help to insure a more natural, more complex, and more stable plants and animals.

Fish Friends

LESSON 4 ACTIVITY SUMMARY

In this lesson, the students begin to examine biodiversity and its importance to survival of a habitat. They first describe the variety of organisms living in freshwater and then examine some of the interactions among them. A new concept is introduced in this unit, “biodiversity”, as biodiversity is important for the survival of living things in any habitat. In the absence of diversity, the loss of one or two key species can result in the collapse of all life in the habitat.

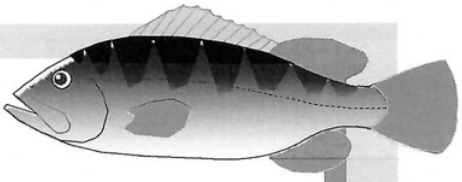
Class Activities:

1. Diversity Activity Sheet - Kindergarten - Grade 5. For younger grades, teachers can ask students to name as many aquatic insects, types of fish etc and fill the sheet in as a class. For older grades, the students can write their answers into the sheets themselves.
2. Freshwater Activity Sheet - Kindergarten - Grade 5. Younger grades can color in the images, and older grades can fill in the missing blanks. This will be a great introduction to the water cycle!
3. Freshwater vs Saltwater Activity Sheet - Kindergarten - Grade 5. Students will identify the pictures if they are lakes, oceans, rivers, streams, or ponds.
4. What I Know About Rivers Activity Sheet - Kindergarten - Grade 5. Students are encouraged to write all that they know about rivers. This would make an excellent group activity, and then share the findings with the rest of the class!
5. My Life As a Salmon Activity Sheet- Grades 3 - 5. A writing exercise, in which students are encouraged to use their imagination to talk about what their life would be like from birth, their travels, and different stages of their life- if they were a salmon! This is a great opportunity to build on story writing skills!

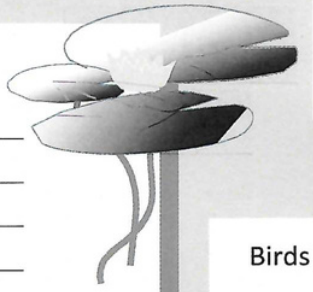
Lesson 4 Activity 1

Lots of Diversity

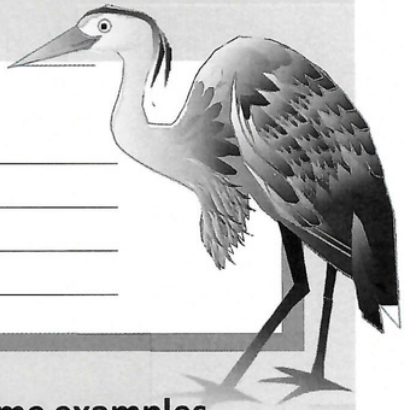
Insects



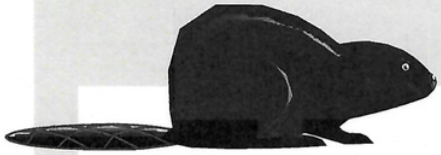
Fish



Plants

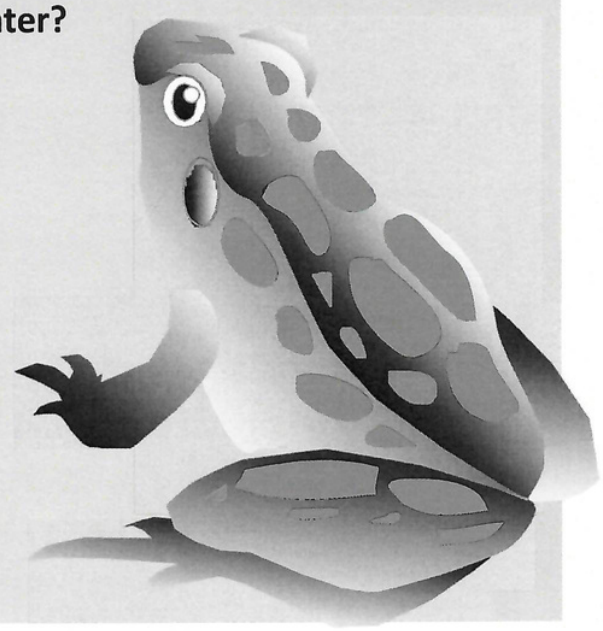


Birds



Mammals

Can you give some examples of things that live in fresh water?

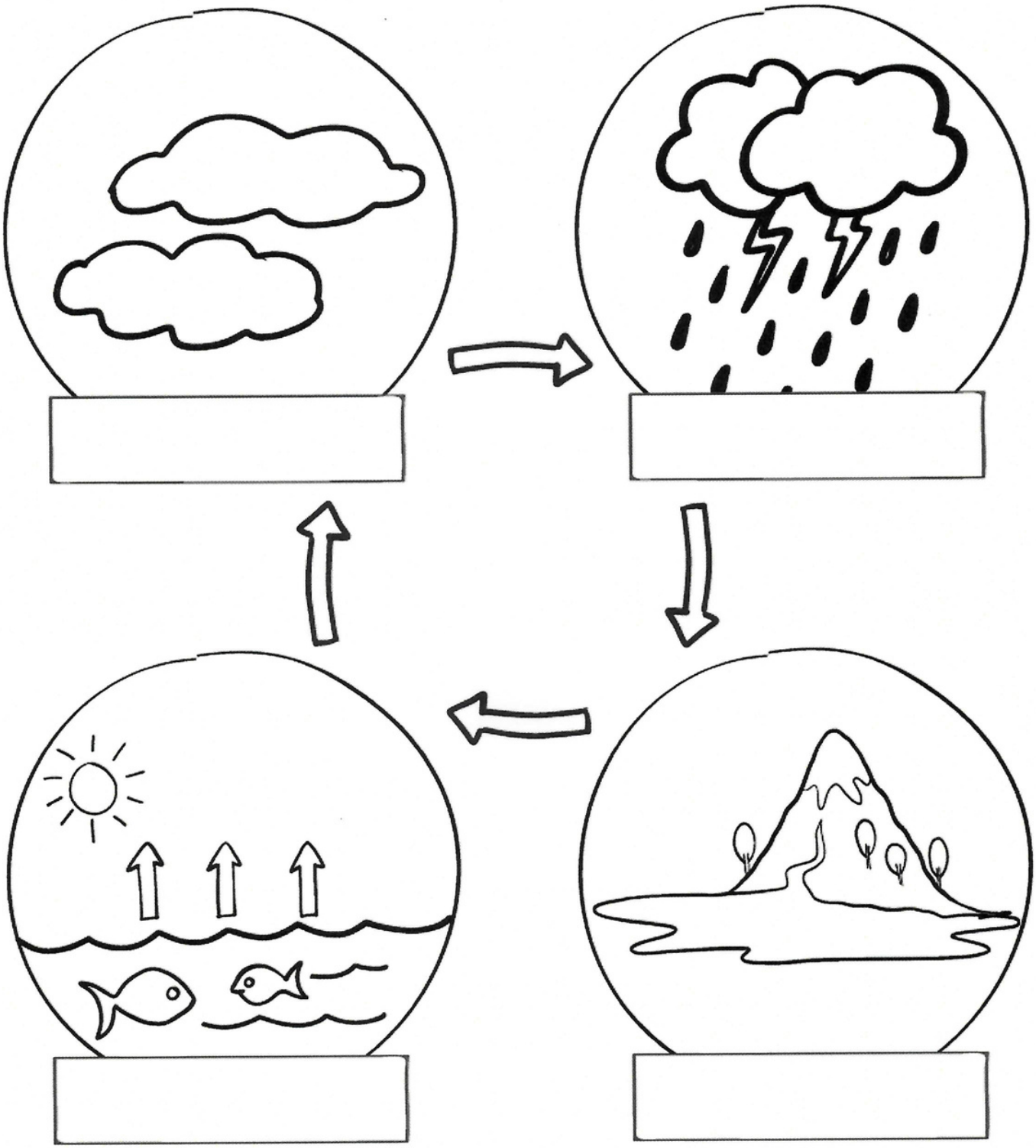


Microscopic Organisms

Lesson 4 Activity 2

The Water Cycle

Color and complete the cycle with these words:
Precipitation, Collection, Evaporation and Condensation



Name _____

Lesson 4 Activity 3

Bodies of WATER

Look at the pictures on the left. In each row, check the correct name of the body of water.

☐ river ☐ lake ☐ ocean

☐ lake ☐ ocean ☐ river

☐ ocean ☐ stream ☐ pond

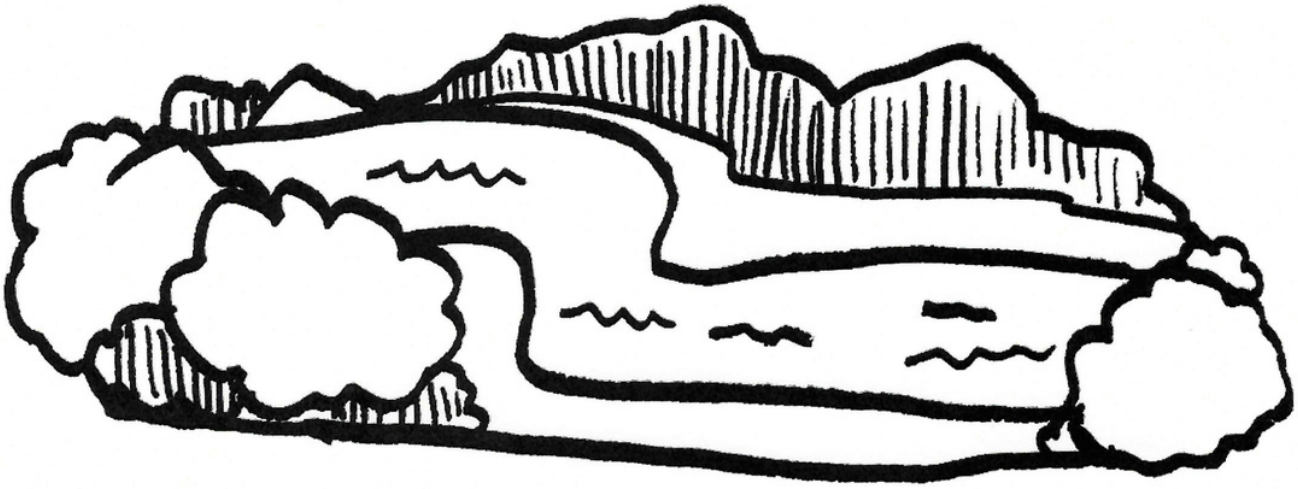
☐ stream ☐ lake ☐ pond

☐ pond ☐ ocean ☐ river

Lesson 4 Activity 4

Name:

What I Know About Rivers



Lesson 4 Activity 5

Name:

My Life as a Salmon Fish

Your task is to write about your life as a salmon from your birth. Discuss the stages of your life and your travels. Start with an appealing introduction, continue with facts and supporting details and finish with a summarizing statement.

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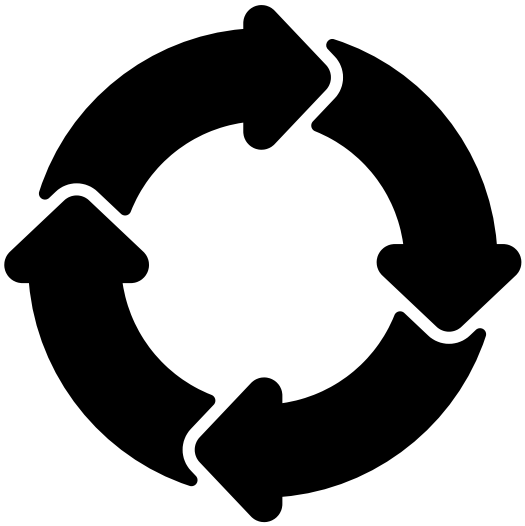
Lesson 5
Lifecycle of an Atlantic Salmon



Fish Friends

Lesson 5
Lifecycle of an
Atlantic Salmon

Lesson Overview:

All living things change over time. They grow and develop as they advance through the various stages of their life cycle. In some species there are distinct differences in appearance and habitat at different stages. Survival of the species depends on meeting basic life needs at all stages. We are going to take a look at the life cycle of the Atlantic Salmon.

Adult salmon enter many rivers in the Atlantic region during the months between May and October. The salmon that survive the journey up the river arrive at a suitable place to lay their eggs. They spawn in freshwater anywhere from just above the influence of the saltwater to the extreme limits of the freshwater. The location must contain a gravel bottom with many small and medium-sized stones. The salmon wait until late October or early November when water temperatures drop to about 5°C and the daylight hours grow short. The female salmon lays approximately 1500-1600 eggs per kilogram of her weight. Of those eggs, under ideal conditions as in fish hatcheries, 85% normally hatch. In the wild, even fewer can be expected to survive.

The eggs develop slowly in the redd over the winter. From mid-April to mid-May, as the water temperature begins to rise, hatching occurs. The small fish, about two centimeters long, is called an alevin. They feed on the yolk of the egg from which they have hatched. When this yolk is nearly gone, the tiny salmon wriggles its way up through the gravel out into the stream. Now it will feed on microscopic materials. Until the young fish is five to eight centimeters long, it is referred to as a fry. Later on, fry are called fingerlings because the little salmon is then about the length of a finger. As the fingerling grows longer than about eight centimeters, marks appear on its sides and it is then called a parr.

The parr is identified by its dark back and lighter belly, with nine to eleven vertical bars, called parr marks, along the sides of the fish. A single red dot occurs between each pair of parr marks. These markings camouflage the parr while it lives among the rocks and weeds of the river. The parr stage continues until it becomes approximately 12 to 24 centimeters in length, when it is called a smolt. This can take from one to seven years, depending on environmental conditions. Smolts are sliver in color to protect it during its life at sea. During May and June, the smolt can sometimes be seen at the mouth of the river. Then they disappear into the sea where great quantity of food in the sea causes tremendous growth. After one year at sea, the salmon may weight up to three kilograms; after two years, as large as 8 – 10 kilos; in five years, up to 20 kilos.

Fish Friends

LESSON 5 ACTIVITY SUMMARY

All living things change over time. They grow and develop as they advance through the various stages of their life cycle. In some species there are distinct differences in appearance and habitat at different stages. Survival of the species depends on meeting basic life needs at all stages. We are going to take a look at the life cycle of the Atlantic Salmon!

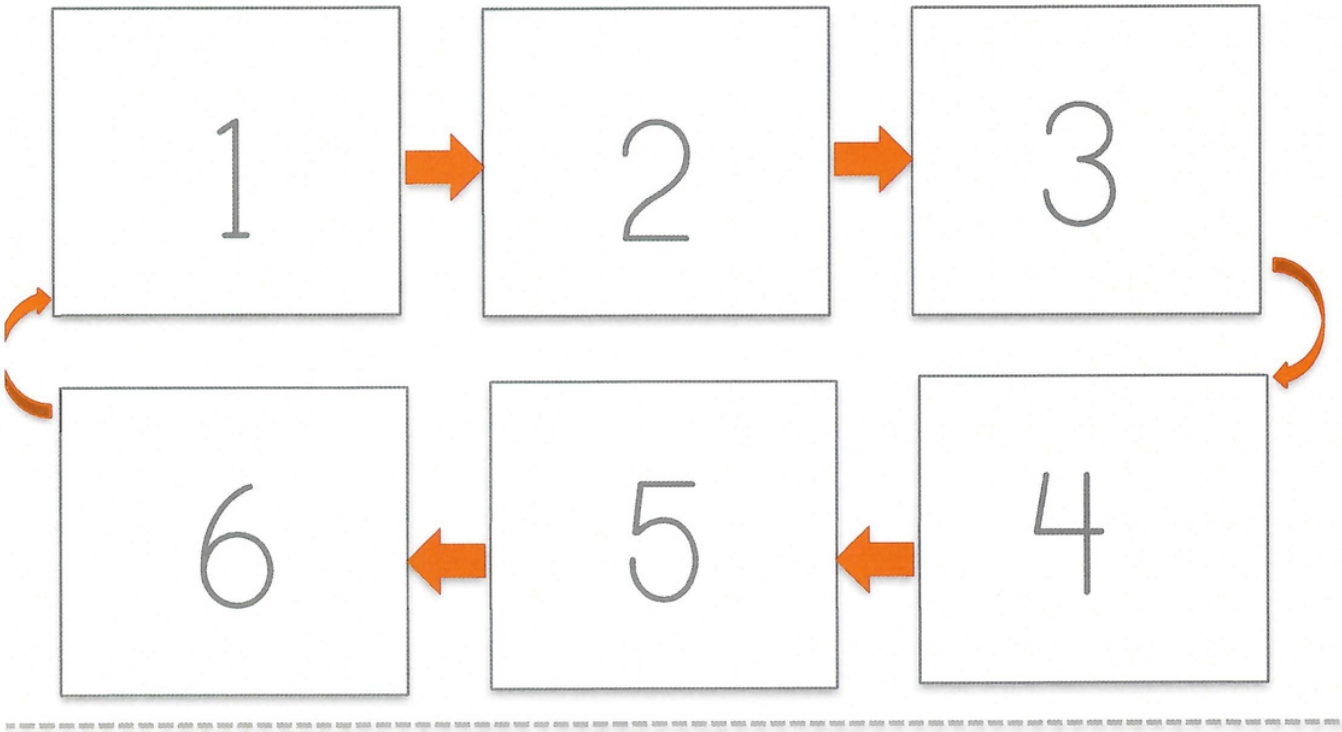
Class Activities:

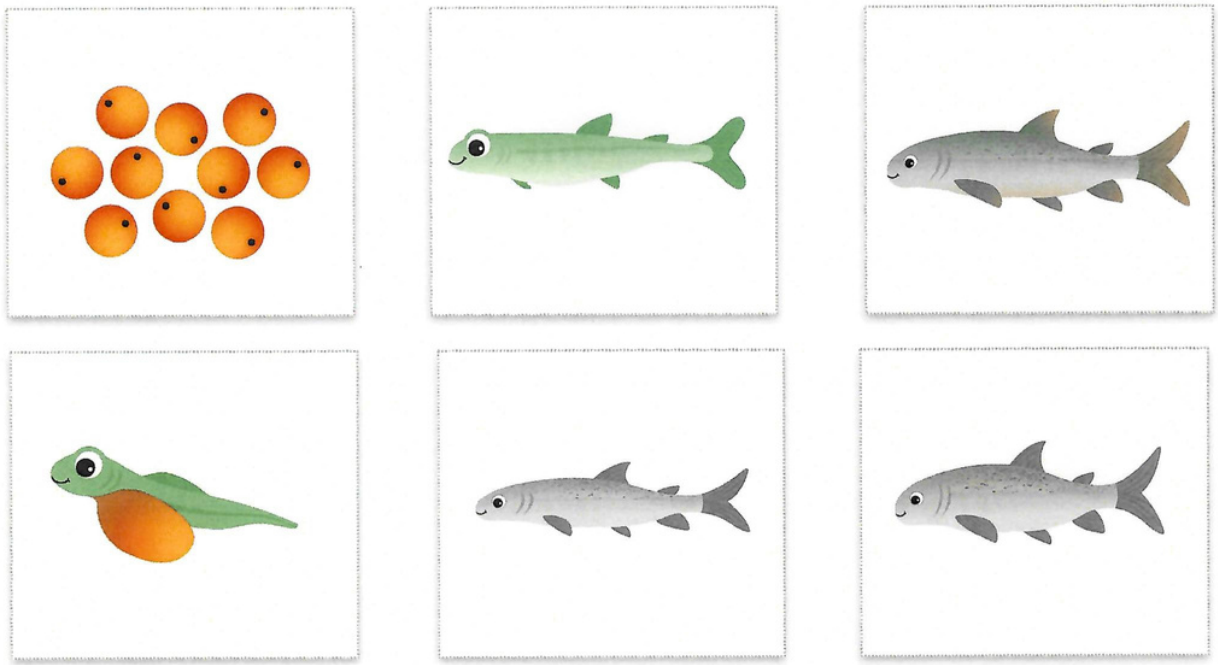
1. Lifecycle Cut & Paste Activity Sheet - Kindergarten - Grade 5. This is a great introduction to the lifecycle through images of the various stages within the lifecycle, and the students then put them in order!
2. Lifecycle Size Sequencing Activity Sheets - Kindergarten - Grade 3. Print off multiple copies and cut out the squares. This can be a great group exercise where students have to put the eggs, fry, smolt, and adult salmon into size sequencing, from smallest to biggest in each life stage! Make it a timed game, and the fastest group wins!
3. Lifecycle Trace the Letters Activity Sheet - Kindergarten - Grade 5. This will help young writers learn to print the various life stages of the Atlantic salmon.
4. Lifecycle Activity Sheet - Grades 3 - 5. Students will have to cut out the squares, read the descriptions, and put the lifecycle in the right order! Great as a group exercise, especially with a time limit!
5. Lifecycle Needs and Threats - Grades 3 - 5. This is a writing exercise where students will have to assess the needs and threats of each life stage of the Atlantic salmon.
6. Salmon External Anatomy Activity Sheet- Grades 3-5. Students will have to cut out the key words, and then put them on to an adult salmon, highlighting the different body parts of the fish!
7. Salmon Internal Anatomy Cut & Paste - Grades K-5. Students will review the internal anatomy of a salmon, cut out the organs, paste them into the correct places, and finish by coloring your salmon! Older students can complete the secondary activity by writing down the function of the organs and adding which human organs are similar!
8. Salmon Anatomy Fill in the Blanks - Grades 3 - 5. Students will review the anatomy of a salmon (male & female) and then fill in the blanks on their own sheet! *Available to print in both color and black & white*

Lesson 5 Activity 1

Salmon Life Cycle

Cut and Paste

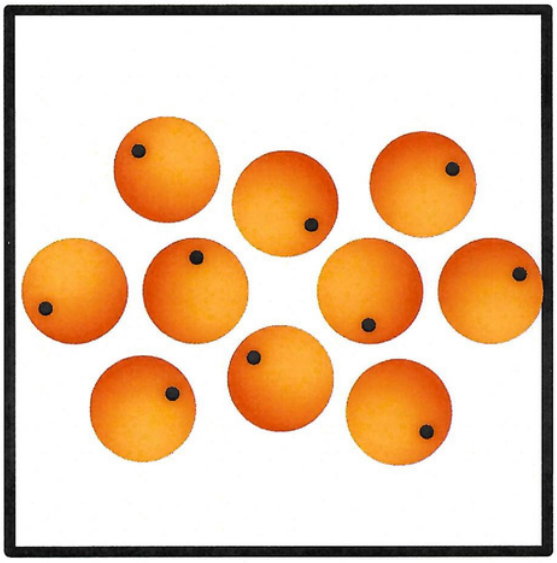


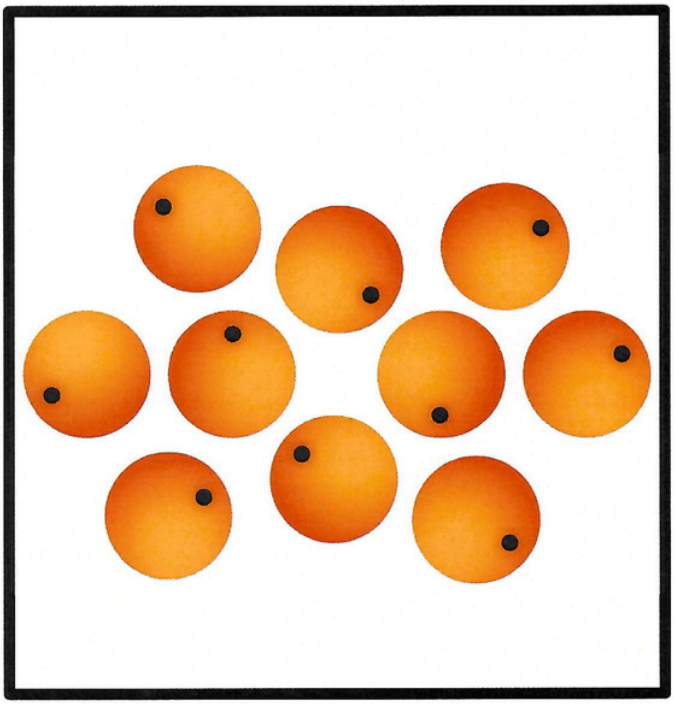


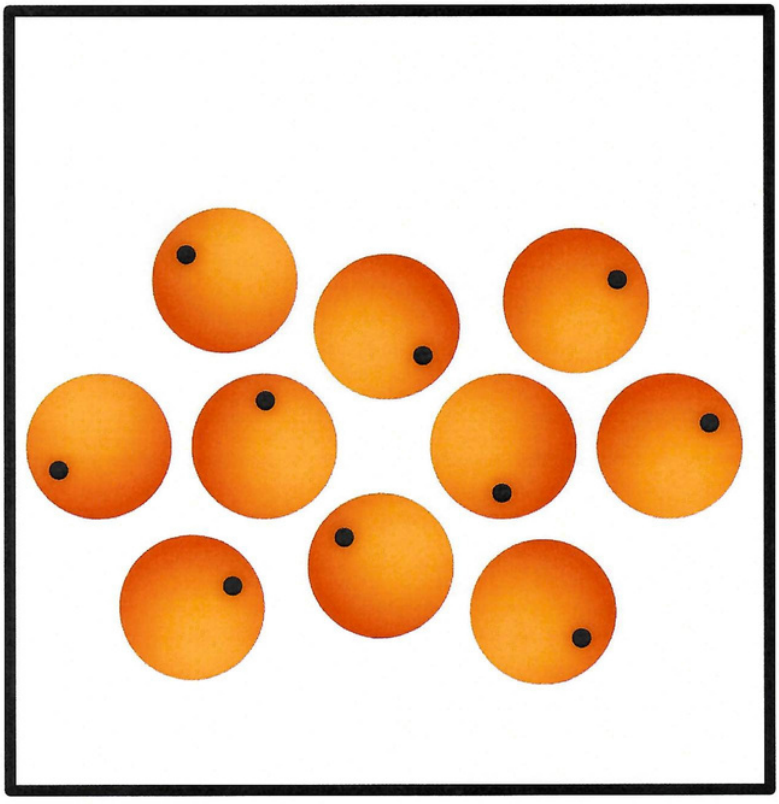
Lesson 5 Activity 2

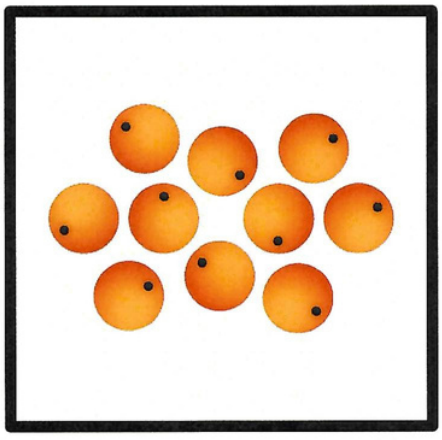
Size Sequencing Cards

Print out on card stock. Cut out and laminate. Use to put in order.









Lesson 5 Activity 2

Size Sequencing Cards

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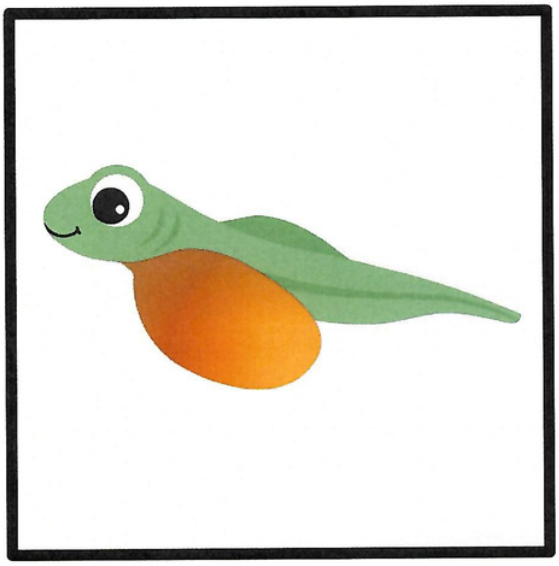

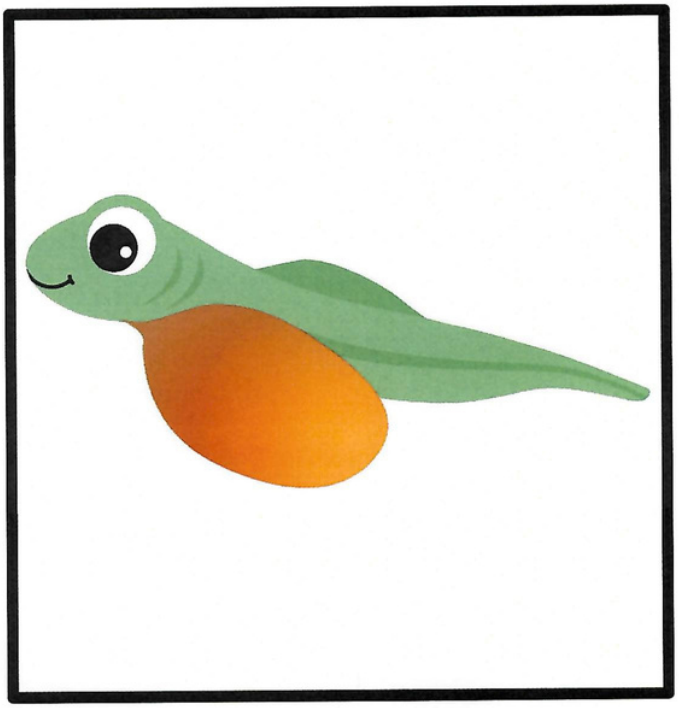

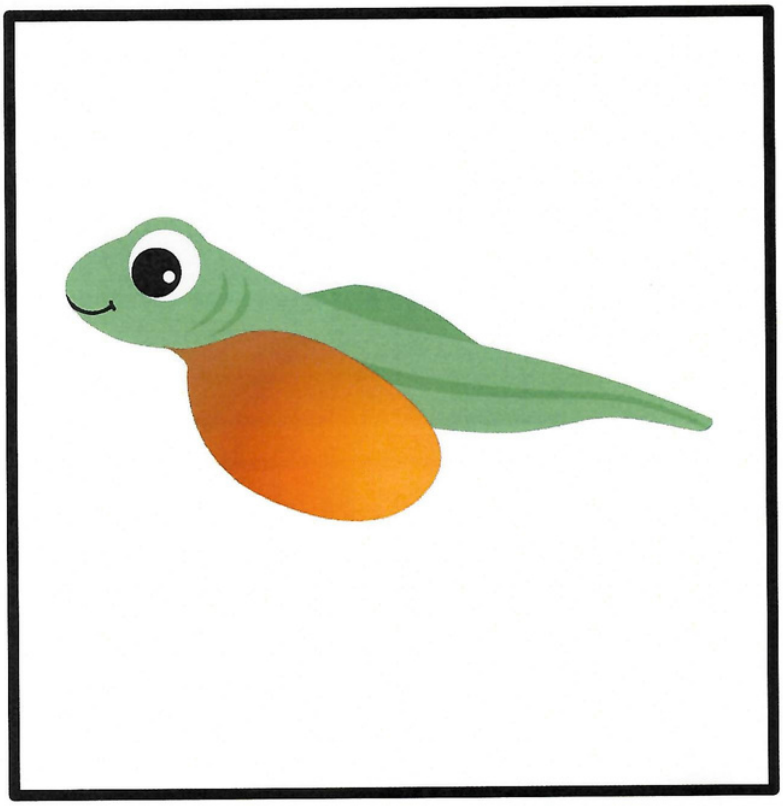

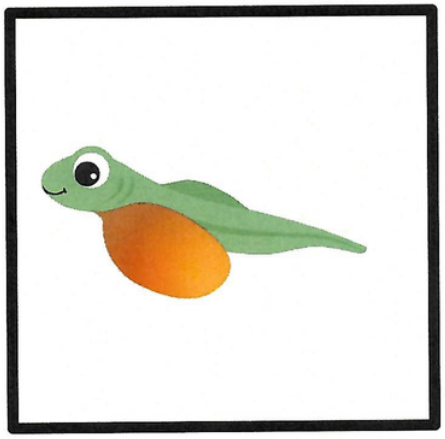

Lesson 5 Activity 2

Size Sequencing Cards

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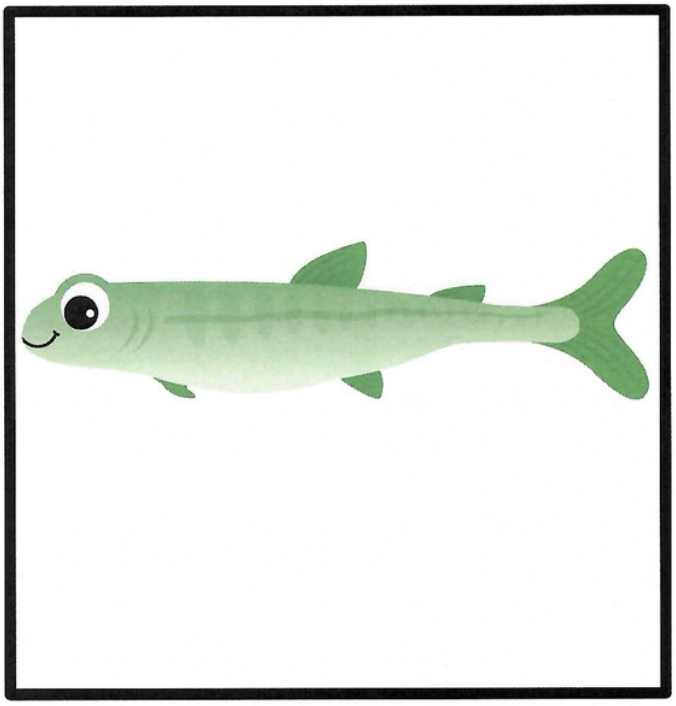

