DRAFT

CLASSROOM HATCHERY PROGRAM

GRADE 2 LESSON GUIDE

Made possible through funding from:

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Lesson Summaries

Lesson 1: **Keepers of the Hatchery**	Students will be introduced to the classroom hatchery components and functions and will be involved in the monitoring of the hatchery function.	50-60 Minutes
Lesson 2: **Label to Learn Life Cycle**	Students will learn about the life cycle of Atlantic Salmon, labeling a diagram as they watch a video.	30-60 Minutes
Lesson 3: **Atlantic Salmon Artists**	Students will be introduced to basic fish biology and identification to assist them to identify an adult Atlantic Salmon. They will then draw an Atlantic Salmon from an instruction sheet, paying attention to key identifying features.	50-60 Minutes
Lesson 4: **Soil Scientists**	Students will be introduced to soil infiltration by water and compare compacted versus loose soils. Students will do some data recording and graphing.	60-120 Minutes
Lesson 5: **Help the Atlantic Salmon Group Discussion**	Group discussions about Atlantic Salmon and ways to help this fish return to the Lake Ontario region.	60 Minutes
Lesson 6: **Survive to Smolt**	A dynamic tag game teaches the students about predators and prey that are involved in the life of Lake Ontario Atlantic Salmon.	60 Minutes

Grade 2 Curriculum Connections

Curriculum	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Science & Technology						
UNDERSTANDING LIFE SYSTEMS GROWTH AND CHANGES IN ANIMALS						
Expectations						
1.2 identify positive and negative impacts that different kinds of human activity have on animals and where they live, form an opinion about one of them, and suggest ways in which the impact can be minimized or enhanced				X	X	
2. investigate similarities and differences in the characteristics of various animals;		X	X			X
2.2 observe and compare the physical characteristics		X	X			X
2.3 investigate the life cycle of a variety of animals		X				X
2.4 observe and compare changes in the appearance and activity of animals as they go through a complete life cycle		X				X
2.7 use appropriate science and technology vocabulary						X
UNDERSTANDING MATTER AND ENERGY PROPERTIES OF LIQUIDS AND SOLIDS						
Expectations						
2.2 investigate the properties of liquids and solids	X			X		
UNDERSTANDING EARTH AND SPACE SYSTEMS AIR AND WATER IN THE ENVIRONMENT						
Expectations						
1.1 assess the impact of human activities on air and water in the environment, taking different points of view into consideration and plan a course of action to help keep the air and water in the local community clean				X	X	
2.1 follow established safety procedures during science and technology investigations	X			X		
2.3 investigate, through experimentation, the characteristics of water				X		
3.3 describe ways in which living things, including humans, depend on air and water	X			X		
3.4 identify sources of water in the natural and built environment				X		

Expectations

D1. creating and Presenting: apply the creative process (see pages 19–22) to produce a variety of two- and three-dimensional art works, using elements, principles, and techniques of visual arts to communicate feelings, ideas, and understandings		X	X			
D1.3 use elements of design in art works to communicate ideas, messages, and understandings		X	X			

Mathematics

MEASUREMENT

Expectations

describe how changes in temperature affect every day experiences	X					
use a standard thermometer to determine whether temperature is rising or falling	X					

DATA MANAGEMENT AND PROBABILITY

Expectations

collect and organize primary that is categorical or discrete, and display the data using one-to-one correspondence in concrete graphs, pictographs, line plots, simple bar graphs, and other graphic organizers, with appropriate titles and labels and with labels ordered appropriately along horizontal axes, as needed				X		

Language

ORAL COMMUNICATION

Expectations

1. listen in order to understand and respond appropriately in a variety of situations for a variety of purposes;	X	X	X		X	X
Active Listening Strategies 1.2 demonstrate an understanding of appropriate listening behaviour by using active listening strategies in a few different situations	X	X	X		X	X

Health and Physical Education

LIVING SKILLS

Expectations

1. demonstrate personal and interpersonal skills and the use of critical and creative thinking processes as they acquire knowledge and skills						**X**
Personal Skills 1.1 use self-awareness and self-monitoring skills to help them understand their strengths and needs, take responsibility for their actions, recognize sources of stress, and monitor their own progress, as they participate in physical activities, develop movement competence, and acquire knowledge and skills related to healthy living						**X**
1.2 use adaptive, management, and coping skills to help them respond to the various challenges they encounter as they participate in physical activities, develop movement competence, and acquire knowledge and skills related to healthy living						**X**
Interpersonal Skills 1.3 communicate effectively, using verbal or non-verbal means, as appropriate, and interpret information accurately as they participate in physical activities, develop movement competence, and acquire knowledge and skills related to healthy living						**X**
1.4 apply relationship and social skills as they participate in physical activities, develop movement competence, and acquire knowledge and skills related to healthy living to help them interact positively with others, build healthy relationships, and become effective team members						**X**
Critical and Creative Thinking 1.5 use a range of critical and creative thinking skills and processes to assist them in making connections, planning and setting goals, analysing and solving problems, making decisions, and evaluating their choices in connection with learning in health and physical education						**X**

ACTIVE LIVING

Expectations

A1. participate actively and regularly in a wide variety of physical activities, and demonstrate an understanding of the value of regular physical activity in their daily lives						**X**
A1.1 actively participate in a wide variety of program activities, according to their capabilities						**X**
A3.1 demonstrate behaviours and apply procedures that maximize their safety and that of others during physical activity						**X**

Class size:	Unlimited
Setting:	Classroom
Time:	50-60 Minutes

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Grade 2 Classroom Hatchery Activities

Lesson 1: Keepers of the Hatchery

Lesson Objectives:

- Introduce the class to the hatchery components and responsibilities and the importance of monitoring and maintenance
- Involve students in daily monitoring and record keeping of classroom hatchery
- Quickly identify any issues with the classroom hatchery unit so they can be resolved

Materials:

- Classroom hatchery along with all components (listed below)
- "Lake Ontario Atlantic Salmon Classroom Hatchery" sheet (below – 1 copy)
- "Classroom Hatchery Daily Checksheet" (below – 5 copies if set up in February, 6 if set up in January)
- Pencil
- Clipboard

Background:

The survival of your classroom hatchery fish is dependent on a well-functioning hatchery setup. If temperatures become too low the fish will not develop and in the case of freezing temperatures the aquarium tank may be damaged. Too high of a temperature will cause the fish to develop too quickly and may result in mortality. If the fish develop too quickly they will use up their yolk sacs too soon and may need to be fed prior to their release into the stream. When the fish are fed, water quality is greatly reduced. Not all fish will take to the unnatural food source and may die. The most common cause of warm temperatures is a malfunction of the chiller unit. It is imperative that if a component fails, it is noticed and remedied quickly. A daily check data sheet will help to catch issues quickly.

Daily checks on weekends and holidays are not practical and therefore are an accepted risk of the program.

Teaching and Learning Sequence

Part A. Gather the students around the hatchery unit, point out each of the components below, and ask the students what they think each component does.

Part	*Purpose*
Tank (15 or 20 gallon)	Holds the water
Chiller unit	Chills the water
Gravel	Substrate for the eggs/fish to hide in
Scotty incubator unit ("fish condo")	Holds the eggs as they develop and hatch into alevin
Filter with cartridge (Marineland or Aquaclear)	Cleans the water
Mesh screen and elastic	Prevent fish from swimming into the filter
Air pump with hose and air stone	Adds oxygen to the water
Thermometer	Displays water temperature
4" net (NOTE most classes won't have a net)	Capturing fish and removing mortalities
Uniodized, freshwater aquarium salt	Reduce fungal and harmful bacterial growth
Insulation	Insulates the tank and maintains darkness until fry are released; also conserves energy
Power bar (GFCI - water fail-safe)	Powers the components
Water Pump, hoses (2), and clamps (3)	For pumped-water chillers only

Part B. Maintenance and Monitoring:

1. Explain the importance of proper monitoring of the classroom hatchery unit. A missed problem could result in substantial mortality in your classroom hatchery. Common issues are:
    a. **Temperature**: ensure that you check daily that the temperature remains at 4°C until instructed otherwise in preparation for the release.
        i. Too high – this results in a faster development of young fish. If the fish develop too fast they will use up their yolk sacs (their only nourishment when they are in the aquarium) too soon.
        ii. Temperature too low – this results in under-developed fish that are more delicate and not ready for stream life on release day.
    b. **Screen on intake of water filter missing or has gaps**: fish can get into the filter area and may die. If this happens check in the filter for any fish. Some units have a mesh screen while others have a slotted end piece on the filter intake.
    c. **No aeration:** air pump has stopped working or hose has come off; fish can suffocate. Functioning aeration is verified by the presence of bubbles coming out of the air stone.
    d. **No filtration:** filter has lost power or there is insufficient water in the reservoir or it has become clogged; water quality will be reduced. Functioning filtration is verified by water flowing out of filter like a waterfall.

