DRAFT

CLASSROOM HATCHERY PROGRAM

GRADE 4 LESSON GUIDE

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Grade 4 Classroom Hatchery Activities

#1 Stream Habitat Mural

As adapted from: Trout in the Classroom

Time Frame: 50-60 minutes

Class size: 20-30 students

Setting: Classroom

Objectives:
Create a habitat mural showing how the sun and the plants helps help an aquatic habitat be healthy and support the food web of animals that live in a stream habitat, including Atlantic Salmon. As a whole class, the students will create a decorative backdrop that can be attached to the outside of the insulating foam of the Atlantic Salmon classroom aquarium.

Materials:
-Post-it notes (few post-its for each student)
-Large chart paper or whiteboard
-Watercolour paints, paper and brushes
-Scissors and glue
-Decorative collage or textured paper
-Construction paper
-Recycled paper scraps
-Large poster paper cut to the size of the aquarium
-Additional art supplies is available (special paper, etc.)

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
-Plants and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitats
-Changes to habitats (whether caused by natural or human means) can affect plants and animals and the relationships between them
-Society relies on plants and animals
The Arts- Visual Arts
Creating and presenting: apply the creative process 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

Specific Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
1.2 identify reasons for the depletion or extinction of a plant or animal species, evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletion or extinctions from happening

2.3 use scientific inquiry/research skills to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs
2.5 use appropriate science and technology vocabulary, including *habitat, population, community, adaptation* and *food chain* in oral and written communication
3.1 demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life (*e.g., food, water, air, space and light)*
3.3. Identify factors *(e.g., availability of water or food, amount of light, type of weather)* that affect the ability of plants and animals to survive in a specific habitat
3.4 demonstrate an understanding of a community as a group of interacting species sharing a common habitat (*e.g., the life in a meadow or in a path of forest)*

The Arts- Visual Arts

D1.1 create two-and three-dimensional works of art that express feelings and ideas inspired by their interests and experiences
D1.2 demonstrate an understanding of composition, using selected principles of design to create narrative art works or art works on a theme or topic.
D1.3 use elements of design in art works to communicate ideas, messages and understandings
D1.4 use a variety of materials, tools, and techniques to determine solutions to design challenges (*e.g., drawing, mixed media, painting)*

Background

Clean cold streams provide an ideal habitat for Atlantic Salmon. The health of a stream depends on many factors including vegetation, surrounding land, forested cover, and substrate. A healthy stream has many important parts. First, it has a partially to fully rocky substrate (stream bed), such as gravel or boulders. As the cool water flows, it meanders (weaves back and forth) over and around this substrate. A pattern of rocks and gravel makes the water act differently in different parts of the stream. Sometimes, the water pools in flatter, calmer areas and the water flow slows. In other areas, the highly variable substrate creates riffles - the areas of bubbly, white water - that help oxygenate the water. When water flows quickly without interruption by substrate, this is a run.

A healthy stream also holds and is bordered by many living things. Aquatic macroinvertebrates, such as insects, mollusks, and crustaceans, live in every level of the water column. Fish and plants also live within the stream. A healthy riparian zone - the area next to the stream - must also be full of life. A healthy riparian zone has trees, shrubs, and/or herbaceous plants, as well as animal wildlife. This riparian zone (the roots and debris) helps filter surface water runoff and groundwater that might carry sediments and other pollutants that would otherwise enter the stream.

Procedure:

1. On the large chart or whiteboard, write down the following question: *A stream is a type of habitat. What are the parts that you would see and hear when you visit a healthy stream?*
2. Provide each student with a few post-its and ask them to write out one idea per post-it note of the parts that make a stream habitat healthy.
3. Provide students 5 minutes to complete their responses. Once the students have completed their reflections and connections on the post-its, ask them to place their post it notes onto the whiteboard or display chart. On the whiteboard or chart paper, create a chart that outlines features of a stream, animals and plants found at a stream. For this portion of the activity only 3 parts of the chart will be completed. Providing students with the opportunity to share what their responses were, students will place their post-it under the proper heading. This 10-15 minute activity will encourage students to think about the components of a healthy stream.

