DRAFT

CLASSROOM HATCHERY PROGRAM

GRADE 8 LESSON GUIDE

Made possible through funding from:

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Lesson Summaries

Lesson 1: **Program Introduction**	This lesson will introduce students to the hatchery equipment and their responsibilities in monitoring it. Students will make notes on how the equipment functions and how each piece relates to natural habitat. The students will start to create a journal about the program.	60-90 Minutes
Lesson 2: **Life Cycle and Growth**	This lesson will illustrate cell growth as it relates to the development of the classroom hatchery fish and Atlantic Salmon throughout their life cycle.	45-60 Minutes
Lesson 3: **A Salmon's Home**	Students will brainstorm their survival needs, how these are provided in their lives, and compare them to the survival needs of Atlantic Salmon.	60-90 Minutes
Lesson 4: **Wetlands – The sponge and filter**	Students will learn about the ecological importance of wetlands for water quality and quantity control through a simple experiment/demonstration.	60-90 Minutes
Lesson 5: **Where in the World**	Students will discuss the human-caused pressures that led to the extirpation of Lake Ontario Atlantic Salmon and are currently impacting global populations of Atlantic Salmon. Through a map-making exercise students will understand the geographic context of both the global range of Atlantic Salmon and their fish once released.	2.5-3 Hours
Lesson 6: **Presenting *Salmo salar***		

Class size:	Unlimited
Setting:	Classroom

Grade 8 Classroom Hatchery Activities

Lesson 1: Program Introduction

Lesson Objectives:

- Introduce the students to a journal assignment to be completed over the course of the hatchery program
- Introduce the class to the hatchery components, class responsibilities pertaining to the hatchery, 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
- Have the students create a journal entry of the hatchery equipment along with each component's function and how it relates to natural habitat

Materials:

- Classroom hatchery along with all components (listed below)
- "Lake Ontario Atlantic Salmon Classroom Hatchery" sheet (below)
- "Classroom Hatchery Daily Checks Sheet" (below – 5 copies if set up in Feb, 6 if set up in Jan)
- Blank piece of paper and pencil (for each student)
- Clipboard
- Duotang for each student
- Hatchery handout (below)

Background

The survival of your classroom hatchery fish is dependent on properly functioning hatchery equipment. If the temperature becomes too low the fish will develop too slowly and will not be ready for release into the stream. If the water temperature goes below freezing and ice develops, the aquarium tank may be damaged. Too high of a temperature will cause the fish to develop too quickly and they will use up their yolk sacs too soon and so may need to be fed prior to their release into the stream. When the fish are fed, water quality is greatly reduced, and 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 or improper setting of the temperature dial. It is imperative that if a component fails it is noticed and remedied quickly. A daily check data sheet helps to notice issues quickly.

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

Each piece of equipment completes a function that is found in the natural environment.

Equipment	Function	Natural System
Chiller	Keep the water cold	Climate; shade from trees
Tank	Hold the water	Stream/river/creek, lake/ocean
Filter	Clean the water	Wetlands, shoreline vegetation, aquatic organisms
Aerator and airstone	Add oxygen to the water	Movement of water over rocks in streams; dissolving into the water at the surface; produced

		by underwater plants during photosynthesis
Gravel	Allows eggs and small fish places to hide	Gravel in stream bottom
Thermometer	Monitor for correct temperature	N/A

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 and makes them visible as they develop into alevin and hatch
Filter with cartridge (Marineland or Aquaclear)	Cleans the water
Mesh screen held on with elastic	Prevents 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	Reduces fungal and harmful bacterial growth
Insulation	Insulates the tank to conserve energy, and maintain darkness until fry are released
Power bar (GFCI - water fail-safe)	Powers the components
Water Pump, Hoses (2), and Clamps (3)	To pump water into the external chiller. For pumped-water chillers only; coil type chillers will not have these

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 to the fish in your hatchery. Common issues are:
    a. **Temperature**: Ensure that you check daily that the temperature remains at 4°C (it may fluctuate from 3°C to 5°C) until instructed otherwise in preparation for the release.
        i. Too high – this results in the faster development of eggs and 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. 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, 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, there is insufficient water in the reservoir, or it has become clogged – water quality will be reduced. A functioning filter is verified by water flowing out of the filter like a waterfall.

Part F.