Part C.

1. Post the "Lake Ontario Atlantic Salmon Classroom Hatchery" sheet by the hatchery unit and fill out as a class as data are obtained.
2. Introduce the students to the "Classroom Hatchery Daily Checksheet" below.
3. Print off 5-6 sheets (one for each month you will have the hatchery unit) and put sheets on clipboard and leave them near the hatchery unit.
4. Assign groups of 3 for each day to complete the daily checks and fill in the check list, assisting where needed. Instruct the students to notify you immediately if anything is not functioning or if the temperature has changed.
5. Double check the unit to make sure that nothing was missed.

Lake Ontario Atlantic Salmon

Classroom Hatchery

School Name:_____

Year:_____

Date of Tank Setup_____

Water Added		Salt Added	
Date	**Amount**	**Date**	**Amount**

Date of Egg Delivery:	**# of Eggs Delivered:**

Date Range Egg Hatching:	**# of Eggs Hatched:**
Date of Release From Condo:	**# of Undeveloped Eggs:**

Date of Release in Stream:	**# of Fish Released:**
Location of Release:	**Stream Name:**

Classroom Hatchery Daily Checks

Month/Year:

Date	Time	Temp °C	Functioning		Filter Screen Intact Y/N	Insulation Intact Y/N	# Dead Fish	Checked By: Initials
			Aerator Y/N	Filter Y/N				

NOTES:

Class size:	Unlimited
Setting:	Classroom
Time:	30-60 Minutes

Grade 2 Classroom Hatchery Activities

Lesson 2: Label To Learn Life Cycle

Lesson Objectives:

- Familiarize students with the life cycle of the Atlantic Salmon
- Assist students in recognizing and spelling words associated with the Atlantic Salmon life cycle

Materials:

- Printed Copies of "Life Cycle of the Atlantic Salmon" worksheet (found below – 1 per student)
- Projector and computer with access to YouTube

Background:

What came first, the Atlantic Salmon adult or the egg?

Like all living creatures, Atlantic Salmon go through a ***life cycle***. The life cycle of a Lake Ontario Atlantic Salmon begins in a coldwater stream connected to Lake Ontario. In October or November the female deposits between 2,000 and 8,000 ***eggs*** in a shallow gravel depression known as a 'redd' and the male fertilizes the eggs. The eggs start to develop, and eventually the eyes become visible; this is referred to as the ***eyed egg*** stage. In January/February the eyed eggs hatch and the tiny fish hide in the gravel and survive by absorbing proteins from their yolk sacs; this is the ***alevin*** stage. In May, corresponding with warming temperatures (which increases the abundance of tiny invertebrates - the Atlantic Salmon's prey), the yolk sacs are used up and the small fish, now called ***fry***, move into deeper water to hunt for food. The fry grow throughout the summer and develop dark vertical marks on their sides, called parr marks; at this stage they are called ***parr.*** Parr will live in the stream for 1-3 years before becoming ***smolts***. In this stage they lose the parr marks and become the silvery colour of the adult. The smolts head downstream and enter the lake where they hunt for fish and grow into ***adults***. After one to three years in the lake, the adults begin the journey that guides them back to their birth site. As juveniles the salmon imprinted on the unique odours of their home streams. The returning adults use their sense of smell to guide them upstream to where they hatched, and this is where they will spawn and the life cycle repeats. The adult Atlantic Salmon will return to the lake after spawning and will often live to spawn for several years - which is different from many other species of salmon that die after spawning.

Teaching and Learning Sequence

Part A. Share this **Cool Atlantic Salmon Fact:** *The largest Atlantic Salmon ever caught was 174 cm long. How tall is your teacher? How tall are you?*

Part B. Define **Life Cycle** = *the series of changes that an organism goes through as it grows, reproduces and eventually dies.*

Ask these **Guiding Questions** for the students to discuss as a group:

1. What is the life cycle of a tree? (seed, seedling, sapling, mature tree, flowering/seed producing tree...)
2. What is the life cycle of a human? (egg, fetus, baby, toddler, child, teen, adult, mom/dad…)

Part C. Distribute the worksheets and have the students attempt to complete them while you stream the videos below. When the videos are finished, take up the worksheet as a group. If time allows the students can colour the diagram.

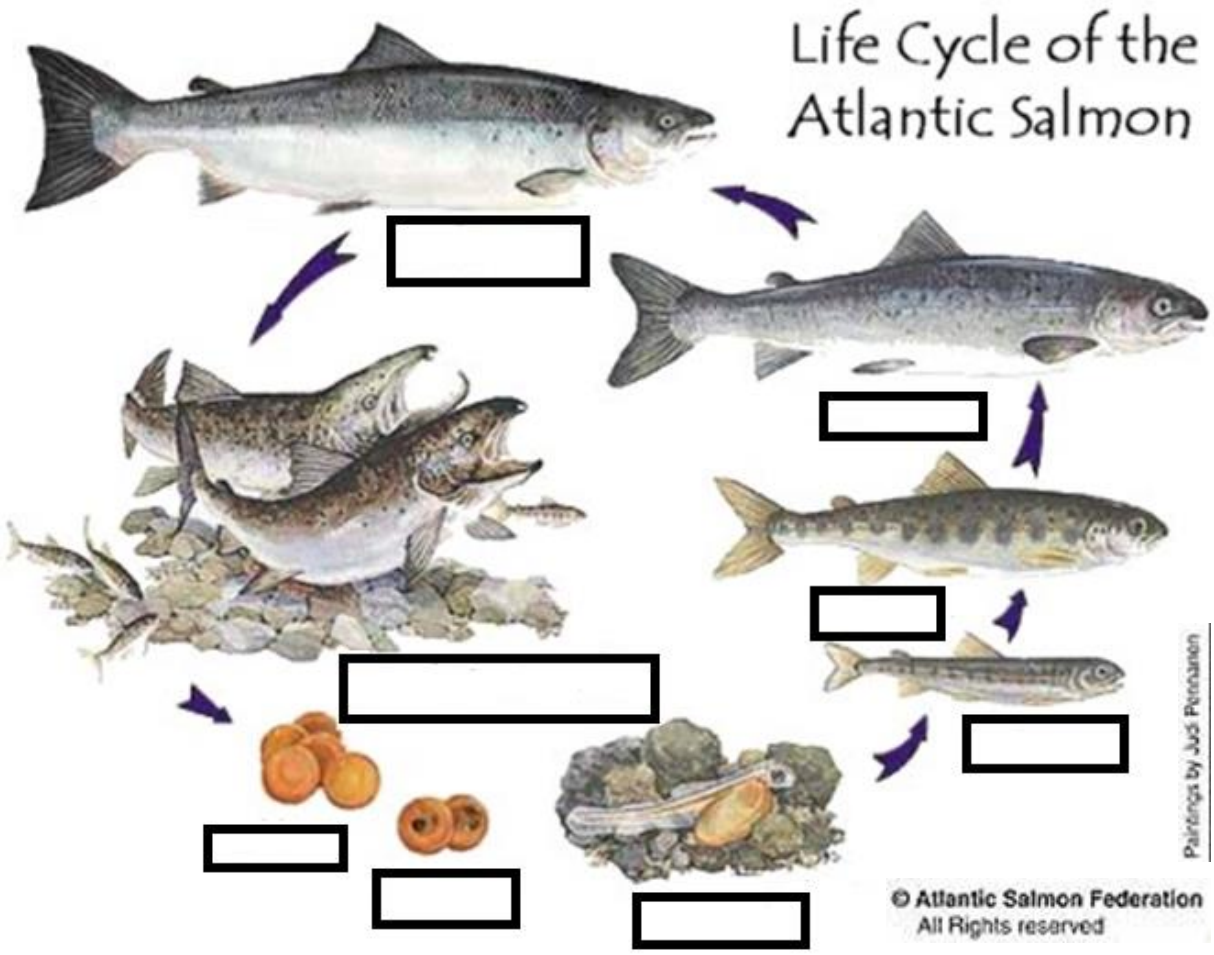
- The Life Cycle of the Atlantic Salmon (animation – 5 minutes) https://www.youtube.com/watch?v=2fGLzEvWuYA
- To The Journey's End: The Lifecycle of the Atlantic Salmon (31 minutes) https://www.youtube.com/watch?v=65EfIjADGSc&t=1077s

Part D. Ask these **Reflection Questions** (can be done as a Think, Pair, Share):

1. What happens if a life stage is removed?
2. Is a life cycle a straight line or a circle? (You want them to get the idea that life is a continuous cycle of birth, growth, reproduction.)