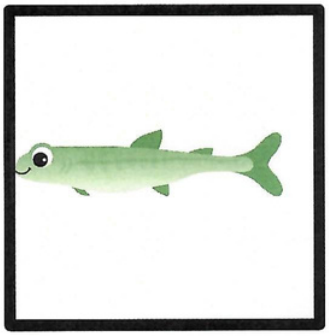

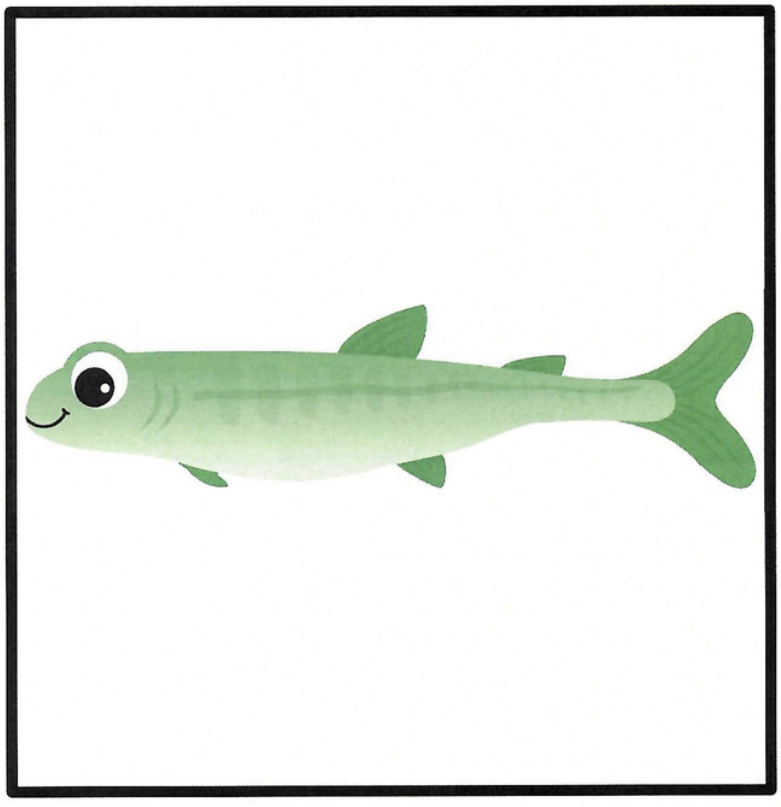

Lesson 5 Activity 2

Size Sequencing Cards

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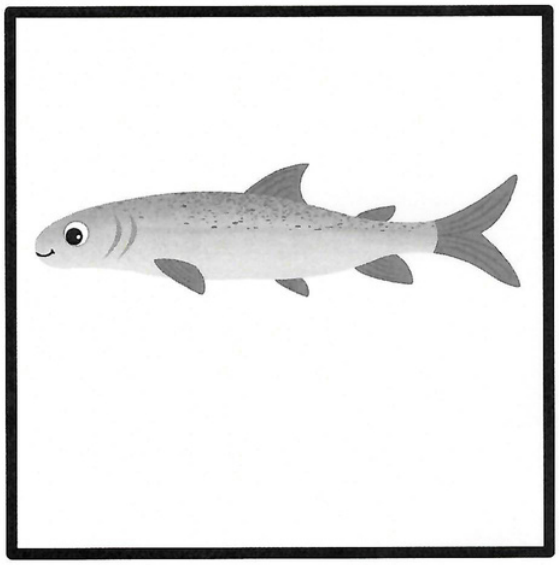
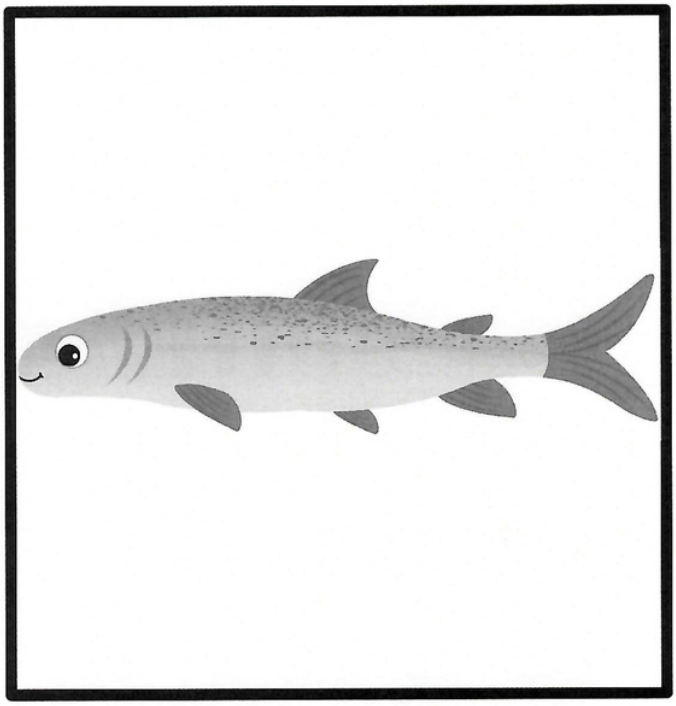
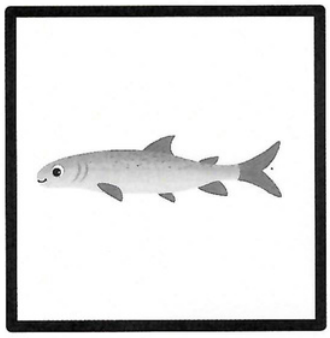
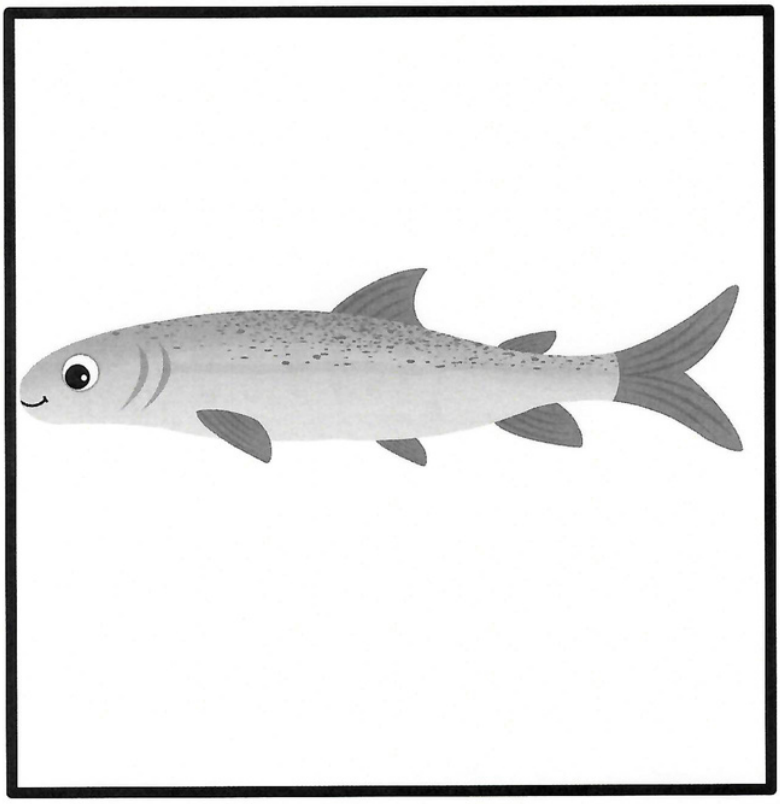
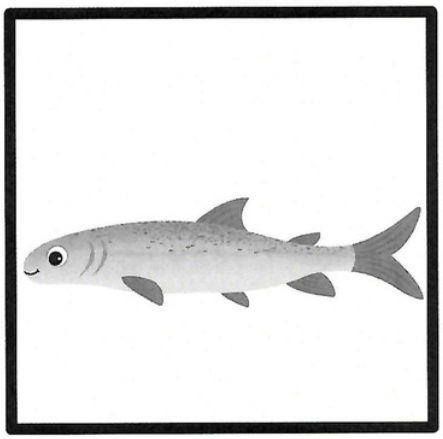










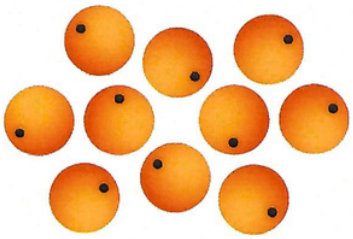
Lesson 5 Activity 2

Size Sequencing Cards

Print out on card stock. Cut out and laminate. Use to put in order.

Lesson 5 Activity 3

Trace the Letters



eggs

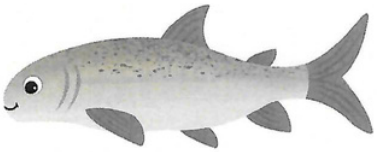
alevin

fry

parr

Lesson 5 Activity 3

Trace the Letters



smolt

adult

salmon

swim

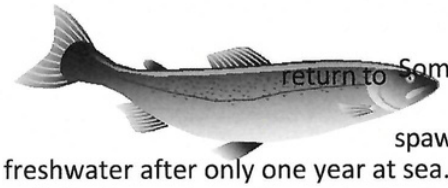
Lesson 5 Activity 4

Salmon Life Cycle

A salmon goes through many changes as it grows and become an adult. These changes are part of its life cycle. The stages are described below but the order is mixed up. Read each description carefully and then using scissors, cut them out and put them in the right order.

A female salmon lays approximately 1500-1600

eggs per kg of her weight. A fish of 5 kg would lay 7,000-8,000 eggs.



Some salmon return to spawn in freshwater after only one year at sea. They are called **grilse** and usually weigh about one or two kilograms.

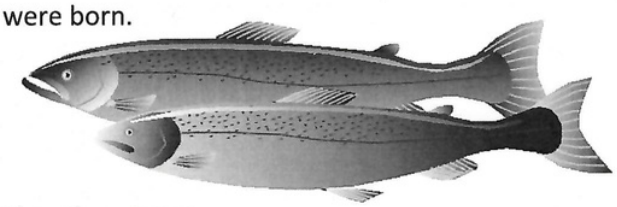
Until the fish becomes approximately 12 to 24 centimeters in length, it is called a **parr.** A parr has a dark back with nine to eleven bars, called parr marks, along its sides. A single red dot occurs between each pair of parr marks. These markings help camouflage the parr while it lives among the rocks and weeds of the river.

The small fish, about two centimeters long, is called an **alevin** . It feeds on the yolk of the egg

from which it has hatched while it is still in the gravel. The yolk is contained in a yolk sac attached to the belly of the fish.

When the yolk sac is nearly gone, the tiny salmon wriggles its way up through the gravel out into the stream. Now it will feed on microscopic materials in the water. It is finally on its own. Until the young fish is five to eight centimeters long, it is called a **fry.**

Some salmon spend two, three or even four years at sea. They may weigh from 4 to 20 kg. They return as **adults** to the river where they were born.



They then spawn, completing another generation and continuing the life cycle.

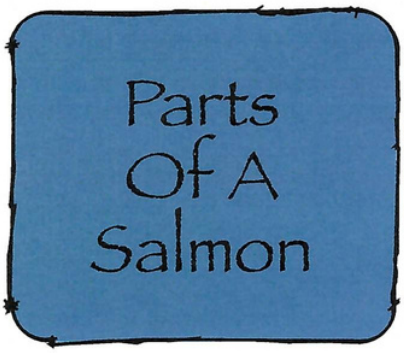
An amazing change takes place. The marks and spots disappear and the fish becomes gleaming and silver. It is now called a **smolt.** It swims swiftly down the river, heading to sea where its silvery colour will protect it. It is dangerous for the fish to enter the sea with brightly coloured stripes and spots!

Lesson 5 Activity 5

Salmon life cycle

Life cycle stage	Needs		Threats	
	Habitat	Food	Predators	Other
Egg				
Alevin				
Fry				
Smolt				
Adult Salmon				
Spawner				

Lesson 5 Activity 6



Materials:

- Option: a classroom plant such as a bean plant.
- Writing supplies
- Copies of Handout 2.3, "Parts of a Salmon," (Parts 1 & 2), for each student.
- Poster showing parts of a fish. See page 54.

Time Required:
One lesson

Level of Conceptual Difficulty:
Simple

Evidence for Assessment:
Monitor student discussion in making the Venn diagram to ensure they recognize that salmon have features in common with people, such as ears, eyes, noses, but that they do not share others, such as fins, tails, etc.

INTRODUCTION

- Option: Have students identify the parts of a plant and what each does.
  The stem holds it up, the leaves collect sunlight and make food, the roots hold it in t he ground and collect moisture, etc.

- Option: Have students identify the parts of a human and what each does.
  The legs hold people up and let people move, arms let people hold things, the mouth lets people eat, etc.

RESEARCH/DISCUSSION

- Have the class use a poster of a salmon to identify the external body parts, i.e., head, mouth, eyes, nostril, gills, body, lateral line, fins (pectoral, pelvic, dorsal, anal, adipose), tail, skin, scales. Have students make and label their own drawing of a fish or place labels on the outline drawing in Handout 2.3, "Parts of a Salmon," (Parts 1 & 2).

SUMMATION

- Make a list or Venn diagram of overlapping circles with the class to identify features in fish and humans that are similar and different.
  Both have ears, eyes and noses, but fish have a lateral line, fins, tails, scales and they use gills to breathe, while people have a neck, arm, legs and hair and lungs to breathe air.

- Option: Have older students make a chart comparing the functions of the fish and human body parts.
  To move, people use legs, fish use tails; to breathe, people uses noses, fish use mouth and gills, etc.

Lesson 5 Activity 6

Parts Of A Salmon

Handout 2.3, (Part 1)

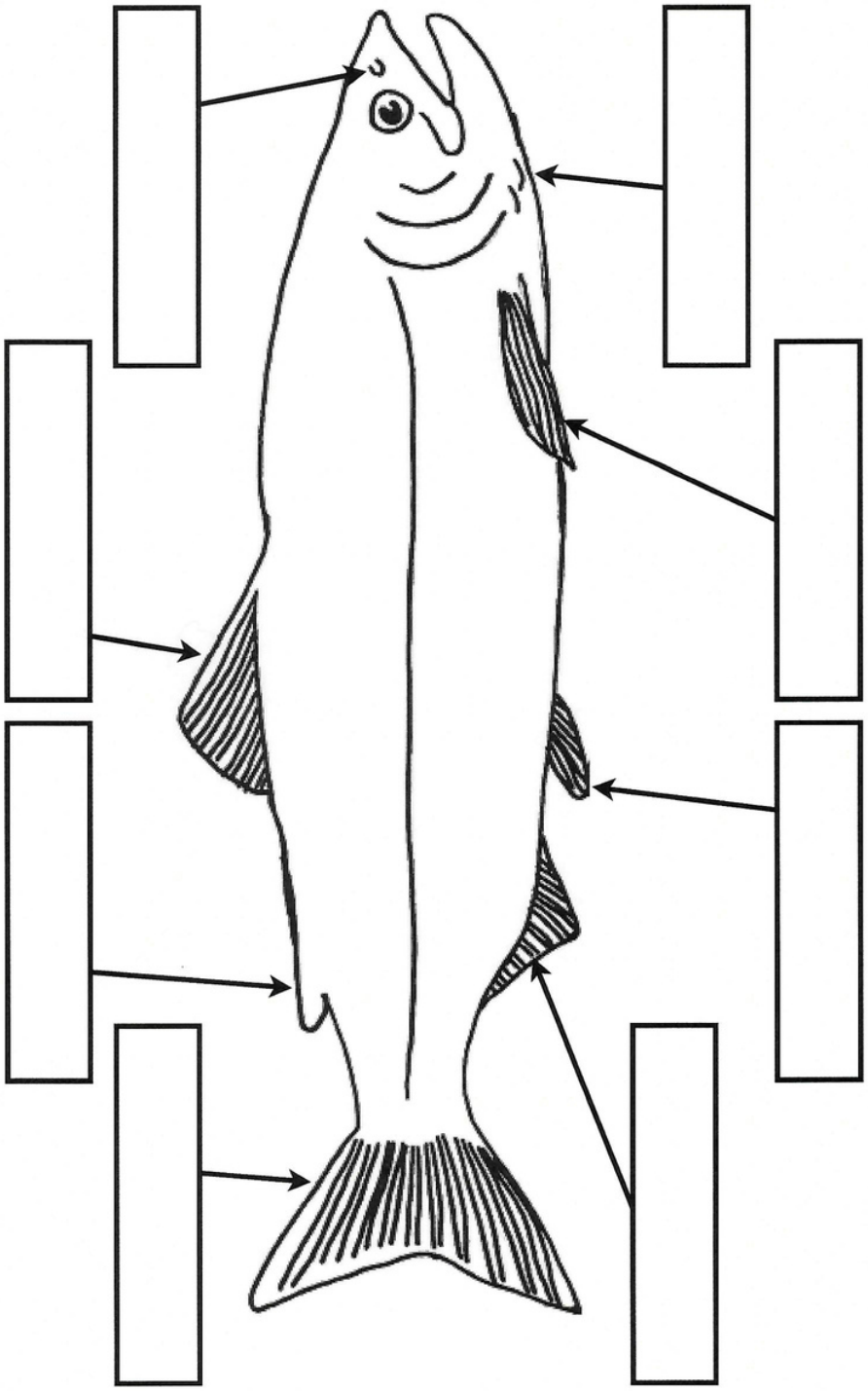
Cut out and label the salmon

adipose fin	dorsal fin
gill cover	anal fin
nostrils	pelvic fins
caudal fin	pectoral fins

Lesson 5 Activity 6

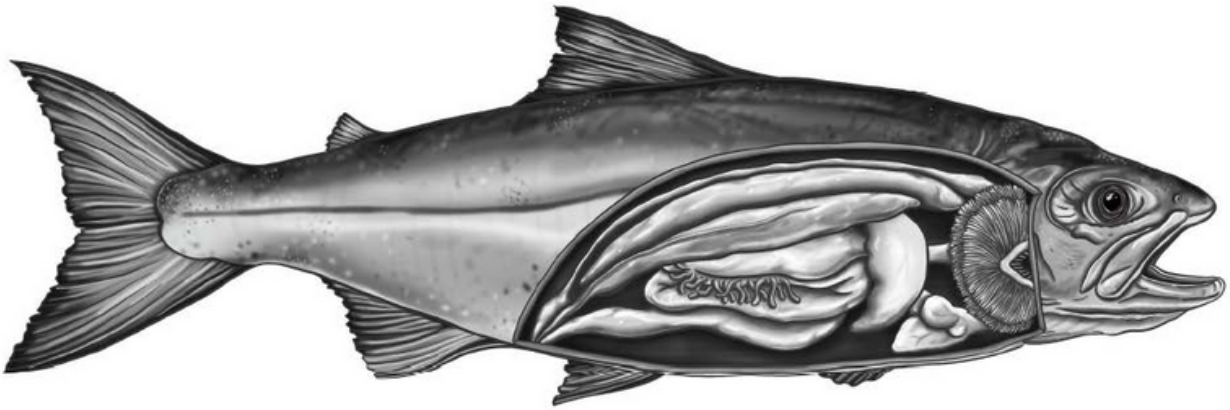
Parts Of A Salmon

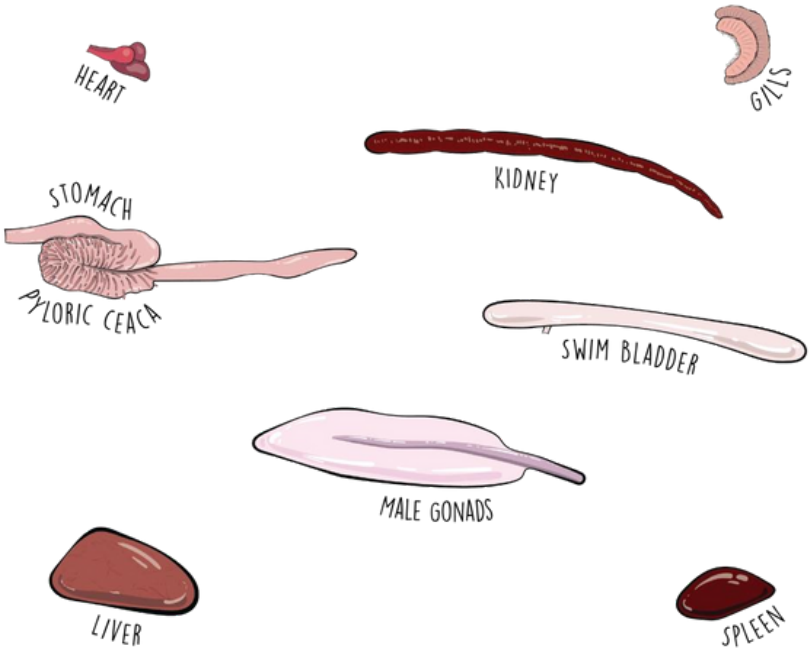
Handout 2.3, (Part 2)



Salmon Anatomy

Cut & Paste





Salmon Anatomy

Cut & Paste

Instructions:

1)Print this document one sided on 8 ½ x 11 paper.