1. Post "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 Checks Sheet" below.
3. Print off 5-6 sheets (one for each month you will have the hatchery unit), 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 hatchery unit to make sure that nothing was missed.
6. Have they students make a 1 page note for their journal on each piece of the hatchery equipment. A suggested note format is to create 3 columns: one for a basic sketch of the equipment, one for its function in the hatchery, and one for its natural counterpart.

Lake Ontario Atlantic Salmon

Classroom Hatchery

School Name:_____

Year:_____

Date of Tank Set Up_____

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 ºC	Functioning Aerator Y/N	Functioning Filter Y/N	Filter Screen Intact Y/N	Insulation Intact Y/N	# Dead Fish	Checked By: Initials

NOTES:

Class size:	Unlimited
Setting:	Classroom

Grade 8 Classroom Hatchery Activities

Lesson 2: Life Cycle and Growth

Lesson Objectives:

- Introduce/reinforce students understanding of cell growth and how it relates to the life cycle of Atlantic Salmon

Materials:

- Student's Atlantic Salmon journal
- Print outs (below)
- Computer and projector connected to the internet
- Computers with internet access for students

Background

The classroom hatchery is a great opportunity for students to observe the growth of their fish from eyed eggs to alevin. We can help the students understand organisms on a cellular level by introducing them to the concept of cell division.

Prior to the eggs being delivered to your classroom they were fertilized at the hatchery and started to develop. This generally takes place in November. Atlantic Salmon, like nearly all fish, reproduce sexually where a sperm formed in the testes of the male fish is fused with an egg from the female. At the point of fertilization the egg is a single cell. It begins to grow and divide into a multicellular organism through the process of cell division.

Like all organisms, Atlantic salmon go through a ***life cycle***. The life cycle of a Lake Ontario Atlantic Salmon begins in a cold-water 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 food) 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 other species of salmon that die after spawning.

Teaching and Learning Sequence

Part A. From that tiny little egg in the condo, an Atlantic Salmon will develop that will be over 50cm long! In fact, the largest Atlantic Salmon ever caught was 174cm long! These fish can reach this size in 5-10 years.

Part B. Ask these Guiding Questions:

1. How do Atlantic Salmon and other organisms grow? (Cell division)
2. What do you know about cells?

Part C.

1. Provide the students with the worksheets below and have them watch the video below filling in the "Cells" part of the worksheet.

Video: Introduction to Cells: The Grand Cell Tour (9 minutes)
https://www.youtube.com/watch?v=8IlzKri08kk&list=PLwL0Myd7Dk1HR9u5jw19E1_Q5u25PKg8v&index=3

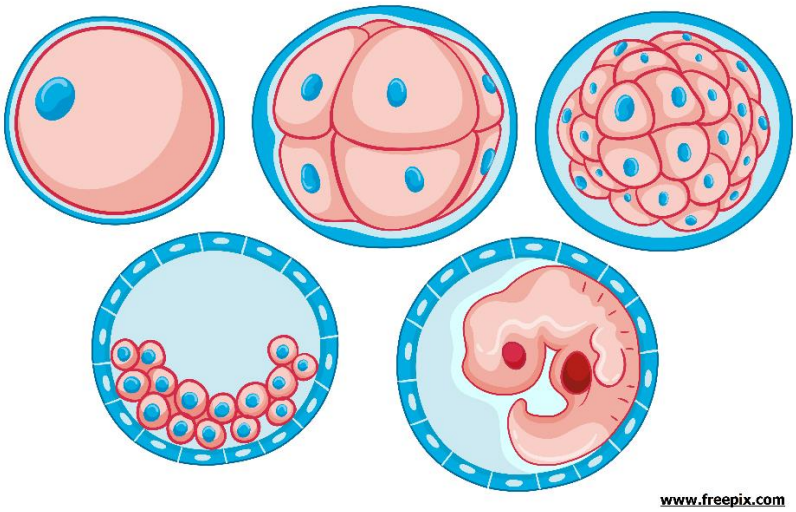
Answers: 1. cell division; 2. billions; 3. (1) living, cells, (2) building block, (3) pre-existing; 4. eucaryotes; 5. D and E; 6. nucleus; 7. D; 8. proteins

2. Optionally watch this next video that shows cells dividing.

Video: See a Salamander Grow From a Single Cell in this Incredible Time-lapse | Short Film Showcase (7 minutes)
https://www.youtube.com/watch?time_continue=384&v=SEejivHRIbE&feature=emb_logo

3. Individually or in small groups research the life cycle of Atlantic Salmon and fill in the "Life Cycle" worksheet below. There are lots of online resources readily available.
4. Take up the answers as a class before students add the worksheets to their Atlantic Salmon Journals.