Features of a stream	Animals present at a stream	Plants present at a stream	Atlantic Salmon's prey	Atlantic Salmon's predators

4. Following the discussion of the healthy parts of a stream, discuss with students Atlantic Salmon habitat. Let students know that they will create a background for the Atlantic Salmon aquarium to prepare them for their freshwater home when they are released. Use the following prompts to begin brainstorming ideas:
    - *What are the Atlantic Salmon's prey?*
    - *What are the Atlantic Salmon's predators?*

    Record the student's responses on the chart paper or whiteboard table that has been created as a class.
5. **Begin creating aquarium backdrop:** Not all students are familiar with techniques that artists use when working with watercolour. One aspect of the Atlantic Salmon collage is the background material and colour that can represent the water. Watercolour paper and watercolour paint are natural media to use to represent this. Give every student the opportunity to try out creating the freshwater background and explain that the class will vote on what colours will ultimately be used to make the class collage. Model the technique of wetting both sides of the watercolour paper with a brush before painting water patterns on one side of the sheet. When you wet one side, the paper rolls up toward you; by wetting the other side you will be able to get a flat surface. (This process is also known as "waking up the paper".). Preparing the paper in this way also give the flowing sensation often seen in watercolour paintings. Students are then ready to choose the colours to imitate the look and feel of a freshwater stream or river.
6. While the backdrop dies after watercolour painting has been completed, students will create their own living and nonliving shapes for the habitat collage using recycled paper, construction paper or additional art materials that are available.
7. Once the watercolour backdrop has dried and the students have created their plants and animals for the stream habitat, lay the large watercolour paper out in a large flat surface in the classroom. Students will place their pieces on the stream background where they want them. Discuss what could be added to fill the scene and choose volunteers to create these additional elements or allot time for students to create a few remaining items to complete the masterpiece.
8. Once all pieces have been completed and there are no large open spaces and the background is nicely covered with plants and animal paper elements, glue down the pieces - students can glue their pieces or you can glue the pieces onto the backdrop and install the background using tape and affixing it on the <u>outside</u> of the insulation that is attached to the tank. This paper masterpiece will decorate the outside of the classroom aquarium rather than having solely the insulation on the outside of the tank. You can still have one side of the decorated insulation pieces open and close for viewing inside the tank. Be sure to attach the masterpiece on the <u>outside</u> of the aquarium tank and affix it on the sheets of hard foam insulation, rather than directly against or on the glass, as with the presence of condensation on the glass, it will destroy the art piece.

Grade 4 Classroom Hatchery Activities

#2 Stream Habitat Dioramas

As adapted from: Trout in the Classroom

Read aloud source: *Salmon Boy*: pg. 95-97 *Keepers of the Animals*

Time Frame: 70 minutes

Class size: 20-30 students

Setting: Classroom

Objectives:
Through an interactive hands-on activity, students create their own stream diorama's that show the key elements of a healthy stream. Students will learn of the importance of Atlantic Salmon in a variety cultures including their own and the Haida through the read aloud activity of the Haida legend *Salmon Boy* as well as become familiar with vocabulary that will be used throughout this unit of study.

Materials:
-Salmon Boy Haida legend read aloud story (attached)
-Images of healthy Atlantic Salmon streams
-Shoeboxes or other small boxes
-Construction paper
-Glue, glue sticks
-Saran wrap
-Clay
-Natural materials such as sticks, rocks, leaves, small plants, etc.
-Gravel
-Computers (if conducting research on elements of healthy stream habitats)

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
-Plants and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitats
-Changes in habitats (whether caused by natural or human means) can affect plants and animals and the relationships between them
-Society relies on plants and animals
Language- Oral Communication
1. Listen in order to understand and respond appropriately in a variety of situations for a variety of purposes

Language- Reading
1. Read and demonstrate an understanding of a variety of literary, graphic, and informational texts, using a range of strategies to construct meaning

The Arts- Visual Arts

Creating and presenting: apply the creative process 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

Specific Expectations

Science & Technology- Understanding Life Systems: Habitats and Communities

1.1 analyse the positive and negative impacts of human interactions with natural habitats and communities (*e.g., human dependence on natural materials)*, taking different perspectives into account (*e.g., the perspectives of a housing developer, a family in need of housing, an ecologist)* and evaluate ways of minimizing the negative impacts

1.2 identify reasons for the depletion or extinction of a plant or animal species (*e.g., hunting, disease, invasive species, changes in or destruction of its habitat)*, evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletions or extinctions from happening

2.3 use scientific inquiry/research skills to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs

2.5 use appropriate science and technology vocabulary, including *habitat, population, community, adaptation* and *food chain*, in oral and written communication

3.1 demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life (*e.g., food, water, air, space, and light)*

3.3 identify factors (*e.g., availability of water or food, amount of light, type of weather)* that affect the ability of plants and animals to survive in a specific habitat

3.4 demonstrate an understanding of a community as a group of interacting species sharing a common habitat (*e.g., the life in a meadow or in a patch of forest)*

3.10 describe ways in which humans are dependent on natural habitats and communities (*e.g., for water, medicine, flood control in wetlands, leisure activities)*

Language- Oral Communication

1.2. demonstrate an understanding of appropriate listening behaviour by adapting active listening strategies to suit a variety of situations, including work in groups

1.3. identify a variety of listening comprehension strategies and use them appropriately before, during, and after listening in order to understand and clarify the meaning of oral texts

1.4. demonstrate an understanding of the information and ideas in a variety of oral texts by summarizing important ideas and citing important details

1.5. make inferences using stated and implied ideas in oral texts (*e.g., listen "between the lines" to detect bias in an oral text)*

1.6. extend understanding of oral texts by connecting the ideas in them to their own knowledge, experience, and insights; to other texts, including print and visual texts; and to the world around them

Grade 4 Language- Reading

1.1 read a variety of texts from diverse cultures, including literary texts (*e.g., myths, plays, short stories, chapter books, letters, diaries, poetry,)* graphic texts (*e.g., graphic novels, diagrams, brochures, graphs and graphic organizers, charts and tables, maps)* and informational texts *(e.g., textbooks, non-fiction books on a range of topics, print and online newspapers and magazine articles or reviews, print and online encyclopedia's and atlases, electronic texts such as e-mails or zines)*

1.4. demonstrate an understanding of a variety of texts by summarizing important ideas and citing supporting details

1.5 make inferences about texts using stated and implied ideas from the texts as evidence

1.6 extend understanding of texts by connecting the ideas in them to their own knowledge, experience, and insights, to other familiar texts, and to the world around them

1.8 express opinions about the ideas and information in texts and cite evidence from the text to support their opinions

The Arts- Visual Arts
D 1.1. create two-and three- dimensional works of art that express feelings and ideas inspired by their interests and experiences
D 1.2 demonstrate an understanding of composition, using selected principles of design to create narrative art works or art works on a theme or topic
D 1.3 use elements of design in art works to communicate ideas, messages, and understandings
D 1.4 use a variety of materials, tools, and techniques to determine solutions to design challenges (*e.g., mixed media and sculpture)*

Background
The clean cold streams provide an ideal habitat for Atlantic Salmon. The health of a stream depends on many factors including vegetation, surrounding land, forested cover and substrate.

A healthy stream has many important parts. First, it has a partially to fully rocky substrate (stream bed), such as gravel or boulders. As the cool water flows, it meanders (weaves back and forth) over and around the substrate. The pattern of rocks and gravel makes the water act differently in different parts of the stream. Sometime, the water pools in flatter, calmer areas and the water flow slows. In other areas, the highly variable substrate creates riffles - the areas of bubbly, white water - that help oxygenate the water. When water flows quickly without interruption by substrate, this is a run.

A healthy stream also holds and is bordered by many living things. Aquatic macroinvertebrates, such as insects, mollusks, and crustaceans, live in every level of the water column. Fish and plants also live within the stream. Then, the riparian zones - the area next to the stream - must also be full of life. A healthy riparian zone has trees, shrubs, and/or herbaceous plants, as well as animal wildlife. This riparian zone (the roots and debris) helps filter surface water runoff and groundwater that might carry sediments and other pollutants that would otherwise enter the stream.

The story Salmon Boy, which has been included in this activity, is an allegory of great importance, revealing a series of interlocking circles, which as the story proceeds, run progressively deeper into the life ways of the Haida. Even though the people catch and eat the salmon, they do so with respect and gratitude. When the people live in balance and treat the spirits well the salmon swim upstream and offer their bodies for food. By returning the bones and all they do not eat to the water this *circle of giving and receiving* remain intact - the gift keeps moving. There is an important, interdependent relationship here: the salmon give people food and the people show their appreciation through prayer and reverence.