2)Cut page 3 in half along the dotted line.

3)Glue the organ tabs to page 4 on “glue here”

*be sure the organs are facing up when gluing.

4)Fold the tabs back and cut along each of the dotted lines to create lift-able tabs, one for each organ.

Organ Name & Function Tabs:

5)Using the “Internal Anatomy - Organ Structures and Their Function”
on page 5, write in the name and function for each organ.
6)Think about what organs humans have that have the same function. Write in the similar human organ.

Reverse Dissection:

7)Carefully cut out each of the organs on page 3.

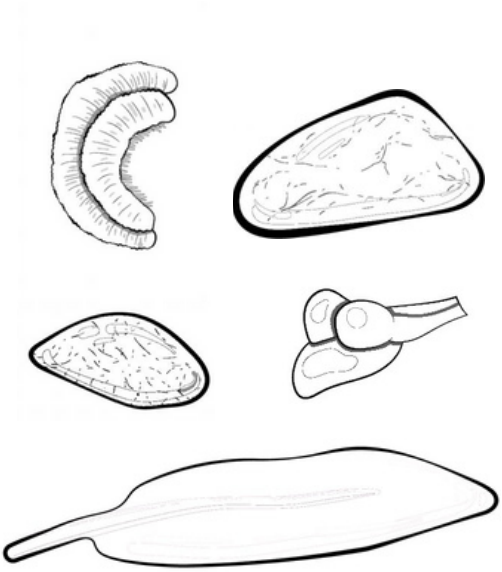
8)Fit the cut out organs into the salmon body where you think they should go. Use the information on page 5 to help you figure out how the organs work together and connect. Do some research online if needed.
9)Glue the organs to the body when you’ve found the right placement. Colour in your completed salmon.

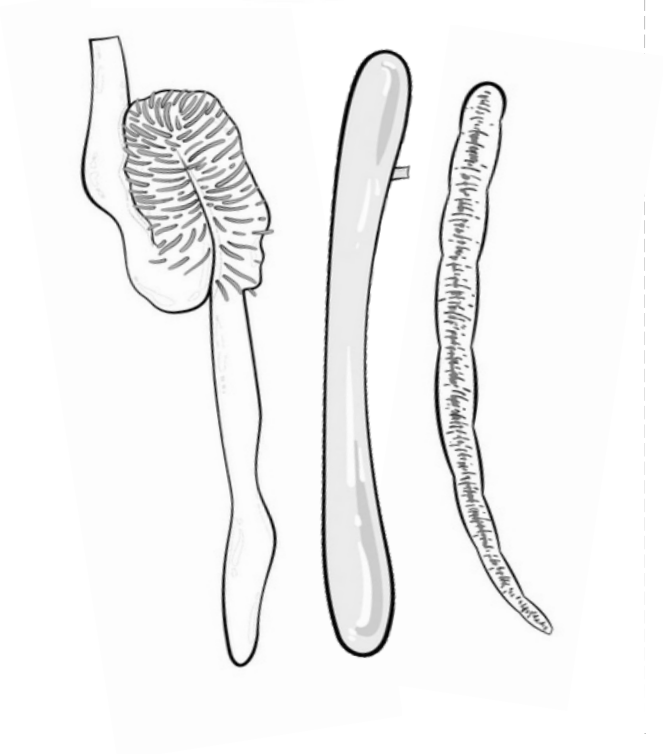
Lesson 5 Activity 7

Cut out each organ below carefully.

Fit the organs into the salmon body where you think they should go.

Some of them may overlap





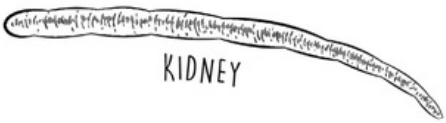
MALE SALMON ORGANS

GILLS

HEART

LIVER

SPLEEN

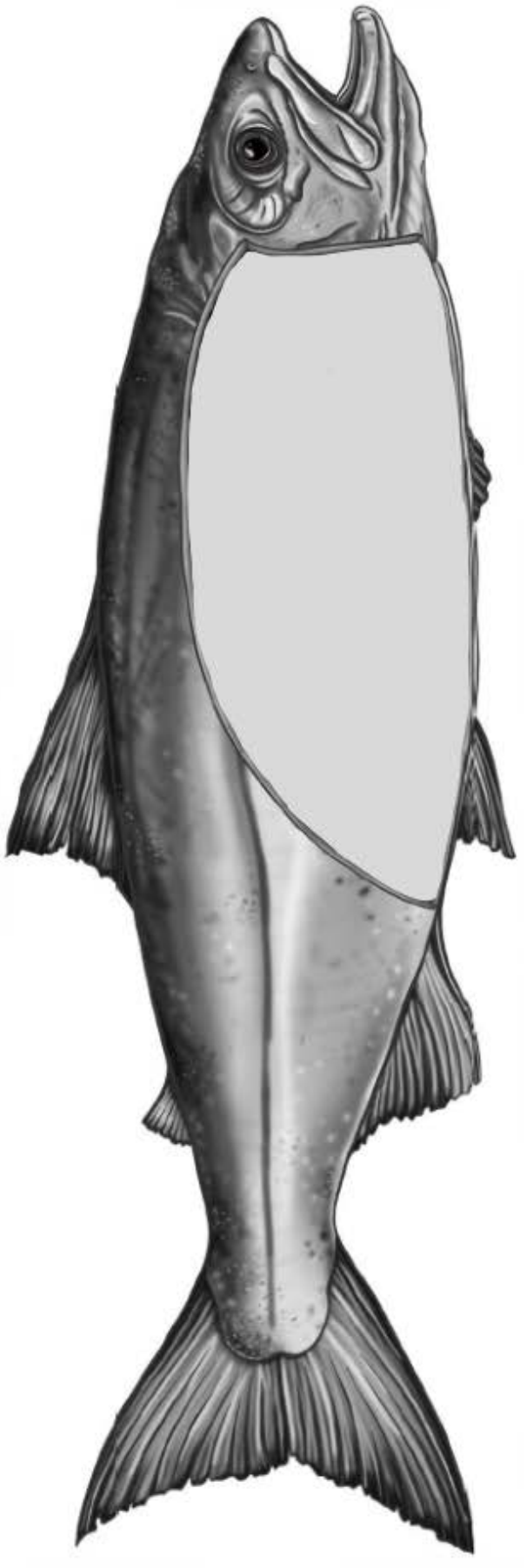


KIDNEY

SWIM BLADDER

MALE GONADS

Lesson 5 Activity 7



GLUE HERE

GLUE HERE

Organ name:
Function:

Similar human organ:

Organ name:
Function:

Similar human organ:

Organ name:
Function:

Similar human organ:

Organ name:
Function:

Similar human organ:

Organ name:
Function:

Similar human organ:

Organ name:
Function:

Similar human organ:

Organ name:
Function:

Similar human organ:

Organ name:
Function:

Similar human organ:

Lesson 5 Activity 7

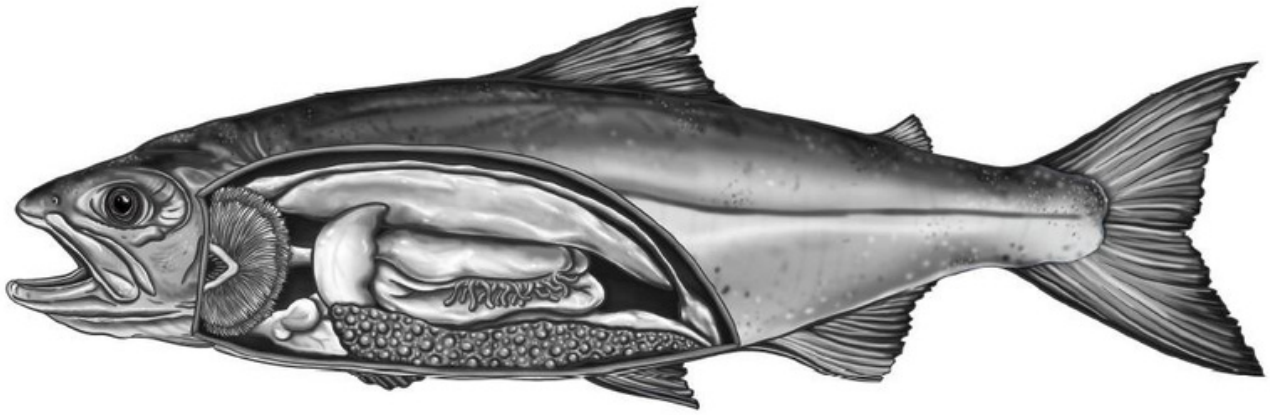
Internal Anatomy
Organ Structures and Their Function

Gills Gills absorb oxygen from the water allowing the fish to "breathe". They can use up to 80 percent of the oxygen dissolved in water, while human lungs only use up to 25 percent of the oxygen in the air.		**Heart** Bony fish like salmon have a two-chambered heart. This muscular organ circulates blood through the body, helping circulate oxygen from the gills and nutrients from the stomach to the other organs in the body.
Stomach The stomach is a sac-like organ that holds food that has been swallowed and starts digesting it. It squeezes the food into the pyloric caeca for more digestion.	**Pyloric Caeca** The strange folds and noodle-like appendages of the pyloric caeca help the body digest food by adding more surface area where nutrients can be absorbed into the blood.	**Intestine** The intestines connect the digestive system to the anal vent. This is where the last bits of nutrients are pulled out of food before it is released as waste.
Liver The liver assists in digestion by secreting enzymes that break down fats. It stores and secretes essential nutrients. It also destroys old blood cells and maintains proper levels of blood chemicals and sugars.		**Spleen** White blood cells are produced in the spleen and red blood cells are recycled. The spleen holds a lot of blood that can help the body in emergencies.
Kidney The kidneys filter waste from the blood which is released as urine. Kidneys also help with osmoregulation, which balances of amount of chemicals inside the body from the amount of chemicals in the water outside the body.		**Air Bladder** The air bladder is sometimes also called a swim bladder. This long balloon like sac holds gasses that help fish control how much they float.
Female Gonads / Ovaries The female reproductive organ, ovaries produce eggs. A group of eggs is often referred to as a skein.		**Male Gonads / Testes** The male reproductive organ, testes produce milt which contains salmon sperm.