Cells – The Basic Building Block of Life



1. What is the basic process that causes the fish to grow from being so small, inside the egg to being a large adult of up to 170cm? _____

2. A human body is made up of _____ of cells

3. The Cell Theory is made up of the following 3 statements: (fill in the blanks)
   (1) All _____ things are made of cells
   (2) Cells are the basic _____ of life
   (3) All cells come from _____ cells

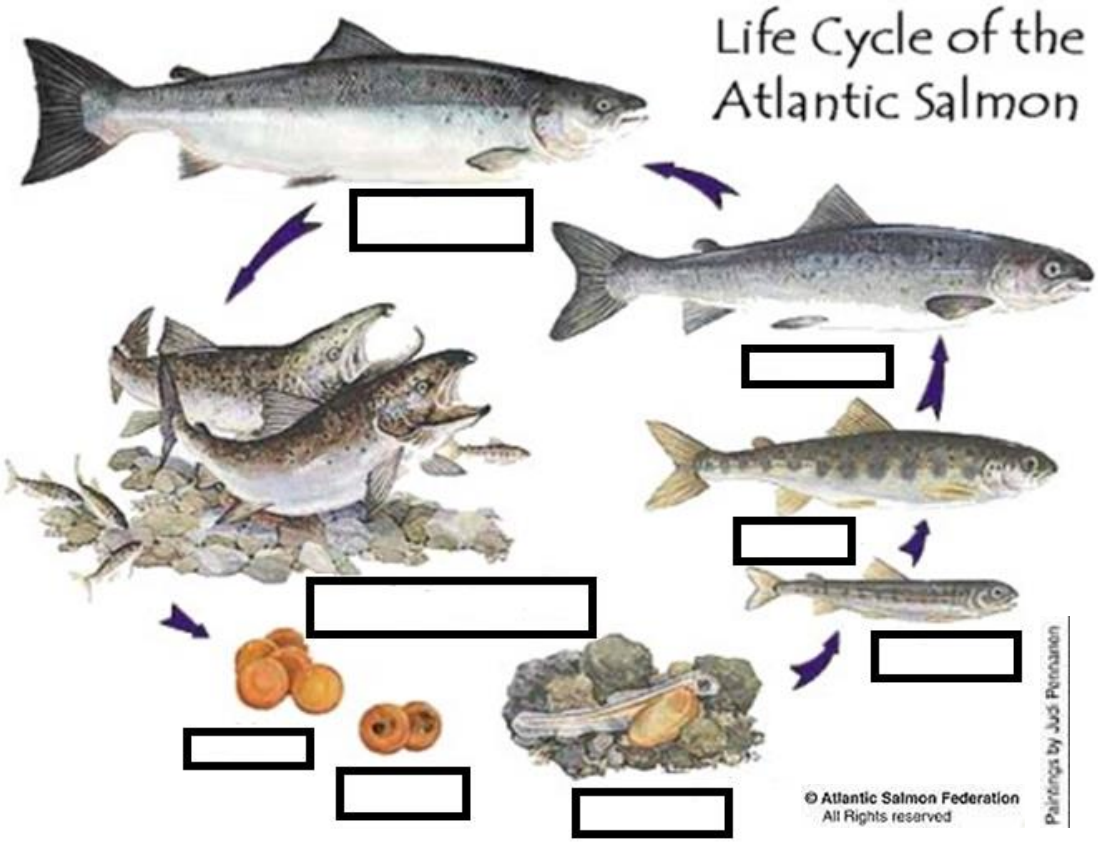
4. Are the cells in an Atlantic Salmon eucaryotes or procaryotes? (circle one)

5. Eucaryote cells lack (circle all that apply)
   A. DNA
   B. Ribosomes
   C. Cell Membrane
   D. Nucleus
   E. Membrane Bound Organelles
   F. Cytoplasm

6. In Procaryotes the cell's activities are controlled by the _____

7. The cell is powered by the (circle one)
   A. Nucleus
   B. DNA
   C. Ribosomes
   D. Mitochondria

8. Ribosomes make _____



Briefly Describe Each Stage Below:

_____: _____

_____

_____: _____

_____

_____: _____

_____

_____: _____

_____

_____: _____

_____

_____: _____

_____

_____: _____

_____

_____: _____

_____

Class size:	Unlimited
Setting:	Classroom

Grade 8 Classroom Hatchery Activities

Lesson 3: A Salmon's Home

Lesson Objectives:

- Introduce/reinforce student;s understanding of the need for healthy habitats for Atlantic Salmon to survive

Materials:

- Student's Atlantic Salmon journal
- Print outs (below)
- Blank paper and pencils

Background

If you were lost in the wilderness what are the things that you would need for survival? Folks who practice survival/bushcraft skills speak about the 4 pillars of survival: **shelter, fire, water, and food**. Of course, oxygen is needed for human survival too. Under general conditions humans can survive approximately 3 minutes without oxygen, 3 hours in extreme heat or cold, 3 days without water, and 3 weeks without food.