The salmon take notice when the boy begins to live out of balance by being disrespectful and breaking the circle. Yet, the salmon do not react by getting angry and harming the boy. He is made one of them so that he may more fully understand who they are and how to care for and respect them. Even though he drowns and dies to his own people, Salmon Boy has a new life among the Salmon people at their home in the ocean. We see the great *circle of life and death* and the reality of the spirit world. Then, in another circle, one of transformation. Salmon Boy returns to his people as a healer to teach them the ways of the Salmon People and to help them when they are sick. This event in the story reveals the Native American's deep sense of *interconnectedness* between this world and the spirit world, and between animals and people.

Finally, after downing and finding a new life first among the salmon and then again with his own people, Salmon Boy spears his own salmon soul and his human self dies. When his body is placed into the river it circles *four times* - a sacred number - and returns again to life among the Salmon People.

Just as the salmon in this story represent a link between the ordinary world and the spirit world, they also connect us to their mysterious home under the sea. It is believed that salmon once lived only in fresh water, but at some point in their history began to migrate to the sea where food is plentiful.

The salmon in the story "Salmon Boy" are *anadromous* species that live and grow in salt water, then return to freshwater spawning grounds when mature. Salmon travel immense distances on their life's migration to the sea and back. No one knows for sure how the salmon navigate to make their epic migrations. They may follow the sun, moon or starts. Some hypothesize that they orient according to salinity, temperature, and the unique odour and chemistry of water in their home streams. Once in their home river systems salmon demonstrate an intense desire to move upstream - leaping up to 10 feet (3 metres) high over waterfalls and rapids.

As in the story "Salmon Boy", people still fish for salmon as well as many other aquatic species. Fishhooks and spears have largely supplanted by a high technology fishing industry that uses computers, planes and echo sounders to locate fish, and an array of nets and highly effective catching devices. A modern fishing fleet often consists of a mother ship, spotters, catchers and factory processing ships where the catch is gutted, cleaned and frozen, all while at sea. Some species have been so over-fished that they have become scarce and can no longer be used as food.

Salmon and other fish face many other threats to their well-being besides extreme angling pressures. Dams present obstacles that block migration upstream. Water pollution stresses and weakens the health of migrating fish and masks the natural odours by which salmon recognize their home streams on the return spawning runs. Severe water pollution along a stretch of river can create zones that are so deadly to fish that they cannot be traversed and so act as barriers to migration. Polluted water can adversely affect the development of fish eggs and young as well as change in temperature due to deforestation near streams will affect the healthy Atlantic Salmon habitat.

Fortunately, over time, some of the dams that once blocked the flow of many rivers are being fitted with fish passages such as fish ladders. There are also continued efforts for stream restoration that can help support healthy habitat for Atlantic Salmon to live in.

Procedure

1. Read aloud the Haida legend *Salmon Boy* (attached). Provide students with a brief understanding of what a legend is as well as an overview of First Nations heritage and the Haida. Following the reading of the legend, ask students some of the following comprehension questions:
    - *What do the salmon do when the young boy treats them disrespectfully? What would you have done? Why do the salmon make the boy one of their own?*
    - *How is the young boy changed by his experience? What does he learn?*
    - *Do you eat fish? How do people catch the fish that your family buys? What is happening to the populations of fish as such great numbers of them are caught? What other factors can limit Atlantic Salmon living in Ontario streams and having healthy habitats? What are some key things that are important in a healthy habitat for fish like Atlantic Salmon?*

2. Share Atlantic Salmon steam images and vocabulary with the students, using magazines, books or the internet.

3. Ask the students to imagine, in their minds' eyes, the perfect Atlantic Salmon stream. What is in the stream? What is the shape of the stream's path? What grows next to the stream? What are the best salmon hiding spots?

4. Providing each student with a shoebox, in their shoeboxes, ask students to describe and portray their "dream stream" path, using a pencil. This is a good start to help them plan out every other key element for their own healthy Atlantic Salmon stream diorama.

5. Provide ample time and allowance for the students to use art and/or found materials (craft materials or natural materials). Students can use anything they brought or found as well as share with their peers. Gravel makes great substrate. Sticks with leaves of paper make excellent tress, and stand up well in little balls of clay. As a final touch, the saran wrap can be used to depict the stream water.
6. In small groups or as a class, ask students to share their dream streams with each other. Provide time for a gallery walk for students to view their peers stream dioramas.