Lesson 5 Activity 8

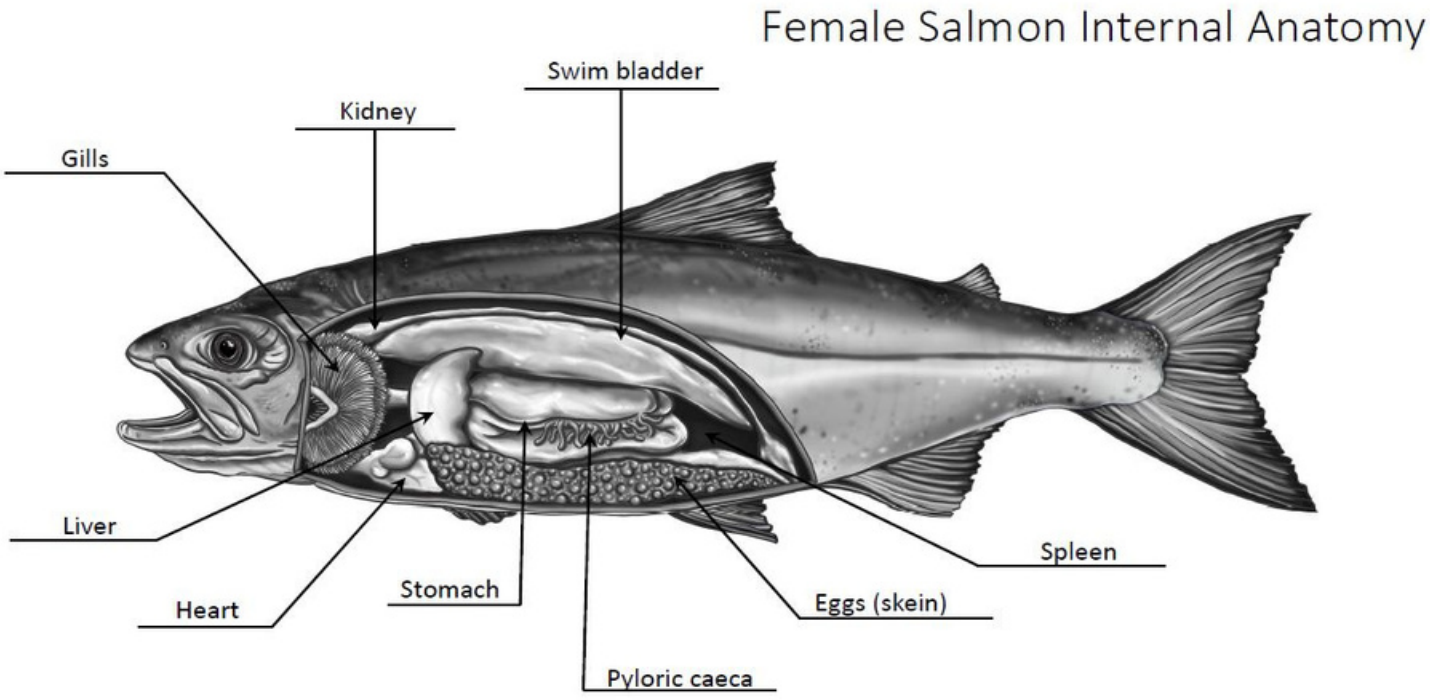
Fish Friends Anatomy of a Salmon

Female Salmon Internal Anatomy



Lesson 5 Activity 8

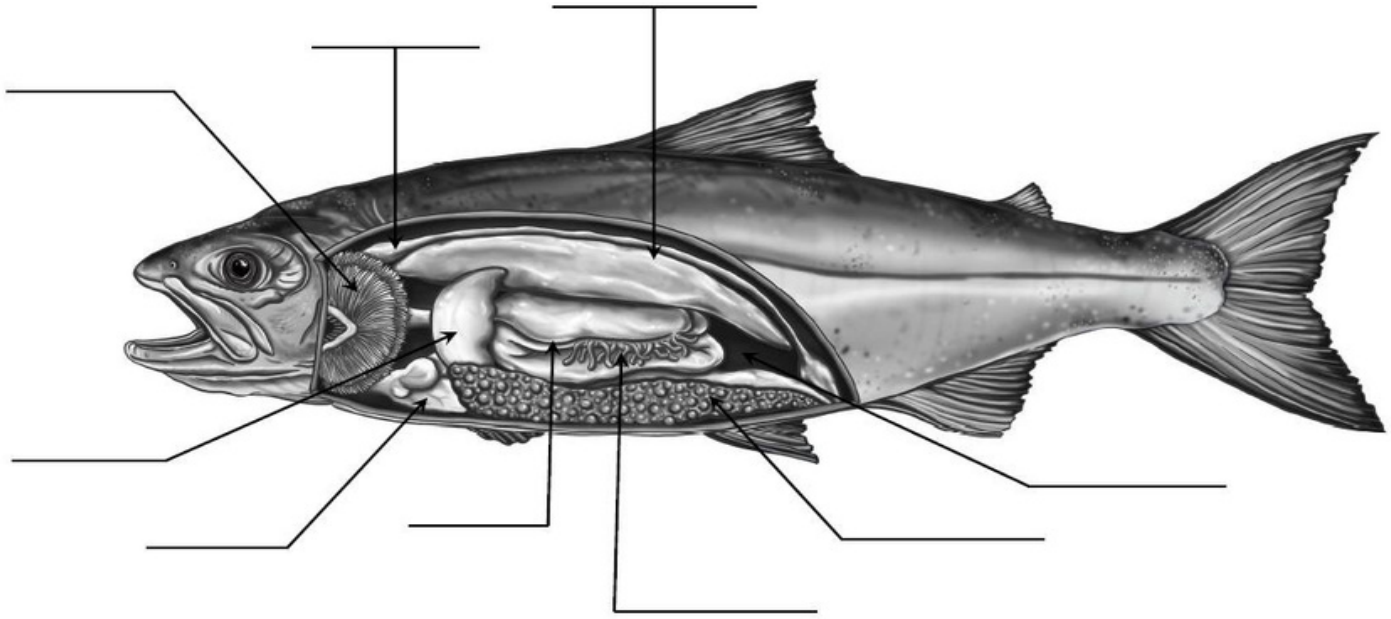
Fish Friends Anatomy of a Salmon



Lesson 5 Activity 8

Fish Friends Anatomy of a Salmon

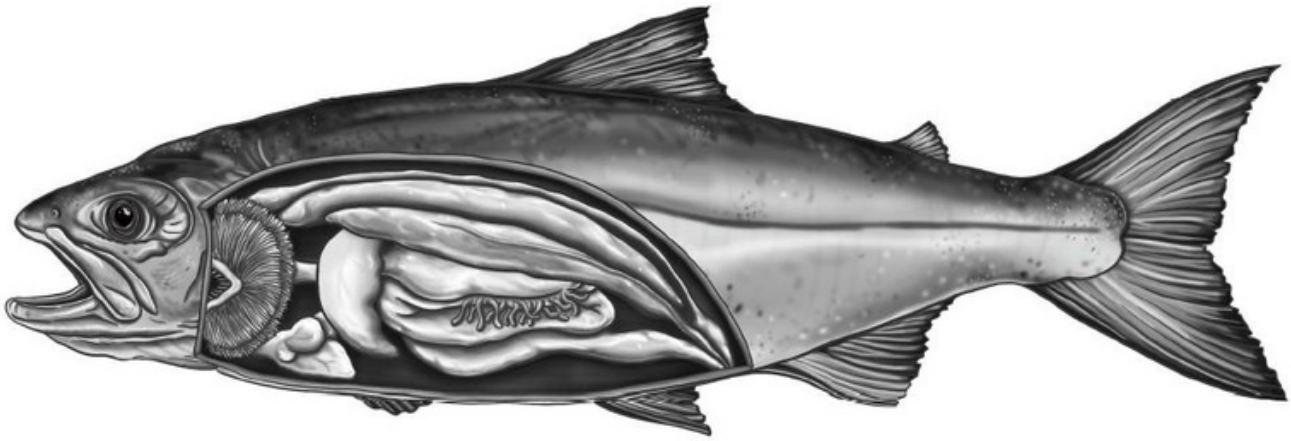
Female Salmon Internal Anatomy



Lesson 5 Activity 8

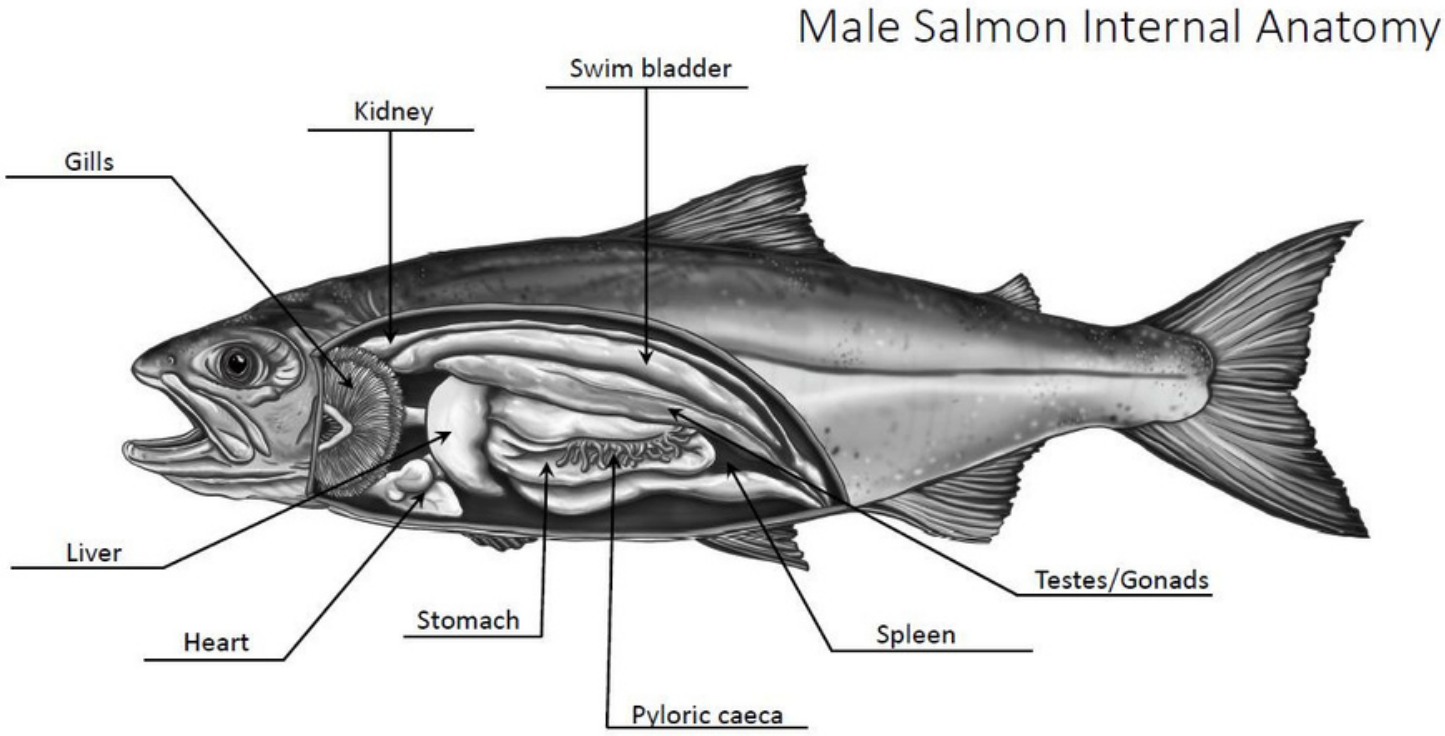
Fish Friends Anatomy of a Salmon

Male Salmon Internal Anatomy



Lesson 5 Activity 8

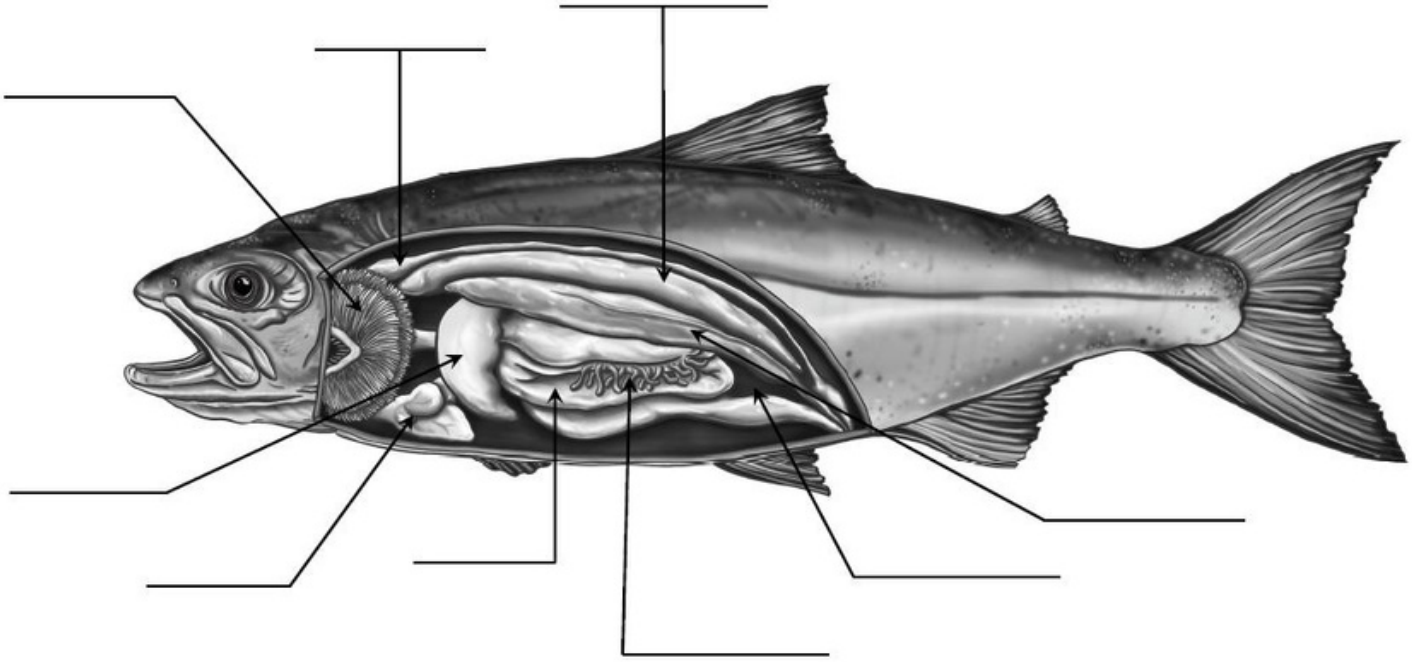
Fish Friends Anatomy of a Salmon



Lesson 5 Activity 8

Fish Friends Anatomy of a Salmon

Male Salmon Internal Anatomy



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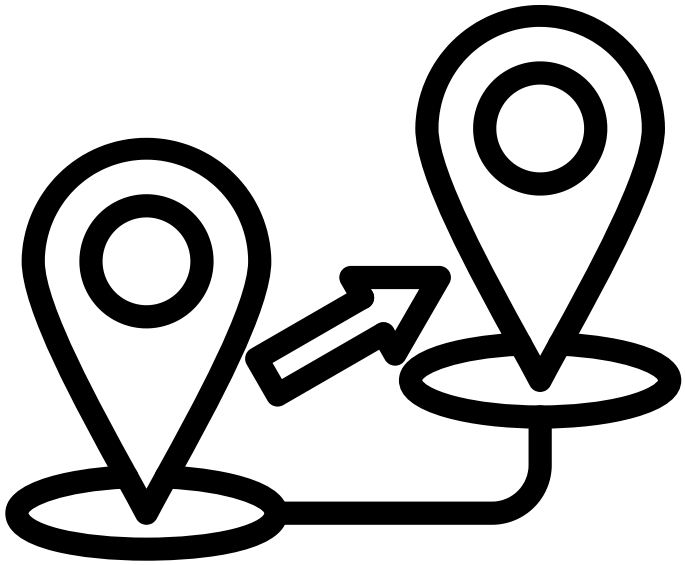
Lesson 6
Migration



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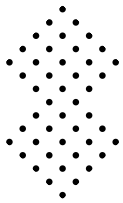

Lesson 6 Migration

Objectives:
Through a combination of a guided imagery activity and a mapping activity, students will trace the migration of a fish from its home river to the ocean and back to the river.

Lesson Overview:
Another type of change occurs when fish migrate from one habitat to another. Migration may be stimulated by a change in climate or season, or by life cycle changes. Therefore, in order to survive, migrating species must be able to meet their basic life needs in more than one habitat.

The Atlantic salmon has been referred to as the classic anadromous fish which means it migrates from the sea into the rivers to spawn. It's well known that most salmon travel great distances as part of their life cycle. In Canada, spawning runs of Atlantic salmon normally enter the rivers between May and November, although some runs begin as early as March or April. Some salmon return to freshwater after only one year at sea. Others return after two years. Salmon generally enter the river when the water is high. While some salmon may spawn within a mile of the sea, others travel several hundred miles before reaching their preferred spawning place.

They return to the same river where they were born. The salmon faces many natural hazards including shallow water, strong currents, waterfalls, beaver dams and rapids. After entering the river, salmon stop feeding. They often lose their luster and become very thin. Although adult fish enter rivers from early spring to late fall, actual spawning usually occurs in October and November. As the male salmon approaches sexual maturity prior to spawning, physical changes occur. Its head becomes elongated, and its lower jaw is enlarged and forms a pronounced hook at its tip.

Much is still to be learned of marine feeding areas and migration routes. It appears that certain salmon from New Brunswick rivers may not venture beyond the waters of the Bay of Fundy. Others travel long distances in search of food, many to the coastal waters of West Greenland. It is only recently that scientists have gained detailed knowledge of the food of salmon in the sea. It has been found that smolt and larger salmon are voracious eaters and will feed on anything they find within their range. Herring, capelin, gaspereau, small mackerel, smelt, and shrimp, squid and amphipods are taken when the opportunity arises. Salmon are known to wander at sea, but after one or more years at sea, the surviving salmon return to spawn in the river in which they were born.

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LESSON 6 ACTIVITY SUMMARY

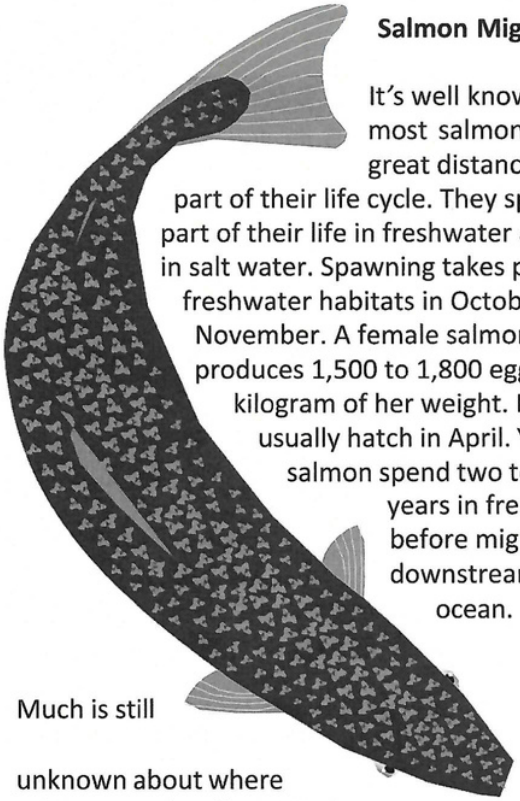
Another type of change occurs when fish migrate from one habitat to another. Migration may be stimulated by a change in climate or season, or by life cycle changes. Therefore, in order to survive, migrating species must be able to meet their basic life needs in more than one habitat. Through a combination of a guided imagery activity and a mapping activity, students will trace the migration of a fish from its home river to the ocean and back to the river.

Class Activities:

1. Migration Activity Sheet - Grades 3 - 5. Students will read about the migration patterns of Atlantic salmon and lamprey eels. They will then trace out the migratory routes of both species, and using the key, they will measure the distance of the migration. This is a great introduction to mapping and spatial awareness!
2. Amazing Migration Activity Sheet - Grades 3 - 5. Students will fill in the blanks and learn all about the migratory behaviors of Atlantic salmon!
3. Salmon Count Activity Sheet - Kindergarten - Grade 3. Students will count the number of eggs, alevin, fry, and adults they see on the page and enter their count into the boxes on the bottom!
4. Migration Verb or Noun - Grades 3- 5. Students are provided with a list of words and must place them in the correct box if the words are either verb or nouns. Of course, they are all salmon-related words, too!

Lesson 6 Activity 1

Long Distance Swimmers



Salmon Migration

It's well known that most salmon travel great distances as part of their life cycle. They spend part of their life in freshwater and part in salt water. Spawning takes place in freshwater habitats in October and November. A female salmon produces 1,500 to 1,800 eggs per kilogram of her weight. Eggs usually hatch in April. Young salmon spend two to four years in freshwater before migrating downstream to the ocean.

Much is still unknown about where salmon go when they are at sea.

It appears that some Atlantic salmon do not travel far beyond their home rivers. Other salmon travel long distances, many to the west coast of Greenland where there is lots of food.

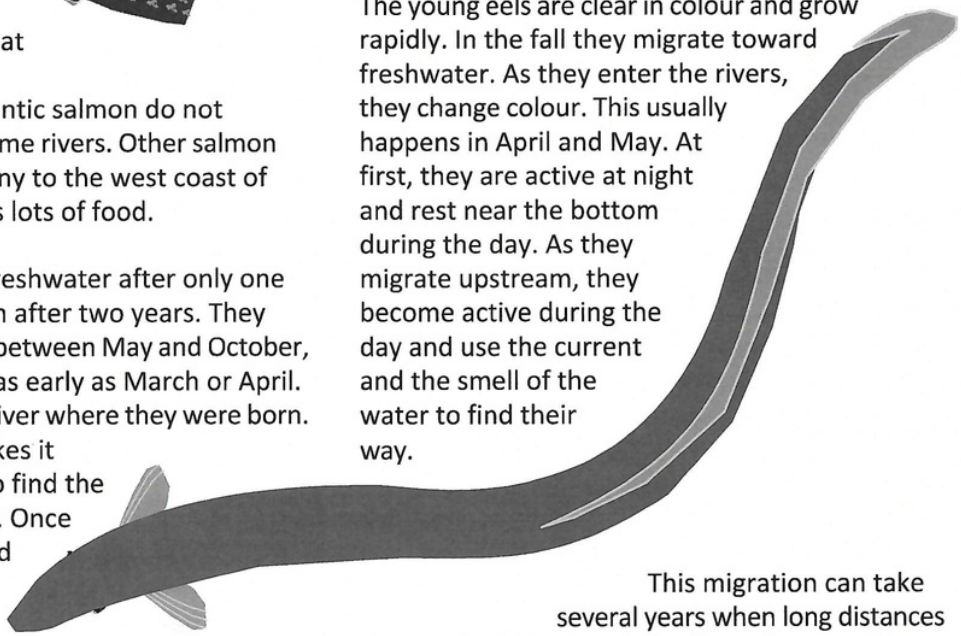
Some salmon return to freshwater after only one year at sea. Others return after two years. They normally enter the rivers between May and October, although sometimes it's as early as March or April. They return to the same river where they were born. Sometimes pollution makes it difficult for the salmon to find the smell of their home river. Once they reach their preferred area, they spawn, continuing the life cycle.

The Atlantic salmon normally survives at least one spawning. After living at sea for another year, some will return to freshwater to spawn at least one more time. Others may spawn three or four times.

Eel Migration

The eel that is commonly found in our region of Canada is called the American eel. It has a long snake-shaped body which is covered with a slippery substance called mucus. This is where the expression "slippery as an eel" comes from. Eels are found in freshwater streams and rivers. They are also found in the Atlantic Ocean. They are very common in the four Atlantic provinces.

Unlike salmon, eels spend most of their lives in freshwater and then go to the sea to spawn. They begin to migrate in late summer and fall. They travel all the way to spawn in the Sargasso Sea, between Bermuda and The Bahamas. Spawning occurs from February to April and the eggs hatch within a few days. Female eels can produce up to 4.0 million eggs. It is thought that all eels die after spawning.



The young eels are clear in colour and grow rapidly. In the fall they migrate toward freshwater. As they enter the rivers, they change colour. This usually happens in April and May. At first, they are active at night and rest near the bottom during the day. As they migrate upstream, they become active during the day and use the current and the smell of the water to find their way.

This migration can take several years when long distances are involved. Some eels live for as long as 40 years in freshwater before they migrate back to the sea to spawn.