Name:

Using the words at the bottom of the page label the diagram below.



SPAWNING IN A REDD	ALEVIN	SMOLT	EGG
EYED EGG	PARR	FRY	ADULT

Class size:	Unlimited
Setting:	Classroom
Time:	50-60 Minutes

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Grade 2 Classroom Hatchery Activities

Lesson 3: Atlantic Salmon Artists

Lesson Objectives:

- Familiarize students with the identification of Atlantic Salmon
- Familiarize students with basic fish biology, identification, and terminology
- Assist students in recognizing the value of proper species identification

Materials:

- Projector connected to computer or printed presentation (found below)
- Blank paper (1 sheet for each student)
- Pencils and pencil crayons (enough for all the students)

Background

Ontario is home to nearly 150 fish species, 129 of which are native. Proper identification of individual species is useful for monitoring (species presence and location, population size, fish health, etc), and for managing and complying with fishing regulations. Identification can help us to connect deeper with a species as we start to see patterns and understand more about their life stories. It can also be a lot of fun!

Fish, just like all other animals, plants, and fungi, have unique physical characteristics that distinguish one species from another. Size, colouration, shape, and presence or absence of particular features are some of these characteristics. Atlantic Salmon, like all salmon, have an adipose fin (the small fin on the back of the fish just in front of the tail) and a soft dorsal fin. The Atlantic Salmon has dark spots on a lighter coloured body, only 2- 3 large spots on the gill cover, a mouth that stops at the eye, and a long narrow caudal peduncle (the part that connects the body to the tail fin). These characteristics are shown in the presentation below.

It is important that anglers can properly identify Atlantic Salmon so they can follow fishing regulations. Anglers with proper identification skills can be valuable citizen scientists and contribute to monitoring efforts.

Teaching and Learning Sequence

Part A. Share this **Cool Atlantic Salmon Fact:** *Atlantic salmon are known as the "leaper". They can jump out of the water 3 metres high! That is as high as a basketball net!!*

Part B. Ask these **Guiding Questions:**

1. Has anyone ever seen an Atlantic Salmon? (They may have seen them in the grocery store – all of those fish are farmed!)
2. How might you tell the difference between an Atlantic Salmon and another fish?

Part C. Present **"Basic Fish ID"** (on a projector screen or print/display to class).:

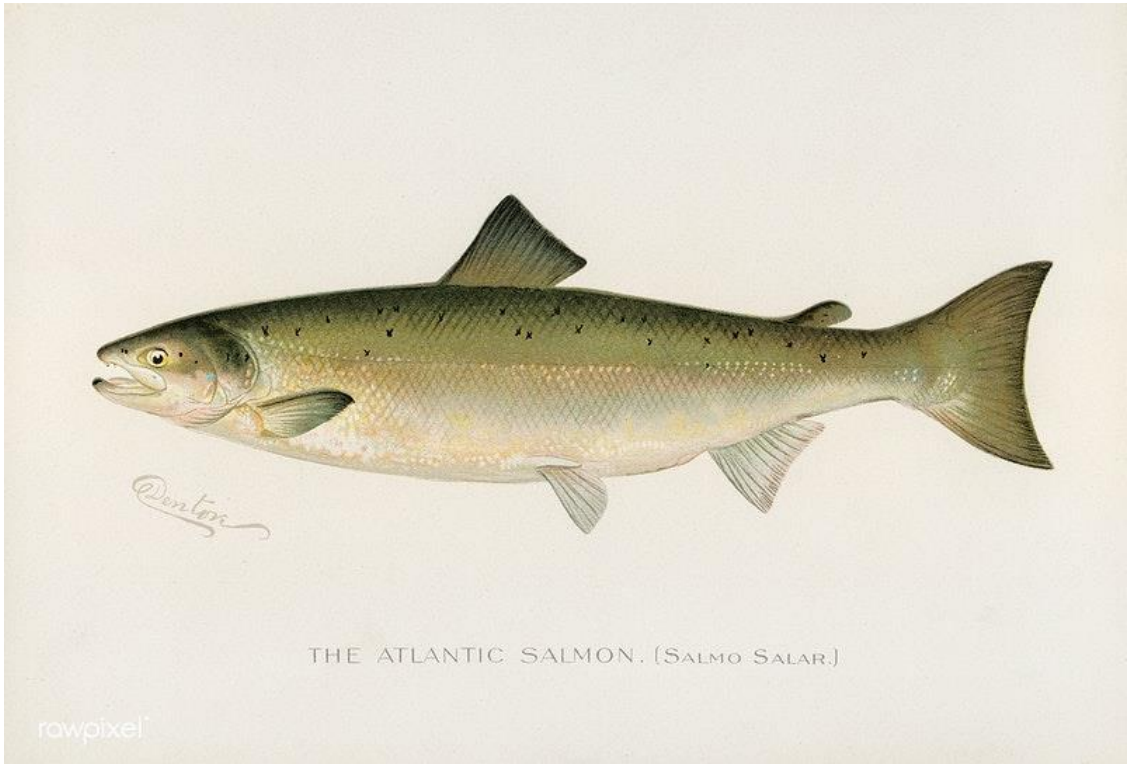
1. Page 1 of Presentation: Allow time for the students to talk about what they see. You are not looking for specific answers; rather, you are engaging their observation skills.
2. Ask the students how a fish breathes. Point out and define the ***gills*** = *the breathing organ of fish and some other animals used to extract oxygen from water.*
3. Page 2- 4: Show the 1 or 2 characteristics identified on each fish. This can be done quickly and is intended to show the students some of the main physical differences between fish. Atlantic Salmon as our focal fish has more characteristics identified.
4. Page 5 shows the fins of the Atlantic Salmon. The presence of these fins are characteristic of all the salmon species. Point out and define the ***adipose fin =*** *A small fleshy fin just in front of the tail. Found on only a small number of fish species including salmon*.
5. Supply students with blank paper, pencils, and pencil crayons.
6. While displaying "**Draw an Atlantic Salmon",** have the students go step by step through the activity.
7. The students can now colour the fish and the background if they choose. For an Atlantic Salmon in the lake the colour of the back can be brown, blue, or green; the sides are silvery and the belly is white. When the fish leaves the lake to enter streams to spawn they lose their silvery colour, becoming darker, and may develop red spots. They can also name their fish and use this name for the fish they release in the spring!

Part D. Ask these **Reflection Questions** (can be done as a Think, Pair, Share):