Salmon Boy

(Haida legend-Pacific Northwest)
Source: *Keepers of the Animals*
Michale J.Caduto and Joseph Bruchac
Pages 95- 96

Long ago, among the Haida people, there was a boy who showed no respect for the salmon. Though the salmon meant life for the people, he was not respectful for the one his people called Swimmer. His parents told him to show gratitude and behave properly, but he did not listen. When fishing he would step on the bodies of the salmon that were caught and after eating he carelessly threw the bones of the fish into the bushes. Others warned him that the spirits of the salmon were not pleased by such behaviour, but he did not listen.

One day, his mother served him a meal of salmon. He looked at it with disgust. "This is moldy," he said, though the meat was good. He threw it upon the ground. Then he went down to the river to swim with the other children. However, as he was swimming, a current caught him and pulled him away from the others. It swept him into the deepest water and he could not swim strongly enough to escape from it. He sank into the river and drowned.

There, deep in the river, the Salmon People took him with them. They were returning back to the ocean without their bodies. They had left their bodies behind for the humans and the animal people to use as food. The boy went with them, for he now belonged to the salmon. When they reached their home in the ocean, they looked just like human begins. Their village there in the ocean looked much like his own home and he could hear the sound of children playing in the stream which flowed behind the village. Now the Salmon People began to teach him. He was hungry and they told him to go to the stream and catch one of their children, who were salmon swimming in the stream. However, he was told, he must be respectful and after eating return all the bones and everything he did not intend to eat to the water. Then, he was told, their child would be able to come back to life. But if the bones were not returned to the water, that salmon child could not come back.

He did as he was told, but one day after he had eaten, when it came time for the children to come up to the village from the stream, he heard one of crying. He went to see what was wrong. The child was limping because one of its feet was gone. Then the boy realized he had

not thrown all of the fins back into the stream. He quickly found the one fin he had missed, threw it in and the child was healed.

After he had spent the winter with the Salmon People, it again was spring and time for them to return to the rivers. The boy swam with them, for he belonged to the Salmon People now. When they swam past his village, his own mother caught him in her net. When she pulled him from the water, even though he was in the shape of a salmon, she saw the copper necklace he was wearing. It was the same necklace she had given her son. She carried Salmon Boy carefully back home. She spoke to him and held him and gradually he began to shed his salmon skin. First his head emerged. Then, after eight days, he shed all of the skin and was a human again.

Salmon Boy taught the people all the things he had learned. He was a healer now and helped them when they were sick.

"I cannot stay with you long," he said, "you must remember what I teach you." He remained with the people until the time came when the old salmon who had gone upstream and not been caught by the humans or the animal people came drifting back down toward the sea. As Salmon Boy stood by the water, he saw a huge old salmon floating down toward him. It was so worn by its journey that he could see through its sides. He recognized it as his own soul and he thrust his spear into it. As soon as he did so, he died.

Then the people of the village did as he had told them to do. They placed his body into the river. It circled four times and then sank, going back to his home in the ocean, back to the Salmon People.

Chiin Sgáanuwaay ~ Supernatural Salmon by Haida Artist April White

Grade 4 Classroom Hatchery Activities

#3 Salmon Life Cycles Bracelet and Puzzle

As adapted from: Trout in The Classroom

Time Frame: 50 minutes

Class size: 20-30 students

Setting: Classroom

Objectives:
Throughout this hands-on activity, students will describe the parts of the salmon life cycle and also identify hardships and obstacles that salmon encounter during the migration cycle.

Materials:
-Medium sized pony beads; at least 12 colours (more if possible)
-Satin or leather cording
-Atlantic Salmon life cycle illustration, printed or digitally displayed
-Whiteboard and/or large chart paper
-Suggestions for Colour of Beads chart (attached)
-Large circle (1 per student) (attached)

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
-Plants and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitats
-Changes to habitats (whether caused by natural or human means) can affect plants and animals and the relationships between them
-Society relies on plants and animals
The Arts- Visual Arts
D1.Creating and presenting: apply the creative process 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

Specific Expectations

Science & Technology- Understanding Life Systems: Habitats and Communities

1.1 analyse the positive and negative impacts of human interactions with natural habitats and communities (e.g., *human dependence on natural materials)*, taking different perspectives into account (*e.g., the perspectives of a housing developer, a family in need of housing, an ecologist)* and evaluate ways of minimizing the negative impacts