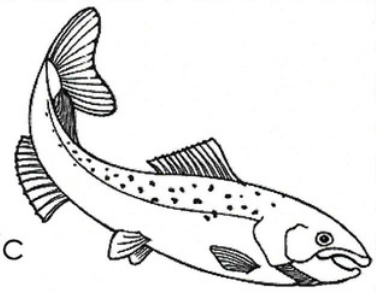
Lesson 6 Activity 1

Long Distance Swimmers

Lesson 6 Activity 2

Name:

The Amazing Salmon Fish Migration



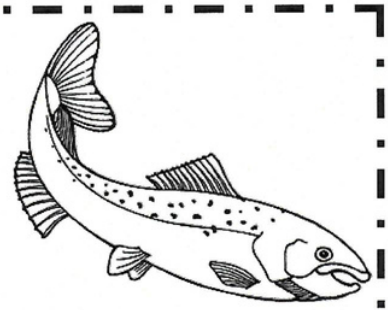
Salmon are found in the Pacific Ocean, the Atlantic Ocean and in _____ lakes and rivers. Salmon can live up to 3 to 8 years. Salmon are born in freshwater and when they get a little older, they will then _____to the ocean. They will continue to live in the ocean until they are ready to _____(lay their eggs). Salmon will travel up to 3500 miles to spawn back in fresh water. During this journey (migration), they do not _____as they can live off the fat that they _____from eating before they migrate. When they lay their _____, the baby salmon will stay in the freshwater until they are more _____ and ready to migrate to the ocean. Salmon are born in fresh water, mature and migrate to the _____ but will _____ to the fresh water to spawn. The migration of the salmon is amazing and unique!

return	migrate	eggs	eat	stored	mature	spawn	freshwater	ocean

Lesson 6 Activity 2

Name:

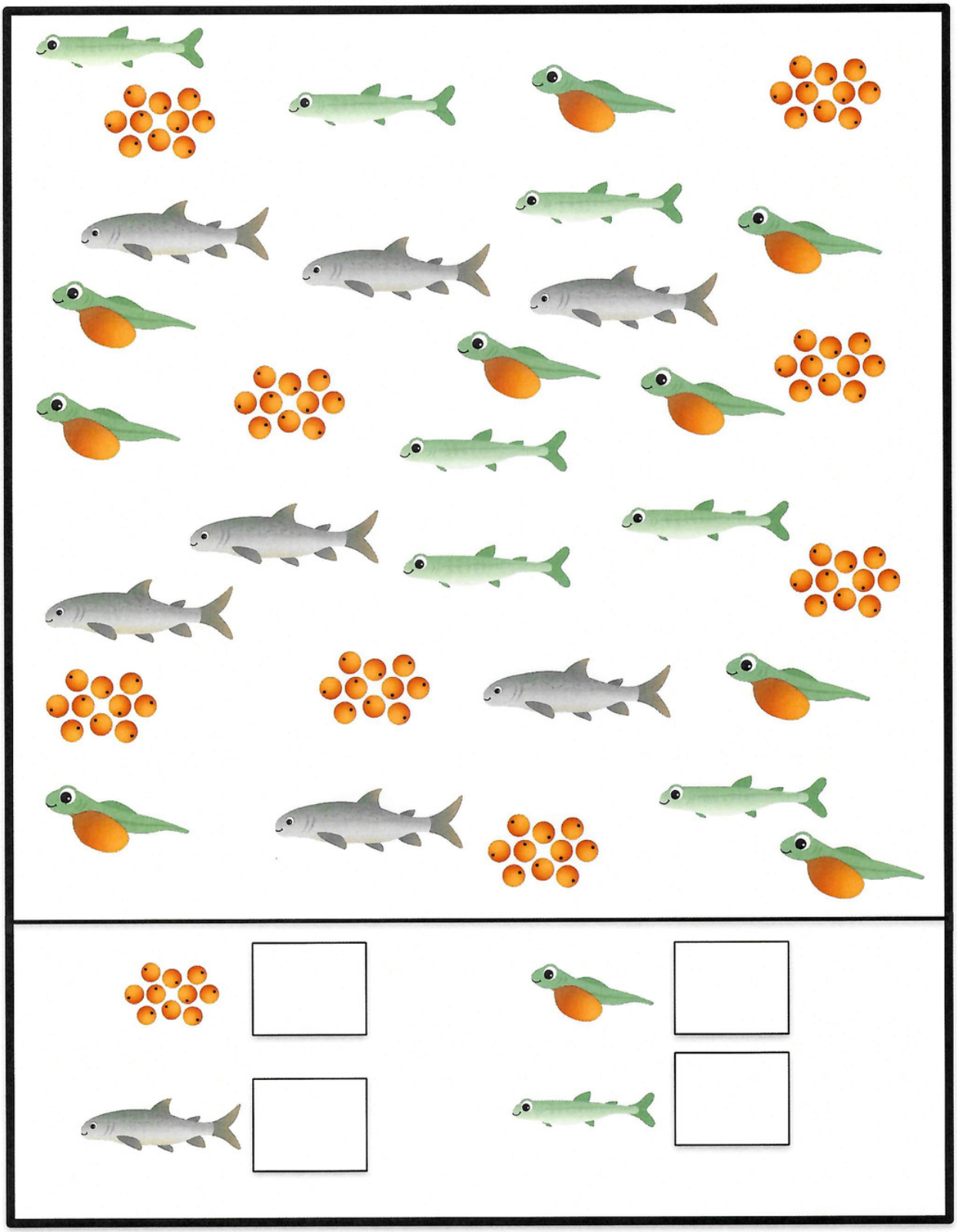
The Amazing Salmon Fish Migration



Salmon are found in the Pacific Ocean, the Atlantic Ocean and in freshwater lakes and rivers. Salmon can live up to 3 to 8 years. Salmon are born in freshwater and when they get a little older, they will then migrate to the ocean. They will continue to live in the ocean until they are ready to spawn (lay their eggs). Salmon will travel up to 3500 miles to spawn back in fresh water. During this journey (migration), they do not eat as they can live off the fat that they stored from eating before they migrate. When they lay their eggs, the baby salmon will stay in the freshwater until they are more mature and ready to migrate to the ocean. Salmon are born in fresh water, mature and migrate to the ocean but will return to the fresh water to spawn. The migration of the salmon is amazing and unique!

Lesson 6 Activity 3

Count the Animals



Lesson 6 Activity 4

Nouns or Verbs?

Cut our the words below and paste them under the correct column..

Nouns	Verbs

salmon	avoiding	river
swim	clears	stream
journey	egg	sweeping

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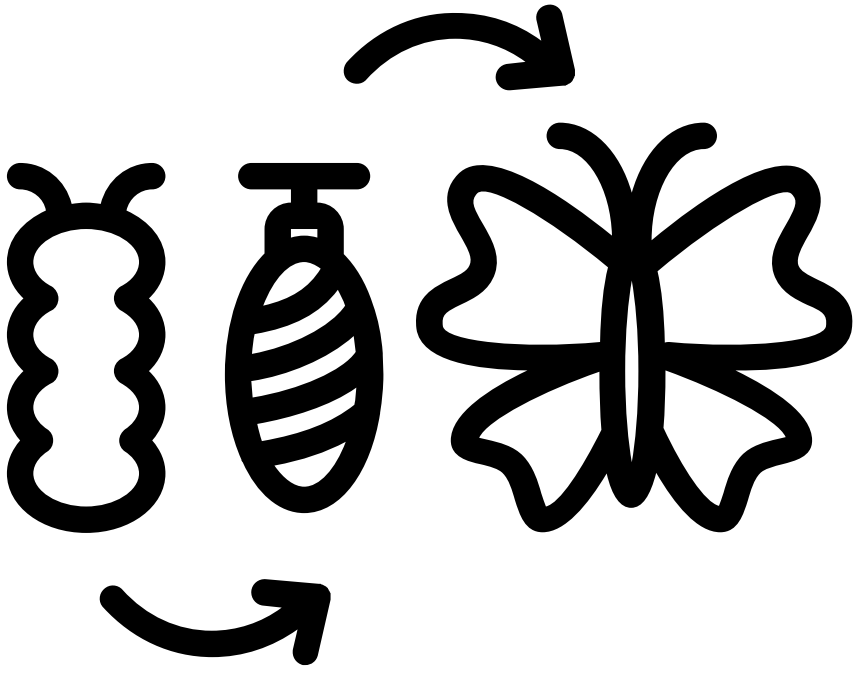
Lesson 7
Adaptations



Fish Friends

Lesson 7
Adaptations

Lesson Overview:

Living things survive because they have characteristics which are suitable for their habitat. These characteristics are called adaptations and enable living things to meet their basic needs. Adaptations are passed from one generation to another through genetic material. When habitats change, living things will survive only if suitable adaptations exist or develop. If not, the organisms will not be able to meet their needs. If the changes in habitat are drastic and rapid, there may not be sufficient time for adaptations to occur naturally and be passed to the next generation.

There are over 19,000 species of fish. Fish have lived successfully in the waters of our planet for over 400 million years. The members of this widespread and diverse group include the 10-meter-long basking shark and the 2.5-centimeter-long sea horse. There are fish even bigger and smaller than these. There are eyeless fish that live in caves, flying (gliding) fish, and fish that walk on land. Fish are found in the highest mountain lakes and the deepest ocean trenches. There are transparent fish living in the Antarctic and rainbow-colored fish living in the tropics.

Fish have many adaptations that make them suitable for their environment and contribute greatly to their survival. The streamlined torpedo shape of the fish allows it to swim through the water with little drag or resistance at bursts of speed up to 20 kilometers per hour, although its cruising speed is much less than this. Paired fins like pectoral fins in the front and pelvic fins in the rear, allow the fish to move up or down, left or right, and help to stabilize the fish. The pectoral fins are also used for propulsion at slow speeds. The unpaired fins like the dorsal fin, adipose fin, anal fin, and the tail keep the fish stable and prevent rolling in the water. An internal swim bladder filled with gas helps the fish to control its depth in the water.

The outside of most fish is covered with scales embedded in a skin or epidermis that secretes a slippery mucus. This further reduces drag and allows the fish to swim as quick as possible while providing physical protection. Many fish have large well-developed eyes that help them to avoid predators and capture prey. The nostrils are not used for breathing, but sense of smell is well developed; they can detect low concentrations of odor. Another sensory structure known as the lateral line system runs along both sides of the body and the head. The lateral line contains special sense organs that detect vibrations and movements in the water.

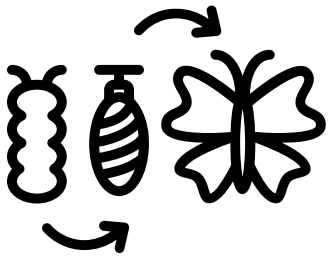
Fish Friends

LESSON 7 ACTIVITY SUMMARY

Living things survive because they have characteristics which are suitable for their habitat. These characteristics are called adaptations and enable living things to meet their basic needs. Adaptations are passed from one generation to another through genetic material. When habitats change, living things will survive only if suitable adaptations exist or develop. Students first examine camouflage as a example of how some organisms have adapted to their environment. They then apply their understanding of adaptation in an activity which examines beaks and feet as examples of adaptations.

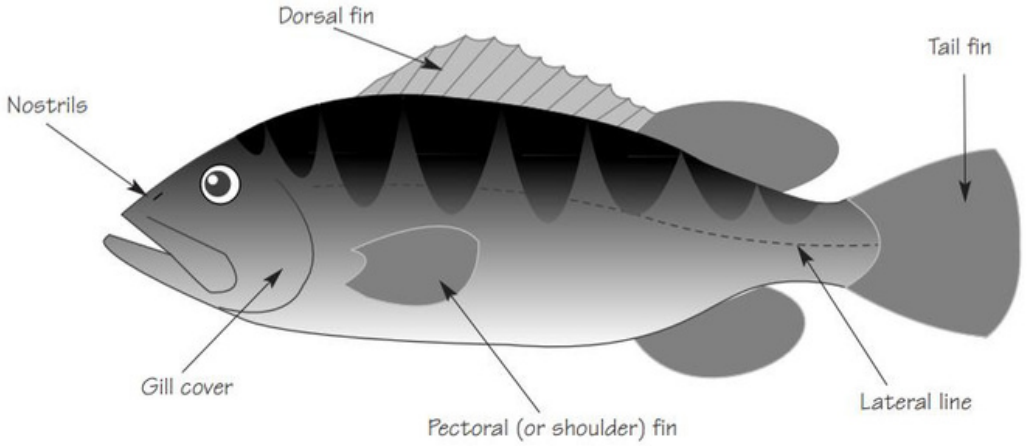
Class Activities:

1. Adaptation Activity Sheet - Grades 3 - 5. Students will have to fill in the blanks on the different anatomy of a fish and how it pertains to the fish's adaptation. They will also complete the "beaks and feet" activity and be challenged to explain why these differences cater to different adaptations!
2. Energy Adaptation Activity Sheet - Grades 3 - 5. This is a great group exercise in which students will have to choose 2 different salmon life stages and determine the adaptations that occur and what the fish gets its energy from, and what it uses its energy for!
3. Salmon Addition and Subtraction - Kindergarten - Grade 3. As adaptation occurs, populations can increase and decrease, and this is a great chance to incorporate addition and subtraction!
4. Salmon Addition and Subtraction - Grades 3 - 5. More advanced addition and subtraction equations!



Lesson 7 Activity 1

ADAPTATION



Using the terminology above, fill in the chart to see the adaptation relationship between fish features and the advantage these features give the fish!

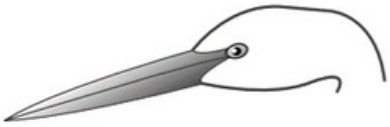
FISH FEATURE	ADVANTAGE
	Easy movement through the water
Lateral Line	
	Protects the soft gills underneath
Nostrils	
	Helps the fish turn left and right, or to move up and down
Dorsal fin	

Lesson 7 Activity 1

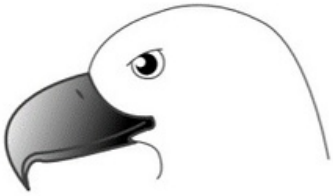
ADAPTATION

Here are four birds, each with a different type of beak, and four types of food. Draw a line from each bird to the food it eats.

How does the shape of the beak help the bird get its food?



_____
_____
_____
_____



_____
_____
_____
_____

_____
_____
_____
_____

_____
_____
_____
_____

There are also many shapes and sizes of feet. Draw two different examples and tell how they help the animal survive.

Lesson 7 Activity 2

Energy use

Choose two stages of the salmon life cycle.

Stage_____
Gets ENERGY from

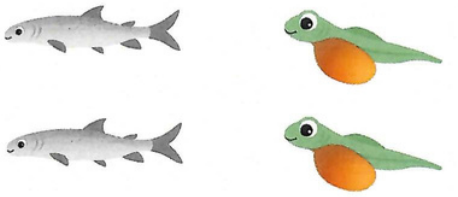
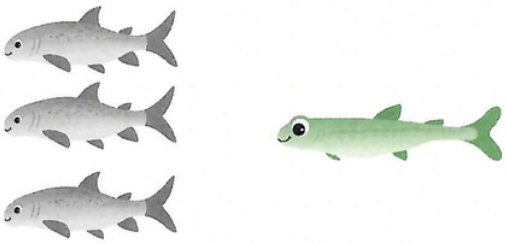
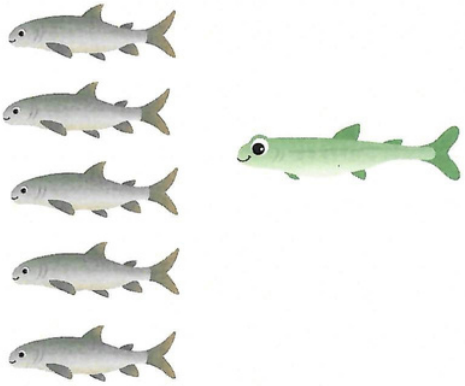
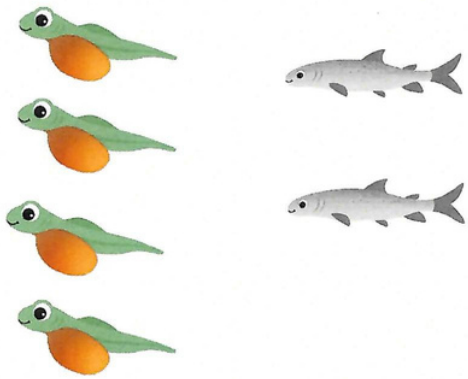
Uses ENERGY to

Stage_____
Gets ENERGY from

Uses ENERGY to

Lesson 7 Activity 3

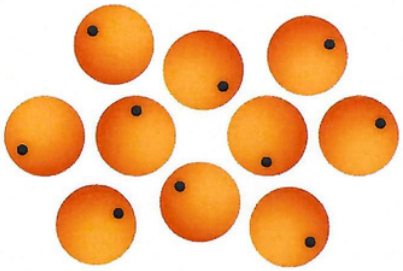
Addition Cards

2 + 2 =  4 2 3	3 + 1 =  4 5 3
5 + 1 =  7 5 6	4 + 2 =  7 5 6

Lesson 7 Activity 3

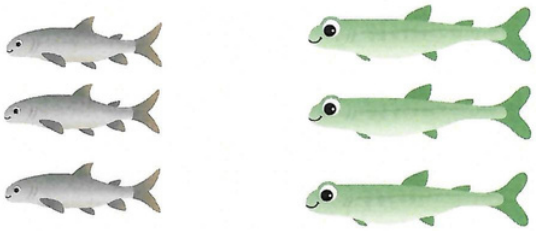
Addition Cards

5 + 5 =



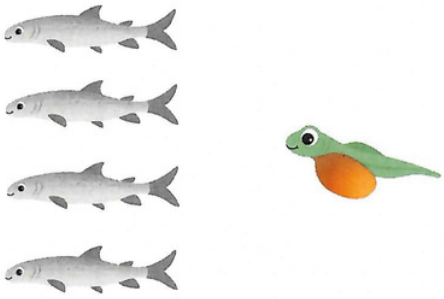
10	9	11

3 + 3 =



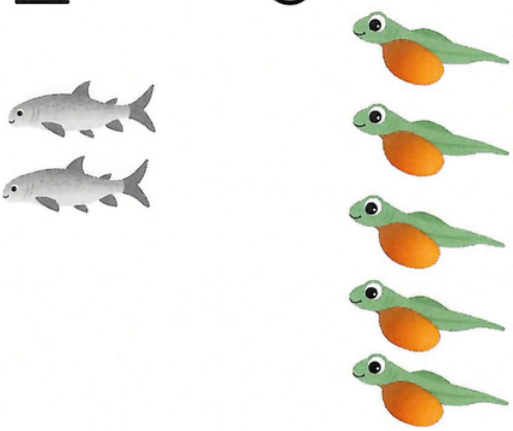
7	5	6

4 + 1 =



4	5	6

2 + 5 =

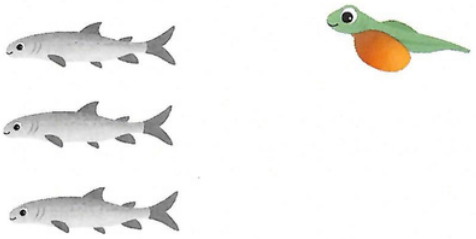


7	8	6

Lesson 7 Activity 3

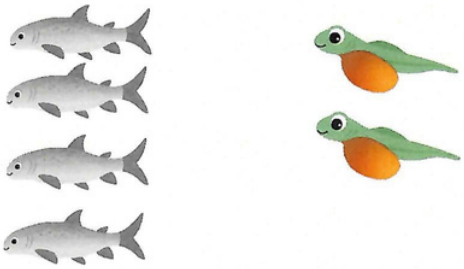
Subtraction Cards

3 - 1 =



1	2	3

4 - 2 =

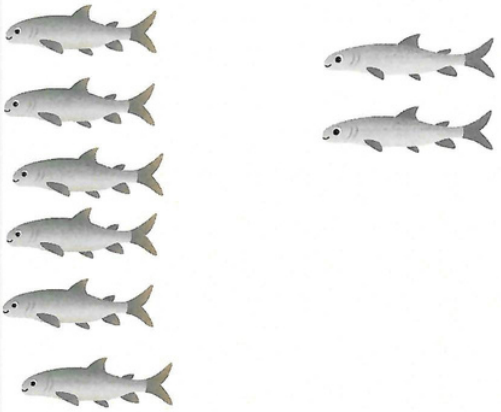


1	2	3

2 - 1 =

1	2	0

6 - 2 =

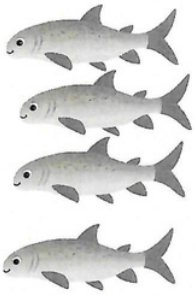


5	3	4

Lesson 7 Activity 3

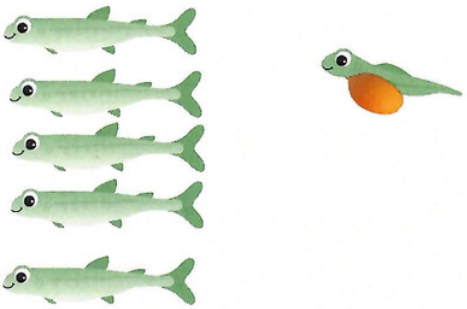
Subtraction Cards

4 - 0 =



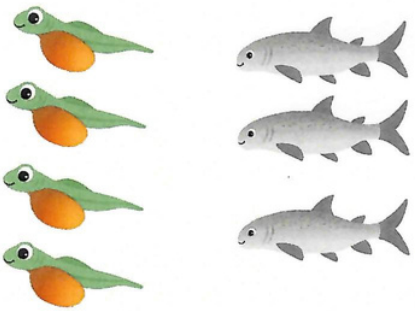
3	5	4

5 - 1 =



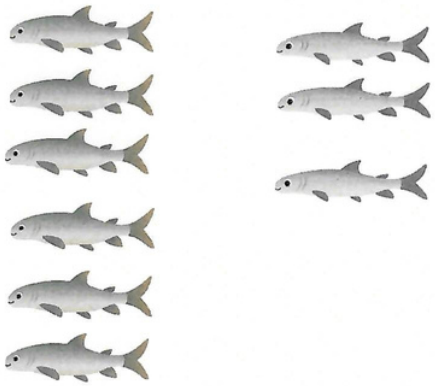
4	5	3

4 - 3 =



1	2	3

6 - 3 =



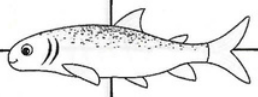
2	4	3

Lesson 7 Activity 4

Let's Add!