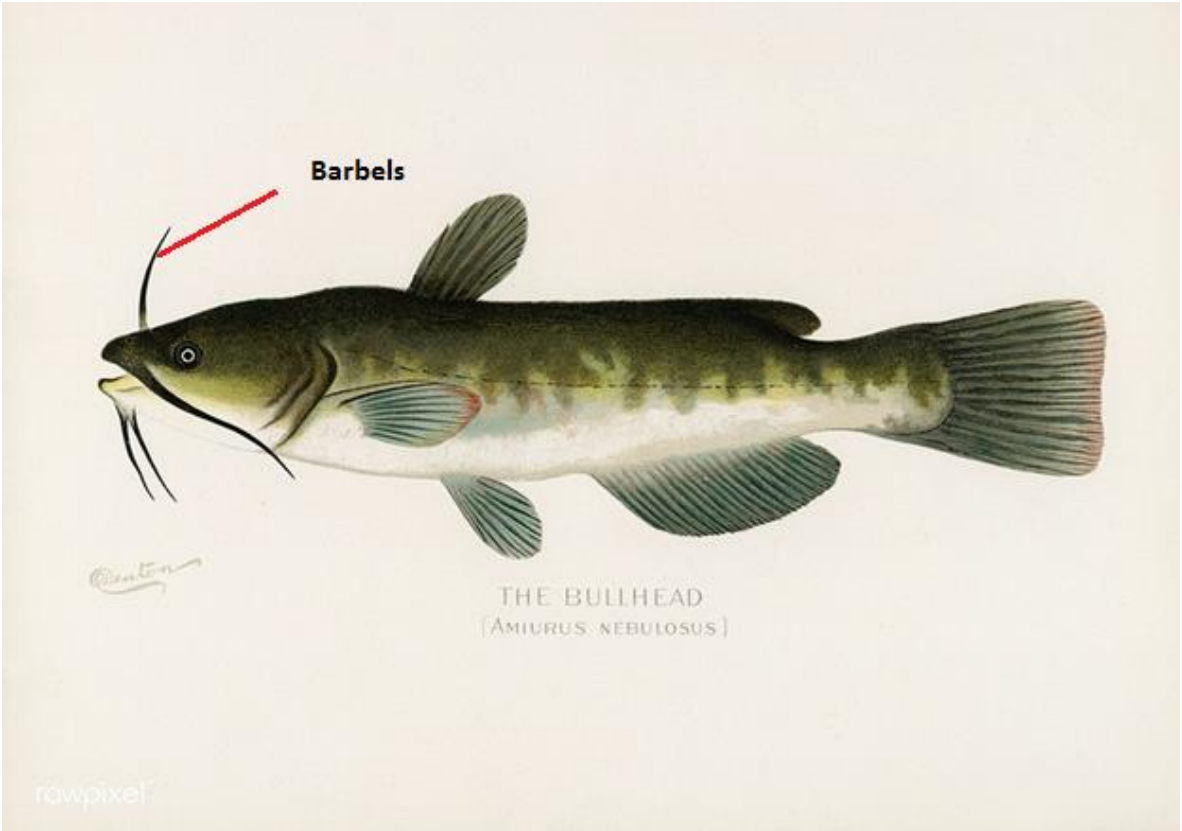
1. Why is the proper identification of fish important?
2. Name some identifying characteristics of an adult Atlantic Salmon.

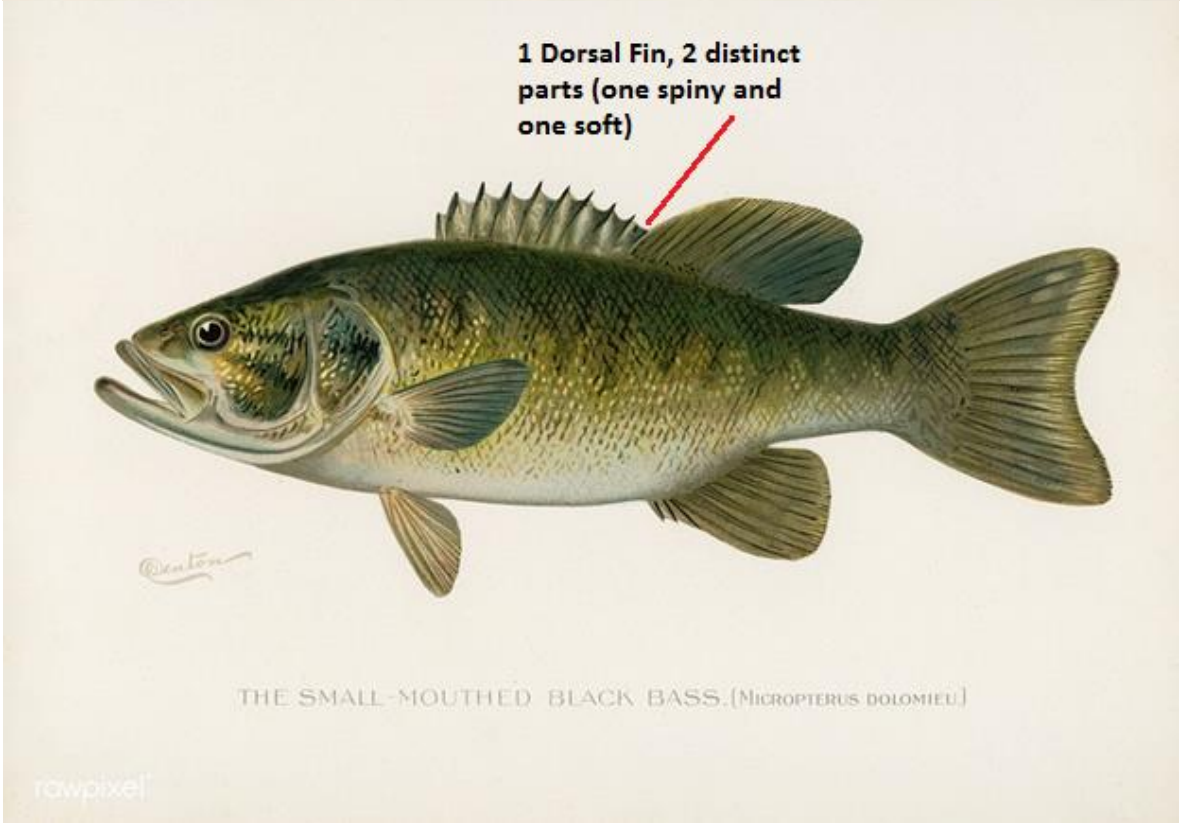
Presentation: Basic Fish Identification

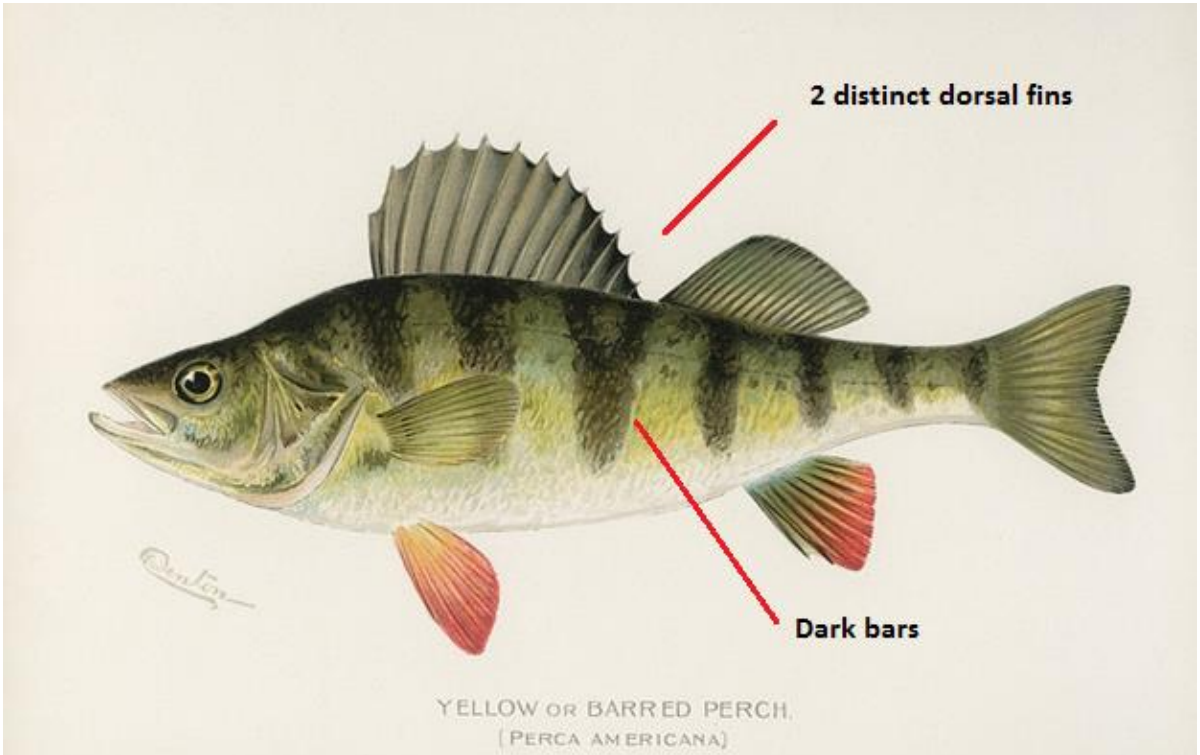
What Differences Do You See?