In our modern society most of us have these pillars provided in our homes. The structure of the home keeps out the cold, rain, heat, wind, and animals - barring the odd mouse, mosquito, and fly. Our furnaces, fireplaces, and baseboard heaters keep us warm and our stoves, ovens, and bbqs turn on with the flip of a switch for us to cook our food. Clean water comes out of our tap or is readily available in bottles at the corner store. Food is easily obtained at the local supermarket. Of course, not all members of our modern society have all of these components so easily obtainable.

What about other organisms? What are their survival needs? What about Atlantic Salmon? What is required for individual survival? And what is required for the survival of the species (i.e., a rate of reproduction equal to the death rate)?

All organisms have their own habitat needs: optimal temperature, protection from elements and predation, access to proper nutrition, and water. Lake Ontario Atlantic Salmon require 2 distinct habitats for their survival: the lake and coldwater streams. The lake is used by smolts to put on weight and become adults. The coldwater stream is used by spawning adults for the building of redds (nests in gravel) and the rearing of juvenile salmon.

In the coldwater stream eggs are laid in a redd (a nest in the gravel) where they are supplied with lots of fresh oxygenated water and are protected from predators. When the eggs hatch, alevin emerge. Alevin are tiny fish that have a yolk sac attached to their bellies. This yolk sac provides the fish with all of the necessary nutrition the alevin need to grow. They stay hidden in the rocks until the yolk sac is used up and the fish, now called fry, need to hunt for tiny invertebrates. The fry live in the stream for 1-3 years as they grow into parr and then become smolts when they swim downstream to the lake. The stream habitat needs to provide the developing fish with rocks and woody debris for shelter; adequate numbers of invertebrates for food; clean, oxygenated water; and a suitable temperature range (above freezing to mid 20°C max). Temperature and water quality are greatly influenced by the land

that surrounds the stream. Trees provide shade from the sun, helping to keep the water cool. Tree roots hold together the soil in the stream bank, helping to keep gaps between the rocks in the stream bottom for hiding eggs, small fish, and the invertebrates that the juvenile salmon eat. Branches and leaves that fall into the stream provide the stream inhabitants with shelter and nutrients. Trees and other plant life will also buffer the stream from land-based pollutants like fertilizers, pesticides, and hydrocarbons by up-taking them and either using them for growth or storing them.

Teaching and Learning Sequence

Part A. Share this Atlantic Salmon Fact: Lake Ontario Atlantic Salmon became extirpated (locally extinct) by 1896. Overfishing, habitat degredation, blocked access to habitat (due to dams), and pollution – all human impacts – combined to cause their extirpation.

Part B.

1. Provide the students with the handout below.
2. As a class or in small groups brainstorm the 3 sections on the handout helping the students to understand the basic habitat needs of organisms, how these needs relate to the students, and how this relates to Atlantic Salmon in a stream environment.
3. Help the students to come up with the 4 pillars of wilderness survival (shelter, fire, water, and food) plus oxygen, to set the ideas for their own homes and the habitat needs for Atlantic Salmon. Start by having them identify the hazards that might be faced i.e. cold, wind, rain, snow, sun, predators.
4. Have the students then relate these items to their own homes and brainstorm how their home meets their survival needs.
5. Have the students brainstorm what the habitat needs are for Atlantic Salmon: 1. Cold/cool water – helped by tree cover; 2. Exposed rock/gravel beds for redds, hiding from predators, and for the growth of aquatic invertebrates; 3. In water structures for hiding places for both juvenile Atlantic Salmon and aquatic invertebrates – downed woody material and large rocks; 4. Clean water – helped by shoreline vegetation; 5. Abundant aquatic invertebrates; 6. Oxygenated water – moving water tumbling over rocks adding air to the water, surface absorption, aquatic plants.

Part C.