Complete each addition sum.

12 + 15	49 + 20	23 + 16
15 + 17	19 + 5	25 + 10
33 + 21	47 + 22	21 + 22



Lesson 7 Activity 4

I can Subtract!

Complete each subtraction sum.

17 - 12	57 - 13	51 - 11
39 - 18	25 - 1	15 - 4
26 - 14	47 - 10	29 - 21

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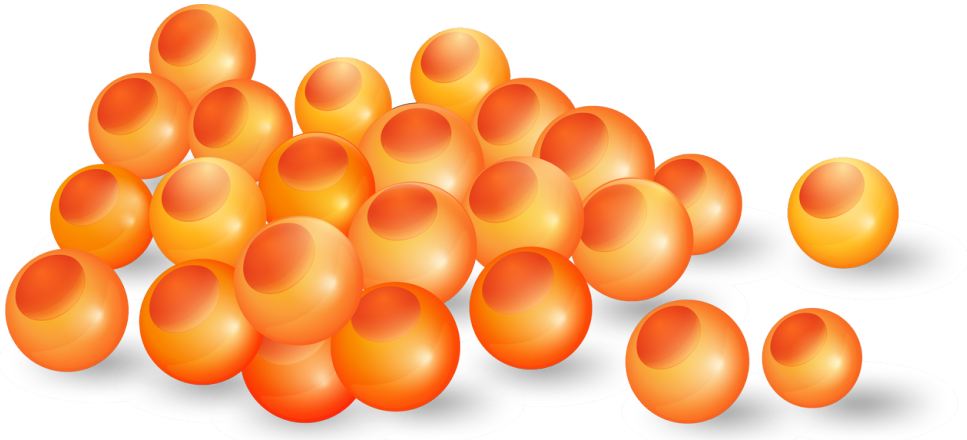


Lesson 8

Getting Redd-y!

Fish Friends

Lesson 8
Getting Redd-y

Objectives:
The students will create models to demonstrate how salmon build redds to protect their eggs from fast currents and predators. Students will determine how successful salmon redds are in protecting the eggs when compared to bare eggs.

Lesson Overview:
The role of humans in the environment has changed drastically, especially in industrialized nations. Originally we followed the same rules as other living things, competing for food and shelter, predator of some, prey for others. In more recent years, however, our relationship with the environment has changed and consequently our role has changed. We have isolated ourselves from the rules that govern natural ecosystems. We have changed our habitat and in doing so we have changed the habitats of other living things. These changes are not without consequences. We must now take responsible action not only for our own survival but for that of other living things that share our planet.

When you first got your salmon eggs and placed them in your tank, chances are, your tank did not have any gravel. Is this similar to how it would be in the wild? No- in the wild, salmon eggs would be in gravel, in something that is called a Redd. When the salmon have completed their ocean migration, they begin to make their way back to the same rivers where they were born to spawn. Once they get back into the river, they begin to look for suitable spots to lay their eggs. Atlantic salmon are very specific when it comes to where they want to lay their eggs! Atlantic salmon will not lay their eggs in mud, or on aquatic plants, or on bedrock, or in very deep water- they will only lay their eggs in gravel!

Salmon will find beautiful gravel to make their nest, which is called a redd. The word redd is Scottish, meaning to “make clean or tidy”. Salmon use their tail to kick up rocks, creating a pit in the streambed and allowing the current to deposit the displaced rock in a pile just downstream. When they use their tail like this, they are removing the algae and scum off rocks, which makes them look bright and clean. Redds are usually 1-2 meters in diameter and roughly rounded. Once the pit has been made into the gravel, the female salmon will lay their eggs and they will be fertilized by the male. Then the salmon will cover the eggs with more gravel. Redds are usually found at the tail of pools on the upstream side of riffles, with relatively high-water speeds, and water depths of 15-70cm. Remember what we learned about dissolved oxygen? Well eggs need oxygen too! That is why eggs are laid in gravel, not mud. Gravel lets the oxygen access the eggs, and the flowing water keeps the eggs well oxygenated.

Fish Friends

LESSON 8 ACTIVITY SUMMARY

The students will create models to demonstrate how salmon build redds to protect their eggs from fast currents and predators. Students will determine how successful salmon redds are in protecting the eggs when compared to bare eggs.

Class Activities:

1. Redd Activity Sheet - Kindergarten - Grade 5. This is a hands-on activity, requiring a few material items, and a demonstration is also included in Lesson 8 video!
2. What Time Will The Eggs Hatch Activity Sheet - Grades 3 - 5. Students will have to learn to tell time in this activity!
3. Color The Eggs Activity Sheet - Kindergarten - Grade 3. A nice coloring sheet that will have students coloring salmon eggs different colors!
4. Salmon Can, Have, and Are Activity Sheet - Grades 3 - 5. A writing exercise that will encourage students to list out what they think salmon can do, what salmon have, and what salmon are! This is a great opportunity to compare class answers at the end of the exercise!
5. Salmon Singular or Plural Activity Sheet - Grades 3 - 5. Students will have to determine if the words in the word box are singular or plural, and of course- they are all salmon-related words!
6. Salmon Facts Activity Sheet - Grades 3 - 5. This would make a great individual or group exercise, in which students will read the sentences and fill in the blanks from a word box!

Lesson 8 Activity 1

Purpose Of A Redd

This activity demonstrates how a gravel redd protects salmon eggs from predators.

Materials:

- Large basin
- Water
- Modeling clay
- Toothpicks
- Rocks 5 to 10 cm (2 - 4 in) in diameter and gravel
- Copies of Handout 2.2, "Making a Redd Observation Page," for each student.

Time Required:
One or two lessons

Level of Conceptual Difficulty:
Moderate to advanced

Evidence for Assessment:
Review student discussion and observation pages to ensure they can describe how a redd protects salmon eggs from predators and strong water flow.

INTRODUCTION

- Discuss with the class how pets and other animals keep newly born babies safe and healthy.
  They make a secure nest or den for the babies, bring them food and drink and protect them from intruders.

- Explain that a redd is like a nest made of gravel on the stream or lake bed, in which spawners lay their eggs.

- Have the class suggest reasons why spawners create a redd in which to lay their eggs, and write their ideas on Handout 2.2, "Making a Redd Observation Page."

ACTIVITY, PART ONE

- Have students make small eggs from modeling clay, about one half centimeter in diameter, place them at one end of a basin, and predict what might happen to them in a stream.

- Tilt the basin at an angle, pour water gently over the model eggs, and have students count the eggs that are washed to the bottom of the basin.

- Have some students in pairs act as birds, use toothpicks to peck at the eggs, and count and record the eggs they catch in ten seconds.

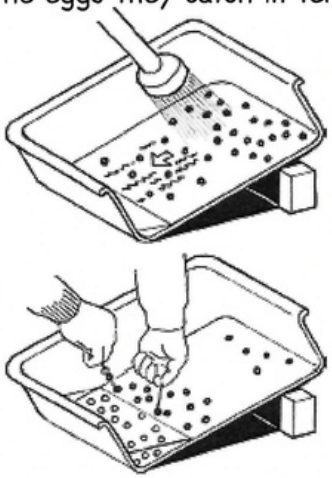
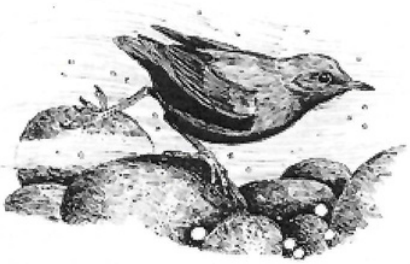


illustration: Donald Gunn

Lesson 8 Activity 1



illustrations: Donald Gunn

ACTIVITY, PART TWO

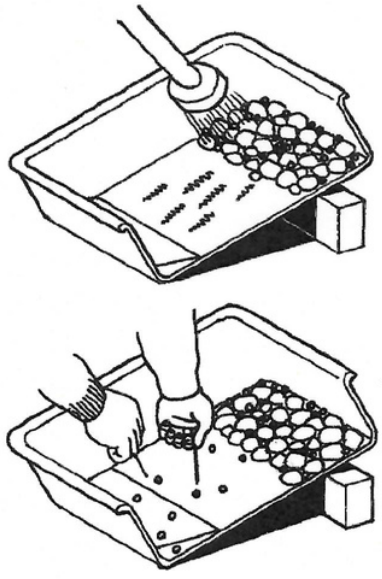
- Make a model redd using rocks and gravel at one end of the basin. Place the model eggs in the redd and cover them with gravel. Have students predict what might happen to them in a stream.

- Tilt the basin at the same angle as Part One. Pour water gently over the redd and have students count the eggs that are washed away.

- Have some students in pairs act as birds, use toothpicks to peck at the eggs, and count and record the eggs they catch in ten seconds.

ACTIVITY, PART THREE

- With the class, compare the outcomes for Activities, Part One and Part Two. Make a graph to compare the number of eggs that were washed away or caught by birds in Part One and Part Two.



DISCUSSION

- Discuss with the class what conclusions they can add to Handout 2.2, "Making a Redd Observations Page." If necessary, prompt them with questions such as the following:

  - Were more eggs washed away with the redd or without?
    Without.
  - Did the birds catch more eggs with the redd or without?
    Without.
  - How was the redd in the basin like a redd in a stream? How was it different?
    Similar materials and shape, but smaller, less water flow.
  - How would a redd help protect the eggs in a real stream?
    It would hide them from birds, and keep them from washing away. It would also help protect them from other predators, such as fish, so more would survive.

Lesson 8 Activity 2

What time will the eggs hatch?

Write the time under each clock.



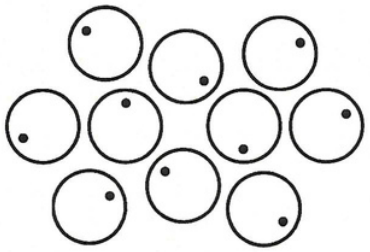




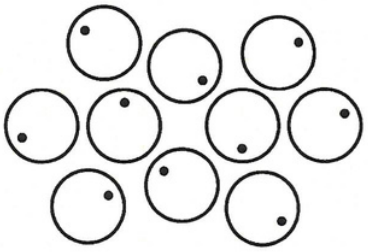


Lesson 8 Activity 3

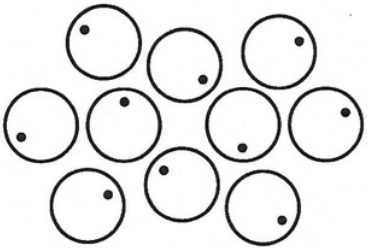
Coloring Activity – Color the picture in to match the color indicated.



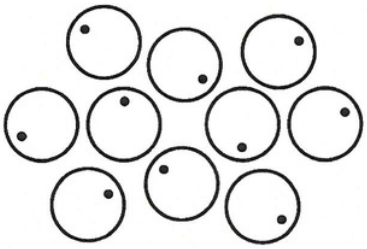
red



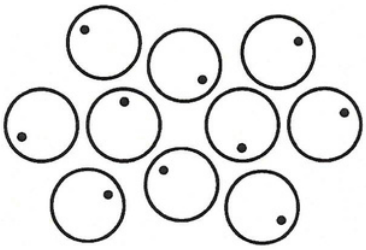
blue



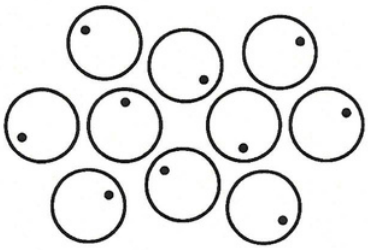
green



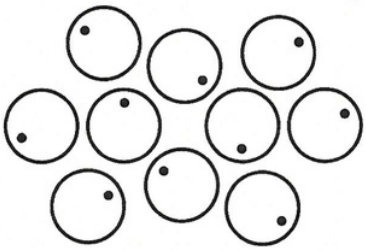
yellow



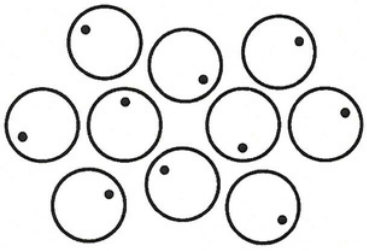
purple



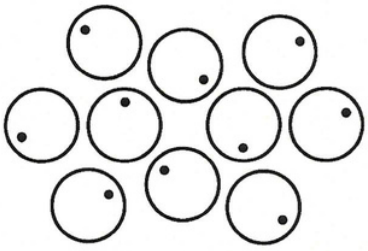
black



white



grey

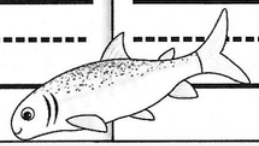


pink

Lesson 8 Activity 4

Salmon

Salmon can:	Salmon have:	Salmon are:



Lesson 8 Activity 5

Singular or Plural?

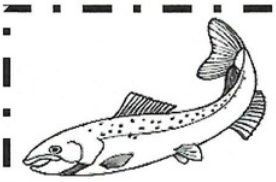
Write the words below under the correct heading.

Singular	Plural

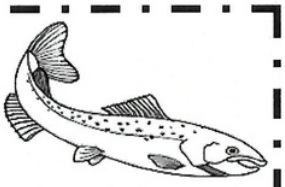
salmon	salmon	egg
eggs	swim	swims
river	rivers	nests
nest	fish	fish

Lesson 8 Activity 6

Name:



Salmon Facts



Fill in the Blanks

1. When the adult salmon return to fresh water, they do not _____. They can go longer than six months without eating!

2. An _____ will eat up to 55 pounds of salmon a day!

3. There are Pacific salmon and Atlantic salmon, the Atlantic salmon don't usually _____ after they spawn but the Pacific salmon does.

4. Most fish live either in _____ water or fresh water, but the salmon lives in both.

5. _____ salmon will spend two or three years in their freshwater streams or rivers before going on their one to three year journey to the Atlantic or Pacific Ocean to become an adult.

6. Adult salmon will travel up to 6000 miles to return to freshwater to _____.

7. The adult salmon will return to the same fresh water they were they were _____ using their sense of smell to find it.

8. A salmon will travel or 30 miles a day when they _____!

9. Not only can a salmon swim fast but they can also _____ very high, almost as high as 12 feet!

10. A typical salmon _____ is 3-8 years.

11. Salmon _____ can take as long as three months to hatch.

young	**spawn**	**hatched**	**migrate**	**eggs**	
Orca	**salt**	**die**	**eat**	**jump**	**life span**

Lesson 8 Activity 6

ANSWERS:

When the adult salmon return to fresh water, they do not **eat**. They can go longer than six months without eating!

An **Orca** will eat up to 55 pounds of salmon a day!

There are Pacific salmon and Atlantic salmon, the Atlantic salmon don't usually **die** after they spawn but the Pacific salmon does.

Most fish live either in **salt** water or fresh water, but the salmon lives in both.

Young salmon will spend two or three years in their freshwater streams or rivers before going on their one to three year journey to the Atlantic Ocean to become an adult.

Adult salmon will travel up to 6000 miles to return to freshwater to **spawn**.

The adult salmon will return to the same fresh water they were they were **hatched** using their sense of smell to find it.

A salmon will travel or 30 miles a day when they **migrate**!

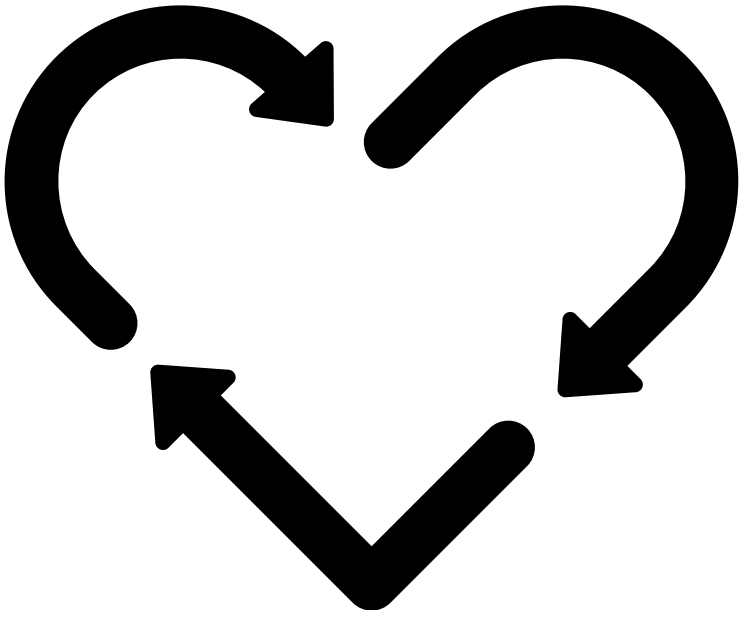
Not only can a salmon swim fast but they can also **jump** very high, almost as high as 12 feet!