Some Basic Physical Characteristic Differences

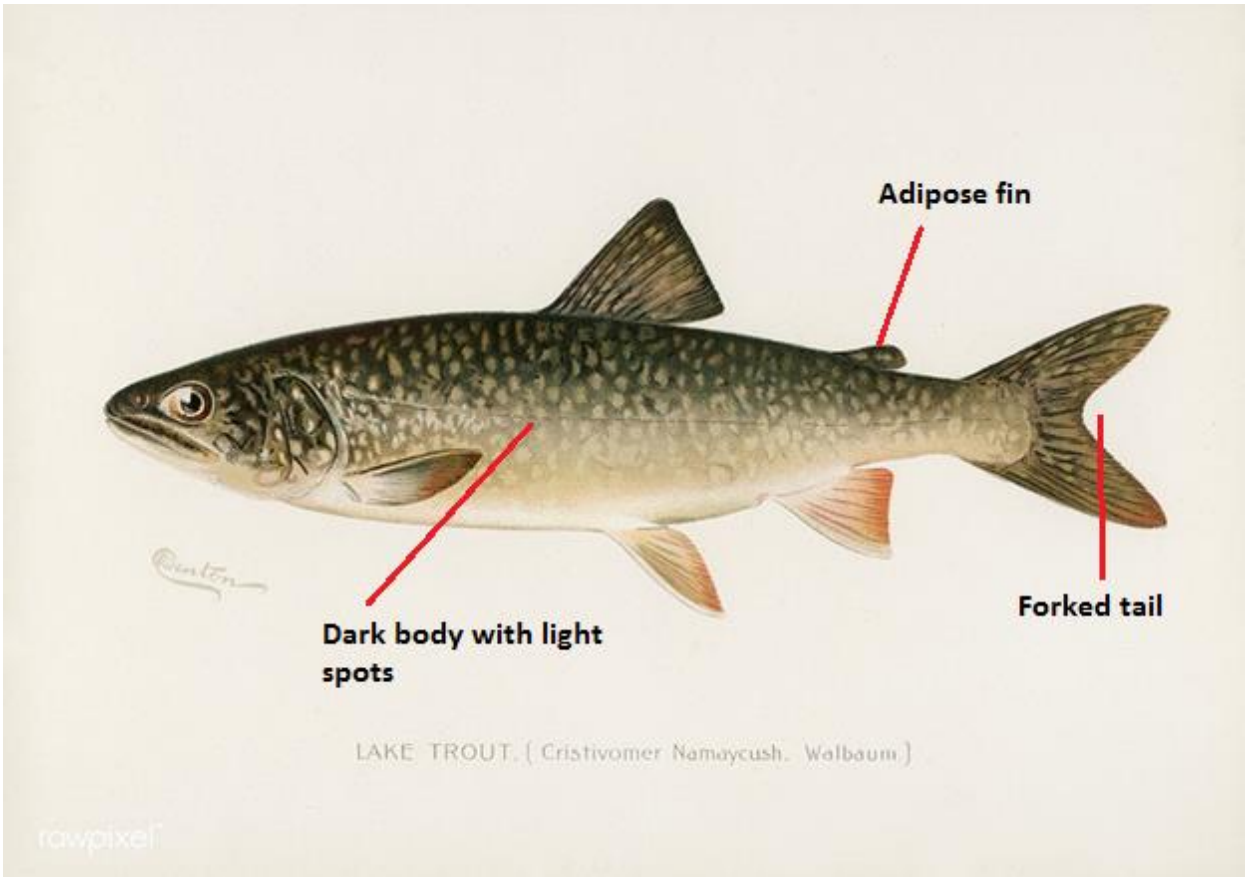


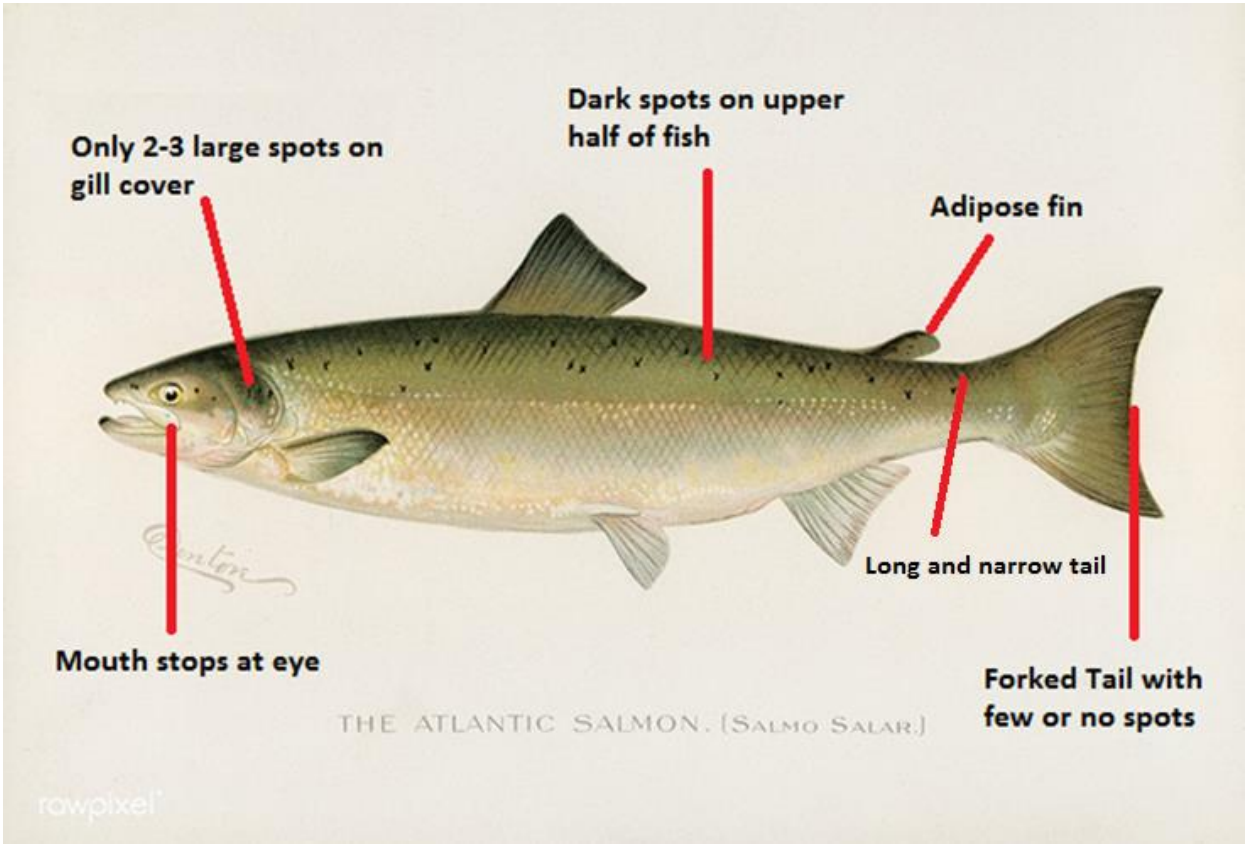




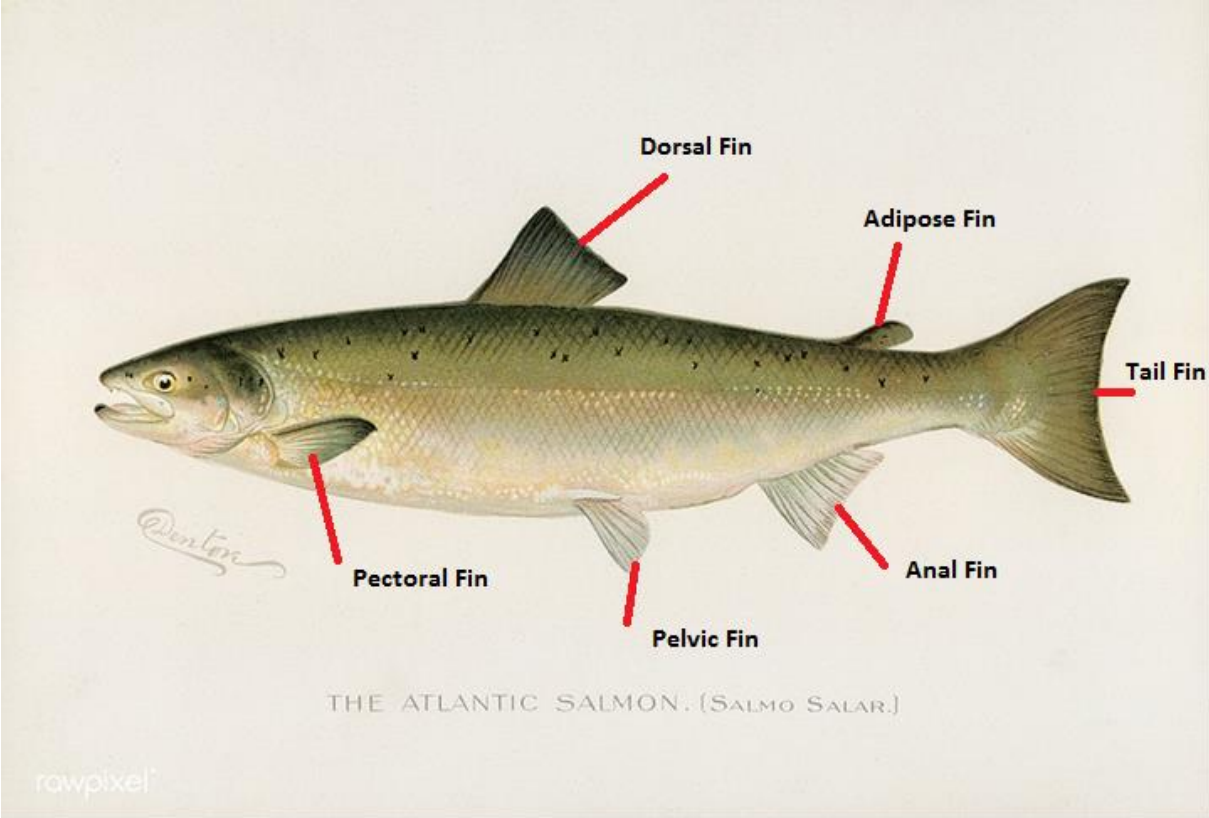
YELLOW OR BARRED PERCH.
[PERCA AMERICANA]