1. Have the students make a sketch of the Atlantic Salmon's coldwater habitat identifying the habitat needs from the organizer.
2. Have the students add the organizer and their sketch to their journals.

Habitat – What is needed for survival?

You in Wilderness Survival

What are the hazards?

What do you need?

You @ Home

Atlantic Salmon in a Stream

Class size:	Unlimited
Setting:	Classroom

Grade #8 Classroom Hatchery Activities

Lesson #4: Wetlands – The sponge and filter

Adapted from: PennState College of Agricultural Sciences

Lesson Objectives:

- Demonstrate the importance of wetlands for water quality and overall ecosystem health, and how this relates to the survival and success of Atlantic Salmon
- Demonstrate the relationship between wetlands, precipitation, and runoff

Materials: (per group or as a whole class)

- Long shallow pan
- Sponge
- Modeling clay
- Cup of soil
- Watering can
- Jar x2

Background

Wetlands are important elements of all types of waterways including the rivers, streams, and lake that our Atlantic salmon depend on. In times of heavy rainfall, wetlands will absorb excess water, which reduces flooding and slows the flow of water thus minimizing erosion. In times of low rainfall, the wetland will release this excess water back into the water way. The wetland functions as a sponge. Less erosion helps Atlantic Salmon (and many other organisms) by reducing sediment in the water that can abrade gills, smother eggs, and reduce the invertebrate populations that juvenile Atlantic Salmon rely on as a food source. In drier times the released water helps keep water levels high enough to allow for adult migration to spawning sites.

The plant life in wetlands traps sediment and takes up nutrients and toxins contributing to better water quality. In this way wetlands act like a filter, similar to how our liver and kidneys help detoxify our bodies.

Wetlands also provide important habitat for many species of birds, amphibians, reptiles, fish, mammals, and invertebrates.

Until recent times many people viewed wetlands as "wastelands" with little importance and function. The rich organic soils found in wetlands create opportunities for highly productive food production. Wetlands were (and sometimes still are) drained to create agricultural lands or are developed for buildings. Along lake shorelines, wetlands have been destroyed for waterfront access and beaches. In southern Ontario this mindset has caused the loss of over 70% of wetlands compared to pre-European settlement. Worldwide it is estimated that as much as 87% of wetlands have been destroyed since the 1700s. The ecological consequence of this loss can not be overlooked. This mindset of wetlands as wastelands must be discarded and the extent of the value of wetlands realized.

Teaching and Learning Sequence

Part A. Share this **Fact:** *Globally more than 19,500 species of animals and plants depend on wetlands for survival.*

Part B. Show the students different photos of Ontario wetlands (bog, fen, swamp, marsh).

Ask these Guiding Questions:

1. What is a wetland?
2. What functions do wetlands serve?

Part C.

1. Have the students brainstorm what kind of animals and plants live in wetlands.
2. As a class or in groups of 4-5 have the students fill 1/3-1/2 of the pan with clay with a slope towards the empty side of the pan.
3. Have the students make predictions of what will happen if water is poured across the clay (the water will travel quickly).
4. Pour the water across the clay and have the students record their observations.
5. Add the sponge to the base of the slope and ask the students to record their predictions and observations (water is absorbed by the sponge).
6. Explain how wetlands act as a sponge by absorbing and slowly releasing water.
7. Sprinkle soil over the clay, remove the sponge and pour the water over the clay again, having the students make predictions and observations.
8. Pour the water into a jar and repeat steps 7 and 8 this time with the sponge back at the base of the slope adding soil only up hill of the sponge.
9. Pour this water into the second jar and compare, pointing out how wetlands trap sediment and pollutants.

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

1. What happens when wetlands are destroyed for housing, beaches, farm fields…? Point out how much this has happened globally and in southern Ontario.
2. How does muddy or polluted water affect fish, other animals, and plants?
3. How do wetlands help people? (water quality, flood/drought control, biodiversity, wildlife viewing)

Class size:	Unlimited
Setting:	Classroom

Grade 8 Classroom Hatchery Activities

Lesson 5: Where in the World

Lesson Objectives:

- Relate patterns of settlement to the extirpation of Atlantic salmon in Ontario
- Create maps to help the students understand the context of Atlantic Salmon's range globally and the local migratory route of their classroom fish

Materials:

- Student's Atlantic salmon journal
- Computer connected to a projector
- Access to computers with internet connection
- Map template below (one per student)
- Markers and paper
- Mapping software (optional)

Background

Atlantic Salmon live in the northern Atlantic Ocean, from Spain to northeastern Russia, around the southern tip of Greenland over to northern Quebec and south to Connecticut. They arrived in the Lake Ontario watershed around 11,000 years ago swimming up the glacial meltwater from the Atlantic Ocean. Due to the flood water from the melting, the lake was much larger than it is today. We call this larger waterbody Lake Iroquois, and it had water 40m deeper than today's lake. This lake and the connecting rivers and streams met all of the needs of Atlantic Salmon and they stayed in the region, not needing to go back to the ocean. Their populations grew to an enormous number.