A typical salmon **life span** is 3-8 years.

Salmon eggs can take as long as three months to hatch.

Fish Friends

Lesson 9
Sustainability



Fish Friends

Lesson 9
Sustainability

Objectives:
The students are introduced to the concept of sustainability within their own community. They examine how the people who live there meet their basic needs today and in the future. They will build on these fundamental principles of sustainability in later lessons.

Lesson Overview:
Sustainable development, or sustainability, involves a holistic examination of the impact of our actions on the environment. Sustainability is more than environmental conservation; it also has economic and humanitarian dimensions. For a sustainable future, all dimensions of sustainability must be addressed.

In earlier lessons, the students learned that food, water, air (oxygen), shelter and elimination of waste are basic needs. Most people in North America spend money to meet their basic needs. We have to buy food and pay rent or purchase a house. Many people are employed in industries and businesses that are directly or indirectly related to supplying our basic needs. For example, buying food creates jobs for farmers, truck drivers, factory workers, and grocery store employees. In turn, these jobs provide an income so that people can buy food.

Many of our activities today will make it difficult for future generations to meet their basic life needs. If we continue to pollute our land and water today, it may be impossible to obtain food tomorrow. When we remove large amounts of forests, we are removing the major building materials for homes in the future. When we destroy countless habitats, we are destroying many species of living things that share our planet. All these activities threaten our water and air quality.

When we think of sustainability, we can't forget about sustainable fishing! Wild fish stocks are often used as an indicator of the health of freshwater environments, and anglers are a source of critical information which is analyzed by fisheries scientists. Anglers spend money on many items including special clothing and footwear, food, accommodations, travel and fishing equipment. Jobs are created in providing all of these goods and services. Some people are also employed as guides for the anglers. But remember: catch and release is a great way to be sustainable, and only take what you need if you do plan on keeping fish! Overall, the recreational fishery is an important source of economic activity in the Atlantic region.

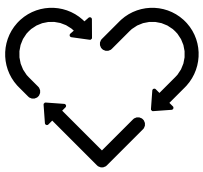
Fish Friends

LESSON 9 ACTIVITY SUMMARY

Sustainable development, or sustainability, involves a holistic examination of the impact of our actions on the environment. Sustainability is more than environmental conservation; it also has economic and humanitarian dimensions. For a sustainable future, all dimensions of sustainability must be addressed. The students are introduced to the concept of sustainability within their own community. They examine how the people who live there meet their basic needs today and in the future. They will build on these fundamental principles of sustainability in later lessons.

Class Activities:

1. Balancing Act Activity Sheet- Grade 3 - Grade 5. Students will imagine Earth is a ball sitting on a stool with three legs. One leg is the environment, one is the economy, and one is people. If the three legs are not balanced, the 'Earth' will roll off the stool, and some living things may not survive the fall, and they will have to answer some questions!
2. Only The Strong Survive Activity Sheet - Kindergarten - Grade 5. This is a math-based activity sheet. For younger grades, the teacher can present the scenario in front of the class and assist with the mathematics. For older grades, students should be able to do the math, either individually or in groups.
3. Overfishing Activity Sheet - Grade 3 - Grade 5. A crossword puzzle focusing on overfishing and how that behavior is not sustainable!
4. Environment Unscramble Activity Sheet - Grade 3 - Grade 5. Students will have to unscramble the words on the page- all of the words tie in with the theme of sustainability. Making this a race to see who can finish first is bound to be a fun time!



Lesson 9 Activity 1

BALANCING ACT

Imagine Earth is a ball sitting on a stool with three legs. One leg is the environment, one is the economy, and one is people. If the three legs are not balanced, the 'Earth' will roll off the stool, and some living things may not survive the fall.

In earlier lessons, we discussed the five basic things we need to survive. What are they?

1. _____

2. _____

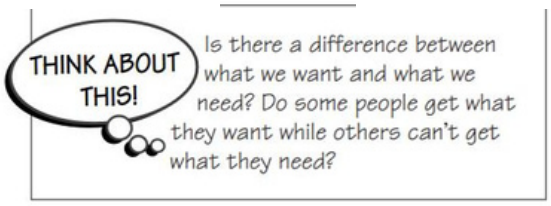
3. _____

4. _____

5. _____

A stool will remain balanced as long as the three legs are stable. We could say it is sustainable. Life on Earth can be sustainable, too. But we must do things today that will help living things in the future meet their basic needs. What can we and our families do to help life on our planet be sustainable?

As we meet these needs, how do we affect the environment? Do we have to spend money to meet our needs? What do we spend it on? Are jobs created? Are we doing anything today that will make it difficult for future generations to meet their needs? What can our communities do? Give a few examples.



Lesson 9 Activity 2

ONLY THE STRONG SURVIVE

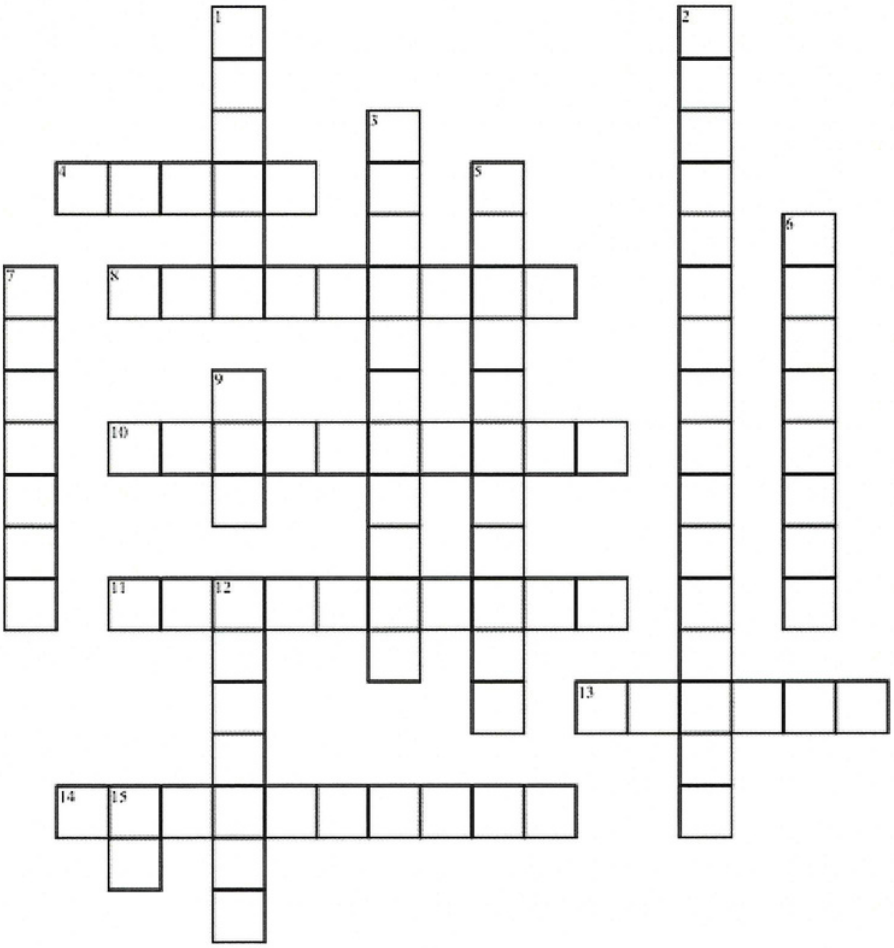
Salmon lay thousands of eggs but very few make it to the age where they come back and reproduce. Here are a few reasons why. Use the numbers below to find out how many salmon are left. Use this page for your work and keep a running tab.

5,000	A salmon deposited 5,000 eggs in a redd (nest)
	500 eggs were not fertilized.
	60 were washed out of the gravel when a 4-wheeler ATV crossed the stream.
	Mud from building a new subdivision eroded into the stream and suffocates 1,000 eggs.
	300 alevins died because they were very weak.
	After the alevins developed into fry, 500 were eaten by other fish in the stream.
	41 of the fry were eaten by birds.
	The fry grew into parr, but 260 parr were eaten by muskrats.
	There was a heat wave in the summer and parts of the river went dry, and 21 parr died.
	The parr grew into smolts, but 3 smolts are eaten by kids who thought the parr were trout.
	The rest of the smolts made it to the ocean, but 1,500 were eaten by bigger fish.
	The smolts grew into adult salmon, but seals ate 556 salmon.
	In the ocean, 77 adult salmon were infected by sea lice and died.
	On their way back to the river to spawn, fishermen caught and kept 62 adult salmon.
	As the salmon made it back to their river, bears ate 80 of the salmon.
	Almost to their spawning grounds, a dam blocked 20 salmon and they died.
	The rest of the salmon made it back to the river to spawn!

Lesson 9 Activity 3

Name: _____ Date: _____

Overfishing



Across

4. Who consumes more fish..Japan or America?
8. Errors in _____ can present opportunities of mismanagement
10. _____ metric tons were used directly for human production
11. _____ fishing occurs throughout much of the ocean in all regions
13. Establishing maximum sustainable yield is a _____ business
14. In 2012 500 species accounted for approximately _____ metric tons of catch

Down

1. Some region have a larger _____ on ocean life than others
2. By 2005 many people worldwide were starting to recognize the concerns with _____ of fish species
3. The process of breeding, rearing, and harvesting of organisms in aquatic environments
5. When the quantity of fish taken exceeds the amount of fish that can be resupplied.
6. A lot of bycatch die while trapped in nets and ultimately become part of the ocean floor as
7. Harvesting of non target species
9. Seafood accounts for about __ of protein humans eat
12. _____ sustainable yield is the greatest yield of target species that fisheries take without jeopardizing future catches
15. Seafood accounts for about __ of what people eat

Word Bank

4%	18%	Japan	Impact	142 million
108 million	Aquaculture	Overexploitation	Bycatch	Sediment
Commercial	Maximum	Tricky	Estimates	Overfishing

Lesson 9 Activity 4

Unscramble the words

Name: _____

itltre _____

cceelyr _____

suree _____

rduece _____

neironvnmte _____

teraw _____

tupoollin _____

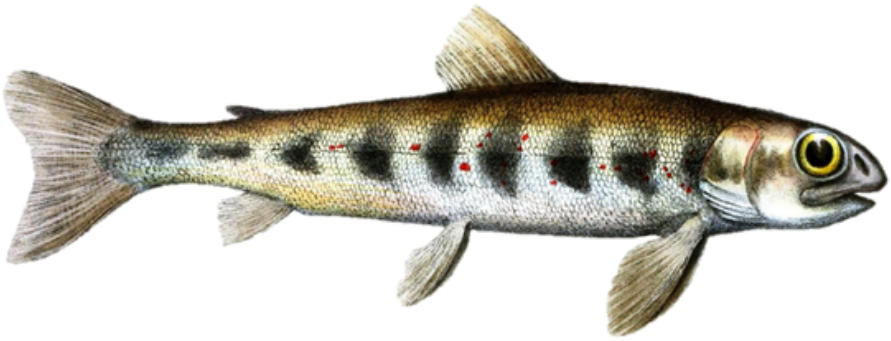
rthae _____

lapent _____

omcpots _____

ergen _____

Fish Friends



Lesson 10
Stewardship

Fish Friends

Lesson 10
Stewardship

Objectives:

Through two activities, the students are challenged to apply their understanding of the concepts developed in the unit. In one, they are presented with a series of difficult situations and are asked to suggest what action they would take. In the second activity, students assume the roles of various community members in addressing a development proposal which has been presented to their town council.

Lesson Overview:

To make informed decisions about our environment, we must be knowledgeable about the various dimensions of sustainability and prepared to participate in the decision-making process. Stewardship is an ethical value that embodies the responsible planning and management of resources. The concepts of stewardship can be applied to the environment and nature, economics, health, property, information, theology, and cultural resources.

Stewardship over the river may include the addition of extra juvenile fish, the closure of a river to sport fishing, or the restriction of commercial fishing to increase salmon numbers over time. The patrolling of a heavily poached river or the clean-up of a polluted river can also result in the enhancement of fish numbers. River protection and fishery closure can play a vital role in the success of an enhancement project.

Habitat improvement is also a type of enhancement. Natural obstructions such as waterfalls or beaver dams and barriers such as power dams, poorly constructed culverts, and log jams can make a water system inaccessible to migrating fish. Replacing poorly constructed culverts, building fishways, removing wooden barriers, or blasting a waterfall to change its shape can allow new access for sea run fish in an unused river system or tributary. To assure success, some restoration projects incorporate the release of hatchery-reared juvenile salmon or trout to rivers or lakes. These projects are used in situations where previously unused habitat is being made accessible to migrating fish; and where over-fishing and pollution have reduced wild fish stocks to virtual elimination. If you have a Fish Friends tank in your classroom, you are doing your part to help be salmon stewards!

Fish Friends

LESSON 10 ACTIVITY SUMMARY

To make informed decisions about our environment, we must be knowledgeable about the various dimensions of sustainability and prepared to participate in the decision-making process. Stewardship is an ethical value that embodies the responsible planning and management of resources. The concepts of stewardship can be applied to the environment and nature, economics, health, property, information, theology, and cultural resources.

Class Activities:

1. I Can Help The Earth Activity Sheet - Kindergarten - Grade 5. Students are encouraged to either write or draw the different ways they can become environmental stewards and help keep the natural world clean and healthy!
2. Sort the Trash Activity - Kindergarten - Grade 3. Students will cut out the items, and determine if they are recyclable, compostable, or garbage!
3. Stewardship Activity - Grades 3 - 5. Students are presented with 4 different environmental dilemmas that they need to solve. This would be a great group task, or you could take this activity one step further and turn the dilemmas into a debate!
4. Stop Overfishing Activity - Grades 3 - 5. Students will draft a letter to their fishing authority to persuade them to stop overfishing. Again, this exercise could be turned into a debate!

Lesson 10 Activity 1

I Can Help the Earth Name: _____

Write in your answers.

5 ways to reduce waste

- _____
- _____
- _____
- _____
- _____

4 things I can reuse

- _____
- _____
- _____
- _____

3 things I can recycle

- _____
- _____
- _____

Lesson 10 Activity 2

Time to sort the Trash!

Name: _____

compost	recycle	trash

 water bottles	 Styrofoam cups	 banana skins
 empty cans	 tissues	 paper
 apple core	 shopping bags	 glass jar

Lesson 10 Activity 3

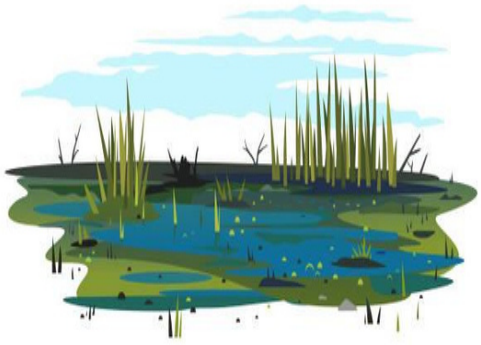
STEWARDSHIP

Dilemma #1- You are fishing at a secluded lake and have caught 7 fish during your first day at the lake. Now, on the second day, the fishing has been great, and you have caught 5 fish in the first hour, all of which are bigger than yesterday's fish. The law allows you to possess 12 fish.

WHAT DO YOU DO?

Dilemma #2- A high-quality fishing stream runs along the edge of your family's farm. The fertilizer which your family uses to increase crop production is carried into the stream by rain runoff. The fertilizer is affecting algae growth and the fish population in the stream. The farm is your sole source of income, but your family has always enjoyed fishing and doesn't want to lose the fish from the stream.

WHAT DO YOU DO?

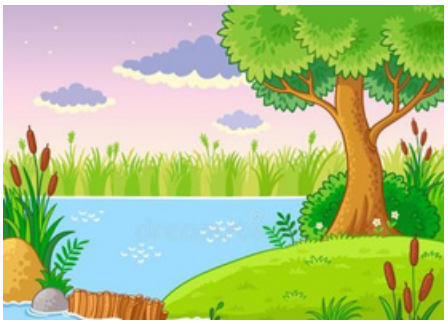


Lesson 10 Activity 3

STEWARDSHIP

Dilemma #3- You and a friend have a favorite lake where you like to fish. In the past, you used to catch trout, but now you catch only small perch. There is a dam at the end of the lake, so trout have not been able to leave the lake to spawn. Your friend wants to introduce a new species of fish to the lake, a type that eats perch.

WHAT DO YOU DO?



Dilemma 4: Now it is your turn! Write about a situation that could be a dilemma in your community. Have other members of your class suggest the best possible action to take.

WHAT IS HAPPENING, AND WHAT DO YOU DO?

Lesson 10 Activity 4

Stop Over Fishing!

Write the aquatic authority figure a letter persuading them to stop over fishing. Your letter must include persuasive reasons supported by facts.

Fish Friends

CONCLUSION

This program could not have been possible without the help from many sources. Thank you to our funder, the New Brunswick Wildlife Trust Fund for the generous sponsorship to update this program. We would also like to thank the DFO Mactaquac Biodiversity Facility for providing the Salmon eggs for the Fish Friends Program.

Our largest, and most sincere, thanks go to the New Brunswick Salmon Council. Without your continued support, the Fish Friends program would have met its untimely demise decades ago. We commend you for your dedication and passion to keeping this program running, and we are hopeful that our efforts within this updated curriculum will support the longevity of the program and help it to keep going for decades to come.

We wanted to extend a thank you to all participating teachers, both previous and current. This program could not be delivered without your cooperation, and we thank you for that. It has been a joy coming into your classrooms, and witnessing firsthand the enjoyment and excitement from educators and students alike when we deliver your salmon eggs!

As always, if you have any questions, concerns, or need help with your Fish Friends curriculum or equipment, our HRAA staff are here for you!

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