THE PIKE. [Lucios Lucius: L.]


Adipose fin
Forked tail
Dark body with light spots
LAKE TROUT. [Cristivomer Namaycush. Walbaum.]


Only 2-3 large spots on gill cover
Dark spots on upper half of fish
Adipose fin
Long and narrow tail
Mouth stops at eye
Forked Tail with few or no spots
THE ATLANTIC SALMON. [SALMO SALAR.]

Fins of a Salmon

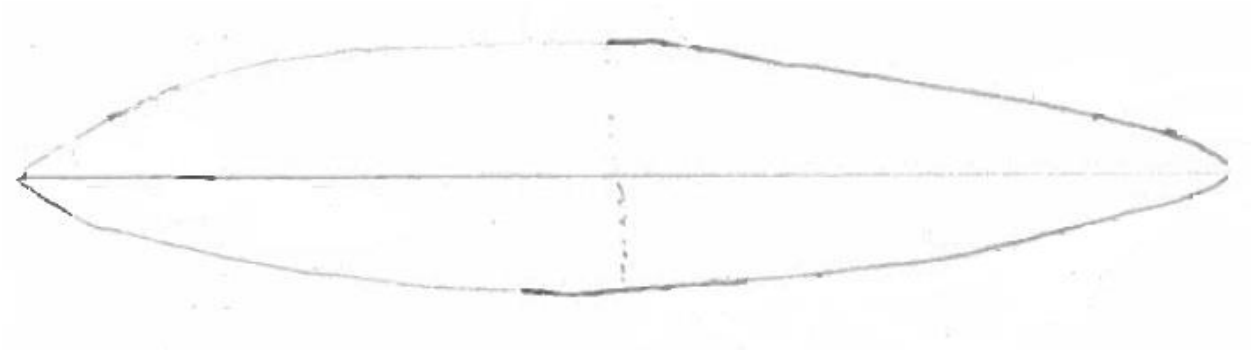


Fish Illustrations from Game Birds and Fishes of North America; illustrated by Sherman F. Denton (1856–1937)

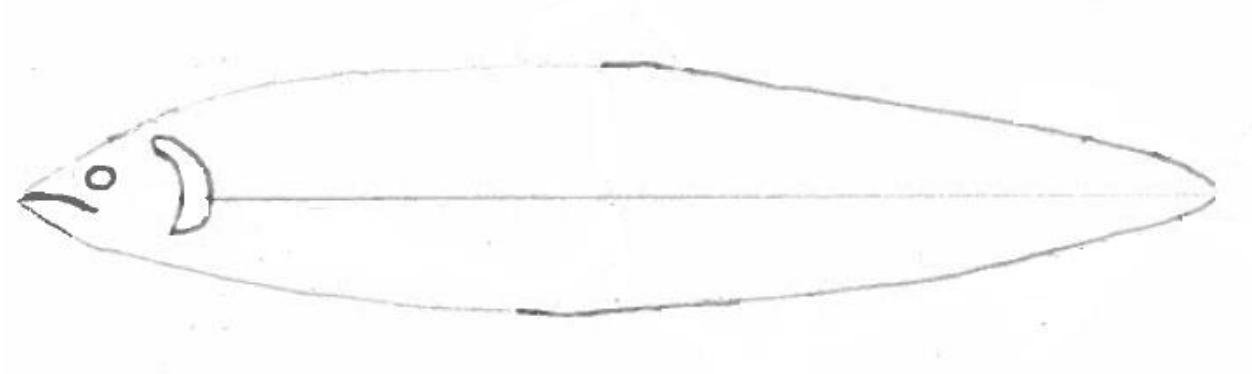
Draw an Atlantic Salmon

Step 1: Draw a straight horizontal line. This is called the lateral line.

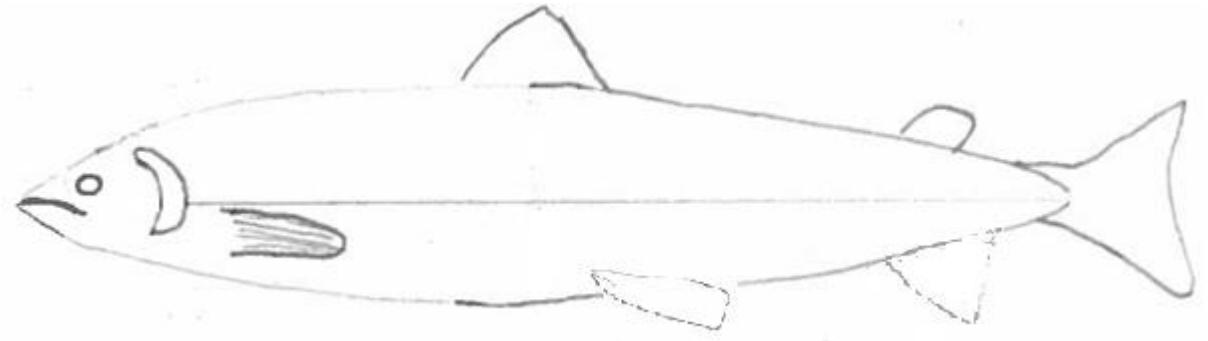
Step 2: Draw arches on the top and bottom of the line.



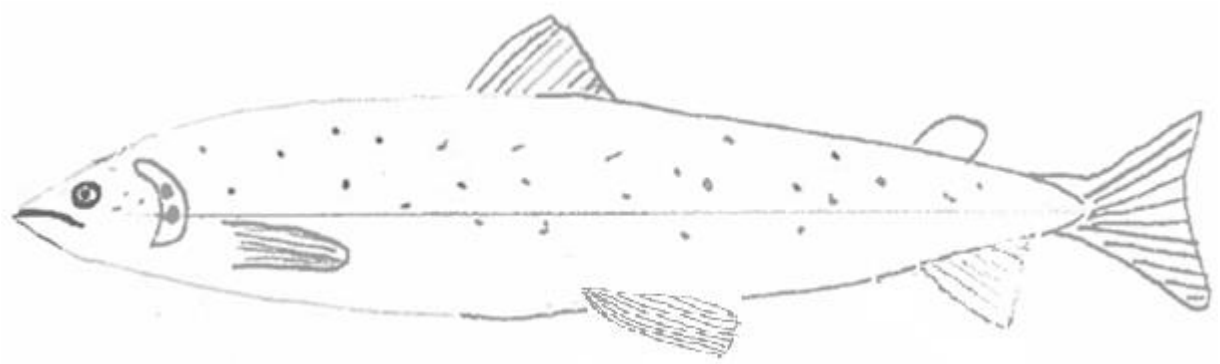
Step 3: Add the gill cover (crescent shape), eye, and mouth. The mouth does not go past the eye!



Step 4: Draw the pectoral, pelvic, tail, adipose, and dorsal fins. The tail is slightly forked.