People moved into this environment around 10,500-11,000 years ago where they hunted big animals like caribou and mammoths, gathered edible plants, and fished. Atlantic Salmon became an important food source for these early inhabitants. For thousands of years the population of Atlantic Salmon remained high and in balance with the local ecology and harvest from local people.

The first European explorers arrived in southern Ontario in the early 1600's, with the first being the French explorer Étienne Brûlé. The French built Fort Frontenac (present-day Kingston) in 1673. In 1793, York (present day Toronto) was established. Early European settlers described the abundant wildlife they encountered and how the waterways were teaming with fish, notably Atlantic Salmon. Atlantic Salmon became an important part of the diet of the newcomers.

With European settlements growing in size and in numbers, increased pressures were put on the natural resources in the region. Forests were cleared to make way for settlements, farm lands, and industry. Timber was used for buildings, furniture, heating, cooking, and ships.

Much of the early settlement focused around waterways as this facilitated transportation of people and goods and provided food and drinking water to settlers and their livestock. With the progression of the industrial revolution, moving water in rivers became valuable sources

of energy. Mills utilized the movement of the water to process timber and grain and to fabricate textiles. To power mills, the rivers were dammed to increase and focus the flow that turned the wheels of industry.

The damming of rivers broke connectivity between the lake and the spawning ground for Atlantic Salmon, reducing their reproduction success. The loss of tree cover allowed more sunlight to warm the water to temperatures not favorable for Atlantic Salmon survival. The loss of the tree roots allowed for increased soil erosion and for more sediment to enter the river, covering spawning beds, smothering eggs and invertebrates (the juvenile salmon's food), taking away hiding places for small fish and invertebrates and abrading and clogging fish gills. These impacts combined with pollutants and overfishing led to a rapid decline in Atlantic Salmon and other fish. Atlantic Salmon became extirpated from the Lake Ontario region by 1896.

The European settlers had a different cultural relationship to the land than the Indigenous People had; more of a "taker" type attitude where nature was seen as a commodity to be exploited by people. They initially described the natural resources of Canada as "inexhaustible", a mindset that quickly proved to be both incorrect and disastrous to fish and wildlife, forests, and ecosystem health. While the Indigenous People also viewed nature as their grocery and hardware stores, many of them revered nature and saw themselves as important members of the natural community. They worked hard to give back to the land through stewardship activities that benefitted many species of plants and animals, a relationship that was rooted in a deep respect. Nature provided for them and they provided for nature, a mindset that we must adopt for a healthy sustainable future.

Teaching and Learning Sequence

Part A. Ask these guiding questions:

1. Why were early settlements focused around waterways?
2. What factors led to the extirpation of Atlantic Salmon in Lake Ontario?
3. How did settlement patterns impact Atlantic Salmon?

Part B.

1. View this story map about Lake Ontario Atlantic Salmon: https://storymaps.arcgis.com/stories/24ebd4f05c13410dbed13db53f85b5ab
2. Have the students research the native range of Atlantic Salmon globally (available in numerous online resources) and create a map using the template below.
3. Have the students create a second map either freehand or using computer software showing the location of their release site in relation to Lake Ontario. Have them highlight the migratory route between the release site and the lake. Include major settlements (villages, towns, cities) and barriers to migration (i.e. dams – this can be obtained from your classroom hatchery contact).

Part C. Ask these closing questions to initiate a class discussion:

1. How can human activities be modified to lessen their negative impacts on coldwater stream habitats?

Possible answers – reduction in pollution, reduction in overconsumption/waste, reduction in barriers, establishing and maintaining vegetative barriers along waterways, rebuilding respectful relationships with nature.

2. What environmental pressures do our classroom fish face from settlements in southern Ontario?

Answer – Pollution, deforestation, increased stream temperature, overfishing, dams still in use for flood control, and the "heritage value" of non-functioning dams

3. Are there many settlements in the global range of Atlantic salmon?

Answer – Yes particularly in the southern part of the range. Areas in the far north i.e. Greenland have less.

4. Do Atlantic Salmon face environmental pressures within other parts of their global range?

Answer – Yes. The same pressures which led to the extirpation of Lake Ontario Atlantic salmon have caused a decline in global stocks and the extirpation of other populations. Additionally, fish farming is taking a huge toll on wild Atlantic salmon due to disease and breeding with escapees from the farms.

5. What human activities can be implemented to have a positive impact on cold water stream habitats?

Possible answers – environmental stewardship such as garbage removal and tree planting; technology to allow fish passage around dams that have not been removed (fishways, fish ladders), legislation to protect vulnerable

Student Instructions

Atlantic Salmon Range Map

1. Using the internet research the native range of Atlantic Salmon. There are multiple sources for this information.
2. Visually display the range with a coloured line around the range. Include both current and historic (extirpated) populations as the range for the species using one colour.
3. Add a north arrow to the upper right corner of the map.
4. Lable the following*:
    a. Atlantic, Pacific, Indian, Arctic, and Southern Oceans
    b. Greenland, Iceland, Norway, France, United Kingdom, and Spain
    c. Newfoundland and Labrador
    d. Lake Ontario

* For locations too small to write on use an arrow.

Release Stream Map

1. Using freehand drawing or computer software (if available) create a large scale map showing the waterway (roughly) from the release site for your classroom fish down to Lake Ontario*. This is the migratory route for your fish when they smolt and swim down to the lake and when they return as spawning adults.
2. Add a north arrow to the upper right corner of the map.
3. Indicate on the map the major human settlements (villages, towns, cities) adjacent to the migratory route

* Use google maps as a reference.

Native Range Map of Atlantic Salmon

Class size:	Unlimited
Setting:	Classroom

Grade 8 Classroom Hatchery Activities

Lesson 6: Presenting Salmo salar

Lesson Objectives:

- Give students experience with creating and delivering a PowerPoint presentation
- Reinforce and expand learning related to Lake Ontario Atlantic Salmon
- Expand the reach of the classroom hatchery program to other grades at the school

Materials:

- Student's Atlantic Salmon journal
- Computers with internet access

Background

Comedian Jerry Seinfeld once stated the observation that at a funeral most people would rather be in the coffin than delivering the eulogy. While this statement was designed as part of his stand-up comedy routine, studies have shown that it is partially true; many people fear public speaking more than death! Presentation skills are very valuable in today's world and developing them can give students an advantage and open up future employment possibilities. Most students will encounter the direction to prepare and deliver presentations in various formats throughout their education and in future workplaces. Practise will help the students develop the tools to present effectively and to increase their comfort level of doing this task. Some may even begin to enjoy it!

Teaching greatly reinforces learnings. For upper grades there is a great opportunity for students to pull together the information and experience that they have had through the classroom hatchery program and share it with lower grades. This will both solidify lessons learned and expand the reach of the program to other grades.

Teaching and Learning Sequence

Part A. Ask the students:

1. What do they know about Atlantic Ssalmon?
2. Where did Atlantic Salmon come from?
3. How did they get to Lake Ontario?
4. What are the habitat needs of Atlantic Salmon?
5. Why are we hosting a classroom hatchery?

Part B. Introduce the presentation project as a way that as a whole class the students will research various aspects of Atlantic Salmon and teach each other and other classes.

- Divide the class into 6 groups:
    1. Biology/Geography
    2. Habitat
    3. History
    4. Restoration
    5. Classroom Hatchery Program
    6. Environmental Stewardship
- Give each group their presentation component (below). Inform them that each group will be putting their section together with the other sections to create one presentation.
- Internet resources containing the information they will need is included in each group assignment. They should also take information and diagrams directly from their journals.
- Each group will elect one member to join the "format committee." This committee will work together to decide on layout elements such as background colour, font, etc., and will pull together each group's section for one presentation.
- Guide the groups where needed particularly with the use of PowerPoint (how to add a photo, text, format, etc.). Tips for creating a PowerPoint presentation are listed below.

Part C. Presentation

- When all sections are complete and compiled into one presentation, each group will take a turn presenting their section to the class. Each student should speak about one slide. Tips for presenting are listed below.
- At the end of each section, students and teacher ask questions about the topic. The group answers the question if they can. It is good to have challenging questions that the group is unable to answer as this provides an opportunity for further research.
- Once all groups have presented and answered questions, invite other classes to come in and observe the presentation and to see the hatchery. If desired each group can have one or two students present their section to the other grades.