Step 5: Add 2-3 dots on the gill cover. Add dots (sometimes dots are x shaped) above the lateral line and a few below.



Step 6: Colour and display your fish!

Class size:	Unlimited
Setting:	Outdoors
Time:	60-120 Minutes

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Grade 2 Classroom Hatchery Activities

Lesson 4: Soil Scientists

Lesson Objectives:

- Demonstrate the difference in rates that water infiltrates into compacted soils versus not compacted soils
- Have the students participate in easy data recording
- Have the students illustrate the data collected in a simple bar graph

Materials:

- Soup can with both ends removed (note that a lot of cans have a rounded bottom that is difficult to remove - find a can that has a flat bottom)
- Permanent marker
- Wooden board 4”-6” x 9”-12”
- Mallet or hammer
- Stop watch
- Hand out (below)
- Pencils
- Rulers
- Pencil crayons or markers (optional)
- Long flat headed screwdriver or a pin flag
- 2L of water
- Measuring cup greater than 200ml

Background:

Soil infiltration refers to the ability of the soil to allow water to enter it. Water soaks into the soil and can be stored or move through it. This stored water is available for organisms such as plants to uptake and utilize.

Soil infiltration is influenced by many different factors including:

- Soil texture: coarser soil like stone or sand will allow water to move through quicker than fine soils like silt or clay because larger soil particles have larger spaces in between them;
- Soil moisture: if the soil is very wet to start with it will have less ability to absorb additional water;
- Soil temperature: frozen soils impede the absorption of water;
- Soil compactness: compacted soil impedes the absorption of water;
- Vegetation abundance and type: roots uptake the water causing greater infiltration.

Why is it important? The water absorbed into the soil is available to soil organisms and plants. Water that does not get absorbed into the soil runs off the land into local waterways, or evaporates. As it does this, it can transport pollutants from the land into the water. On a hot summer day in the city, rain water lands on the hot concrete and asphalt surfaces and warms up. If this water enters storm water services or washes into creeks and rivers it will warm the waterway – which is not good for coldwater fish like Atlantic Salmon.

Excess runoff can also lead to flooding both in the area where it is raining and in areas downstream.

Soil compaction from vehicle and foot traffic can greatly influence the infiltration rate. When soil particles are compacted, the air spaces between the particles are reduced, resulting in less infiltration and greater runoff. Compaction can also limit a plant's ability to establish root systems. If roots do get established they can help to reduce the amount of compaction in the soil by loosening the soils with the growth of the roots.

People are drawn to the edge of water, be it for launching boats, fishing, collecting water, washing, or aesthetics. Trails are often deliberately created or are formed by repeat foot traffic at the edge of waterways. The soil can be covered up with a hard surface or it becomes compacted, limiting the ability of vegetation to grow. It is important for trail designers and land managers to consider and balance people's desire to access the waterway with the protection of the natural features and function of the waterway. An example of this can be to have a trail away from the water's edge with small offshoots to access points and popular fishing locations.

Teaching and Learning Sequence

Part A. Share the information in the background and help the students to understand the language and context. Create a MIND MAP up on the board (put the word INFILTRATE in the middle – in a bubble – and draw lines out from the bubble with ideas on what the kids think INFILTRATE means).

Part B.

1. Select a spot for **SITE A.** This should be a place under heavy foot traffic but that still has a "dirt" based soil. A good spot may be located in an opening of a fence where students pass through from the school building into a play area.
2. Select a spot for **SITE B** with looser soils such as in a garden or in a wooded area off the beaten path.
3. Select **SITE C** right next to a large tree trunk where there is not much foot traffic.
4. Measure and mark a ring 1" from the bottom of the soup can.

Part C.

1. Distribute the hand out (below), one per student.
2. Have the students bring pencils and something to put the handout on so they can enter data (a binder or clipboard).
3. Instruct the students to record their name and date on the sheet.
4. Go to **Site A** and describe the location (i.e. path, garden, or tree).
5. Use the screwdriver or pin flag to demonstrate how hard and compacted the soil is.
6. Have the students predict how quickly water will soak into the soil.
7. Place the can on the ground and hold the wood onto the top of the can. Use the mallet to drive the can into the ground until it reaches the marked line.
8. Measure out 200ml of water.
9. Have a student operate the stop watch while pouring the water quickly into the can.
10. Time how long it takes for the water to enter the soil (no pooling on top).
11. The students record the time.
12. Repeat steps 4-11 for each of the sites.
13. Stop at an area that is cement or pavement and ask the students what happens to rain water on this surface? You can pour out the remainder of your water to demonstrate how none of it soaks in.
14. Return to the classroom.
15. Decide the scale of the time portion of the bar graph.
16. Instruct the students to create bar graphs with the data collected.

Part D. Ask these **Reflection Questions** (can be done as a Think, Pair, Share):

1. If you drive a vehicle on vegetated surfaces how does this affect the soil? (Answer: the soil can become compacted and the water will not infiltrate as easily.)
2. You are the trail keeper at a busy park. The most popular trail is the trail by the river. Because SO many people love to hike to the river, the soil is compacted and the plants are trampled. As the trail keeper, think of ways that people can still hike to the river, but not pack down the soil or trample the vegetation. What could you build? How would you build it?

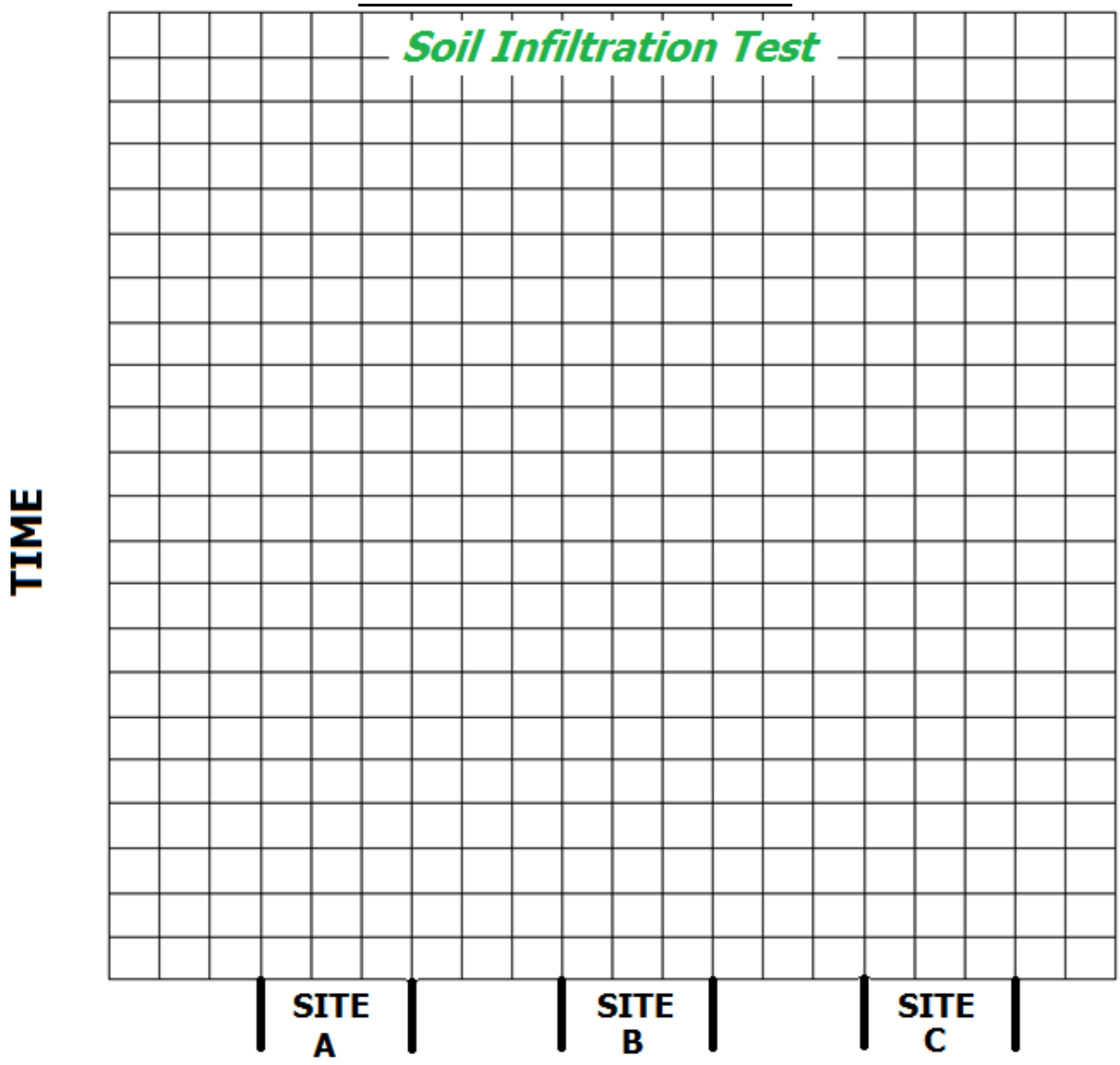
Soil Infiltration Data Sheet

Student Name:_____

Date: _____

	SITE A	SITE B	SITE C
Location Description			
Infiltration Time			

Soil Infiltration Data Sheet



Setting: Classroom
Time: 1 Hour

Grade 2 Classroom Hatchery Activities

Lesson 5: Help the Atlantic Salmon Group Discussion

Lesson Objectives:

- Have the students participate and practice respectful discussion and decision making
- Reinforce learnings that students have received during the hatchery program

Materials:

- Hand out (below)
- Lined paper
- Pens, pencils, markers

Background:

Human activity has changed the world and some of these changes have resulted in severe ecological degradation.

When European explorers first arrived in the Lake Ontario region the rivers were teeming with Atlantic Salmon. These fish had arrived around 11,000 years earlier. The explorers met Indigenous Peoples who had been living in the area for thousands of years. These people had developed deep and important relationships with the land, waters, and other living things where they lived, fished, and hunted. They were active members of the ecological communities that surrounded them. They took care of the environment that took care of them.

Accompanying the explorers were a number of diseases and viruses that were foreign to the Indigenous Peoples. This, combined with wars that followed the Europeans to the New World, resulted in a large decline in the population of Indigenous Peoples in the region. European settlements started to establish in what is now Ontario in the mid-1700s. Major waves of immigration flooded into the area in the late 1700s/early 1800s. Many of the new settlers did not have the relationship with the natural environment that the Indigenous Peoples had. Large changes to the health of the land and water started to happen quickly. Forests were cut for timber, heating, cooking, and to make room for farming and dwellings. The deforestation removed habitat for terrestrial wildlife, warmed streams, and allowed soil to wash from the land into the waterways.

During the 1700s the Industrial Revolution brought in a new era of manufacturing of textiles and lumber products. To power this manufacturing, mills were built along the rivers to utilize the power of the moving water to turn the mills. Dams were built to facilitate the mills. The dams caused further warming of the water and created barriers to the movement of fish. Many Atlantic Salmon were cut off from their spawning grounds.

The abundance of fish (and wildlife, and trees) led to a mindset that the natural resources of the Americas were inexhaustible. Within a time span of 100 years, animal populations plummeted; some species disappeared completely. Atlantic Salmon disappeared from Lake Ontario in the late 1800s.

Deforestation, dams, pollution, and overfishing resulted in the extirpation (local extinction) of Atlantic Salmon from Lake Ontario. However, human impacts on the environment need not only be negative. With awareness and a desire to make things better we can restore the health and integrity of the world around us. This has many benefits for humans and for the wide range of biodiversity that we share this planet with. We can restore our deep relationship with the natural world and become good caretakers of the environment that takes care of us – all of our food, drinking water, clothing, building materials, and all other products ultimately come from the earth!

Environmental stewardship means taking care of the environment. Author and wildlife ecologist Aldo Leopold coined the phrase "land ethic" which states that humans have a moral responsibility to care for nature. Environmental stewardship and restoration ecology are critical pieces of the project to bring back Atlantic Salmon.

Good environmental stewardship involves becoming a positive member of the ecological community and has benefits for the environment and for the steward. The health of habitats can be improved to help support greater biodiversity and abundance. Humans benefit from healthier water, food, and air; increased and improved recreational opportunities; and on an individual level from a sense of accomplishment, involvement, self-worth, purpose and belonging.

Teaching and Learning Sequence

Part A. Share the information in the background and help the students to understand the language and context.

Part B.

1. Break the class into 5 groups
2. Give each group a copy of the questions below

Part C.

1. Read the first question and allow time for the groups to collectively answer on the worksheet
2. Repeat for each question allowing additional time for questions 3, 4, and 5
3. Once all groups are done take up the questions as a class having the groups share their answers

Discussion Questions

Student Names:_____

_____

_____

1. Fish breathe (circle one): Air; Water; Oxygen in Water; Sunlight

2. Atlantic Salmon like to live in hot water. True or False: _____

3. Name one thing that Atlantic Salmon need to survive:
   _____

4. Name one thing that caused Atlantic Salmon to disappear from Lake Ontario: _____

5. Name one way that you can help Atlantic Salmon: _____

Class size:	Unlimited
Setting:	Outdoors
Time:	1 Hour

Grade 2 Classroom Hatchery Activities

Lesson 6: Survive to Smolt

Lesson Objectives:

- Connect students with the predator-prey community that Lake Ontario Atlantic Salmon live with
- Familiarize students with food webs
- Assist students in participating in a dynamic and active game developing personal and interpersonal skills

Materials:

- Scrunchies or pinnies to visually distinguish between 3 groups of students
- 10 aluminum pie plates

Background

Adult Lake Ontario Atlantic Salmon live in the open waters of Lake Ontario. In the fall they travel up streams to spawn and lay eggs. In doing so they bring nutrients from the lake ecosystem into the stream ecosystem in the form of eggs that they lay in the stream spawning beds. These eggs may become food for a variety of animals in the stream. Eggs that survive hatch into juvenile salmon. Juveniles may become predated on by different fish, mammals, birds, and reptiles. The juvenile salmon develop "parr" marks (short vertical stripes) on their sides which helps to camouflage them from predators.

The growing juveniles depend on aquatic invertebrates as a food source. If they survive to become smolts they migrate downstream to the lake. Smolts lose their parr marks and develop the silvery colour of an adult. As they gain size there are fewer animals capable of predating on them, especially when the fish are in deep water away from aerial predators such as osprey and bald eagles. When the adults return to the streams to spawn they are more exposed to predation from mammals such as otters. Where tree cover is sparse, aerial predators like the osprey and bald eagle may take them.

Throughout their whole life, Atlantic Salmon's greatest threat comes from humans! Humans can overharvest them, and degrade and destroy their habitat.

Teaching and Learning Sequence

Part A. Share this **quote** "When we try to pick out anything by itself, we find it hitched to everything else in the Universe." John Muir, Naturalist and Author.

Part B. Ask these **Guiding Questions**

1. What does the above quote mean? Are you part of this connection? How?
2. What is prey? What is a predator? Name some species. Can they be both?

Part C.

1. Select an activity area. An area (50mx100m – 100mx100m) of open or lightly forested area is ideal; however a gym can also be used. Prior to class explore the area to ensure that it is free of hazards such as sharps and toxic plants. Identify any tripping hazards. Also be aware of areas that may be habitat for ticks.
2. Making sure the students are appropriately dressed for the conditions proceed to the play area. Point out tripping and other hazards.
3. Describe the habitat, predator, and prey relationship of the Atlantic Salmon from the background section.
4. Designate one end of the area as the lake and place the pie plates at the other end.
5. Explain the instructions of the game as described below.
    a. Divide the students into the following groups: aquatic invertebrates; juvenile salmon; adult bass. Assign more students as invertebrates, reducing the numbers through each group to bass (eg. 15 invertebrates, 9 salmon, 2 bass).
    b. Have each group start at different areas of the play area. The bass are hunting (tagging) juvenile salmon. The juvenile salmon will be hunting aquatic invertebrates (inverts). When a juvenile salmon tags 2 inverts they grab a pie plate and shout out "smolt". They then try to survive (not get tagged by a bass) as they migrate to the lake. Tagged inverts and salmon move out of the play area for the rest of the round. Use the scrunchies or pinnies to differentiate the groups.
    c. Play until all students have either been tagged or have smolted. Play multiple rounds.

Part D. Ask these **Reflection Questions** (can be done as a Think, Pair, Share):

1. Why do the smolts turn silvery? (Answer: for camouflage in the lake.)
2. What would happen if the aquatic invertebrates were removed? (Answer: no food for juvenile salmon which would result in no salmon which would result in no bass.)
3. How do humans impact the stream? The lake? How does this affect the aquatic invertebrates? The salmon? The bass?