GROUP 1: **Biology/Geography**

Mission: Your group will be presenting components related to the biology of Atlantic Salmon, including:

- Description of an Atlantic Salmon (size, colour, fins…) including identifying features
- Atlantic Salmon life cycle
- Global distribution of Atlantic Salmon

Resources: Your Atlantic Salmon journal; Bring Back the Salmon website; Nature Conservancy of Canada website (search Lake Ontario Atlantic salmon); American Salmon Federation website; The Atlantic Salmon in the History of North America by R.W. Dunfield (google search title)

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GROUP 2: **Habitat**

Mission: Your group will be presenting components related to the habitat of Atlantic Salmon, including:

- Habitat (diet, cover, water conditions) of juvenile Atlantic salmon
- Habitat (diet, water conditions) of adult Atlantic Salmon (both freshwater and saltwater populations)

Resources: Your Atlantic salmon journal; Bring Back the Salmon website; Nature Conservancy of Canada website (search Lake Ontario Atlantic salmon); American Salmon Federation website; The Atlantic Salmon in the History of North America by R.W. Dunfield (google search title)

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GROUP 3: **History**

Mission: Your group will be presenting on the history of Atlantic Salmon, including:

- Importance of Atlantic Salmon to humans (globally and locally)
- When and how they arrived in Lake Ontario
- When and how they became extirpated

Resources: Your Atlantic Ssalmon journal; Bring Back the Salmon website; Nature Conservancy of Canada website (search Lake Ontario Atlantic salmon); American Salmon Federation website; The Atlantic Salmon in the History of North America by R.W. Dunfield (google search title)

GROUP 4: **Restoration**

Mission: Your group will be presenting components related to Lake Ontario Atlantic Salmon Restoration Program, including:

- The 4 pillars of the program

Resources: Your Atlantic Salmon journal; Bring Back the Salmon website; Nature Conservancy of Canada website (search Lake Ontario Atlantic salmon); American Salmon Federation website; The Atlantic Salmon in the History of North America by R.W. Dunfield (google search title)

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GROUP 5: **Classroom Hatchery Program**

Mission: Your group will be presenting components related to your classroom hatchery, including:

- Your hatchery components and their associated function
- The timeline of the program (from egg delivery to release)
- The 3 biggest learnings that your class has gotten out of the experience of hosting a classroom hatchery (consult the class and select the 3 most popular learnings)

Resources: Your Atlantic Salmon journal; Bring Back the Salmon website; Nature Conservancy of Canada website (search Lake Ontario Atlantic salmon); American Salmon Federation website; The Atlantic Salmon in the History of North America by R.W. Dunfield (google search title)_ _ _
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GROUP 4: **Environmental Stewardship**

Mission: Your group will take the program beyond Atlantic salmon to find ways in which students can be involved in actions to take care of the natural world, including:

- Define environmental stewardship
- 3 actions that students can take/get involved in locally to improve the health of nature in their communities

Resources: Your Atlantic Salmon journal; Bring Back the Salmon website; Nature Conservancy of Canada website (search Lake Ontario Atlantic salmon); American Salmon Federation website; The Atlantic Salmon in the History of North America by R.W. Dunfield (google search title)

Tips For Presenting Using PowerPoint

Creating the Presentation

1. Know your audience (age, knowledge and interest in your topic, etc).
2. Use a consistent format of colours, font, and background. Use contrasting colours for words to make them more easily read. Make sure that words and images are large enough to be seen by the back row of your audience.
3. Check your spelling and grammar.
4. Limit the number of words on each slide. Include essential information in bullet or numbered form. Empty space on screen makes it more readable.
5. Images are more visually appealing to your audience than words. Use images that compliment your message. Ensure the image resolution is large enough to maintain clarity when projected on a large screen.
6. Avoid the overuse of flashy transitions as they can be distracting.
7. Limit the number of slides to approximately 1 slide per minute.

Presenting

1. Face your audience. While you will look at your slides for reference return to speaking to the audience and not the screen.
2. Speak clearly and at an appropriate volume and speed.
3. Avoid reading from your slides. Use the images and point form sentences on screen as reference to what you are saying. It is best not to read from notes or to even memorize word for word what you are going to say. Instead know what you are talking about and speak from that place of knowing.
4. Make eye contact with your audience and don't be afraid to smile. This will help to make the presentation more enjoyable for your audience and for you.
5. Have fun with your presentation and with your audience.