1.2 identify reasons for the depletion or extinction of a plant or animal species (*e.g. hunting, disease, invasive species, changes in or destruction of its habitat*), evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletions or extinction from happening

2.5 use appropriate science and technology vocabulary, including *habitat, population, community, adaptation,* and *food chain* in oral and written communication

3.3 identify factors (*e.g., availability of water or food, amount of light, type of weather*) that affect the ability of plants and animals to survive in a specific habitat

3.10 describe ways in which humans are dependent on natural habitats and communities (*e.g., for water, medicine, flood control in wetlands, leisure activities)*

The Arts- Visual Arts

D 1.1 create two-and three- dimensional works of art that express feelings and ideas inspired by their interests and experiences

D 1.2 demonstrate an understanding of composition, using selected principles of design to create narrative art works or arts works on a theme or topic

D 1.3 use elements of design in art works to communicate ideas, messages, and understandings

D 1.4 use a variety of materials, tools, and techniques to determine solutions to design solutions: mixed media

Background

The life cycle of an Atlantic Salmon begins when the female deposits eggs in a shallow gravel depression known as a 'redd'. Once deposited, the male fertilizes the eggs. Newly hatched salmon, called 'alevin', live in the gravel and survive by absorbing proteins from their yolk sacs. After a few weeks, the yolk sacs disappear and the small fish, known as 'fry', move into deeper water to find food of their own. Atlantic Salmon remain in freshwater streams feeding and growing for many 1-3 years before migrating downstream to the lake (or ocean). These salmon are called smolts. Atlantic Salmon grow to adults in large lakes or the Atlantic Ocean. Here the salmon grow rapidly by feeding on other fish (and shrimp and crustaceans in the ocean). The salmon also encounter many dangers in the ocean including sharks, killer whales, other marine mammals, and humans who are also fishing for salmon. After two to three years, they begin the journey that guides them back to their hatching site. Juvenile salmon imprint or memorize the unique odours of their home stream. As returning adults they use their sense of smell to guide them upstream to where they hatched. Once in their home stream, Atlantic Salmon spawn and return to the lake or ocean to repeat the process for sometimes several more years.

Procedure

1. Before class instruction create a salmon life cycle bracelet to use as an example.
2. Ask students if they have heard the term *migration*. Define the term and provide an example (*ie., ducks migrate each year)*. Ask if they know if other animals migrate? Introduce the fact that some fish migrate.
3. Provide a printout or digital version of the Atlantic Salmon life cycle and describe the key information as found in the background of what happens in each stage as Atlantic Salmon grow. After the story, have students discuss each stage of the salmon's life and explain that each student is going to create a story about the life a salmon. Show the students the salmon life cycle bracelet. Explain that the bracelet forms a circle like the life cycle. The bracelet, which is a form of art, can be used to tell a story about the salmon. Throughout time people of all cultures have used art to tell stories and to teach. Ask if anyone knows a culture that uses storytelling and art to teach. Write down ideas on the whiteboard or large chart paper to

record ideas, for example, totems and cave paintings. Show the students the coloured beads. Each student will decide the colours they will use to represent each stage of the life cycle. Students can designate colours for obstacles or hazards that their salmon will encounter during its life. Each bead will tell a part of the story about the salmon as it grows and travels.

4. Ask students to choose about 8 to 12 beads of different colours. Cut a piece of cording approximately 12" per student. Knot one end of the cord and have students create their story bracelet. You can display the suggestions for colour of beads chart for students to refer to if you choose or you can have students designate certain colours to each life stage.
5. Have students share their stories first in small groups of 3 to 5, then to the class. Encourage students to share the story bracelet with their family.
6. Following the bracelet creation and that students have been able to share their salmon bracelet story with their peers, they will move on to create a life cycle puzzle.
7. Provide each student with a copy of the large circle (attached). Students will divide the circle into six equal parts (like slicing a pie). In each section they will record each word for one part of the salmon life cycle (*spawning, eggs, alevin, fry, parr, smolts, adult).* After recording each stage on each portion of the circle, students will draw a picture to represent each stage. When drawings are complete, the circle can be cut out and the sections cut apart. Students can them assemble and reassemble this circle as a puzzle.

Wild Atlantic salmon

a wondrous life cycle

Adult

Smolt

Parr

Fry

Alevin

Spawning in a Redd

Eggs

Eyed eggs

Visit **www.asf.ca**
to learn more

Paintings by Jud Pennanen

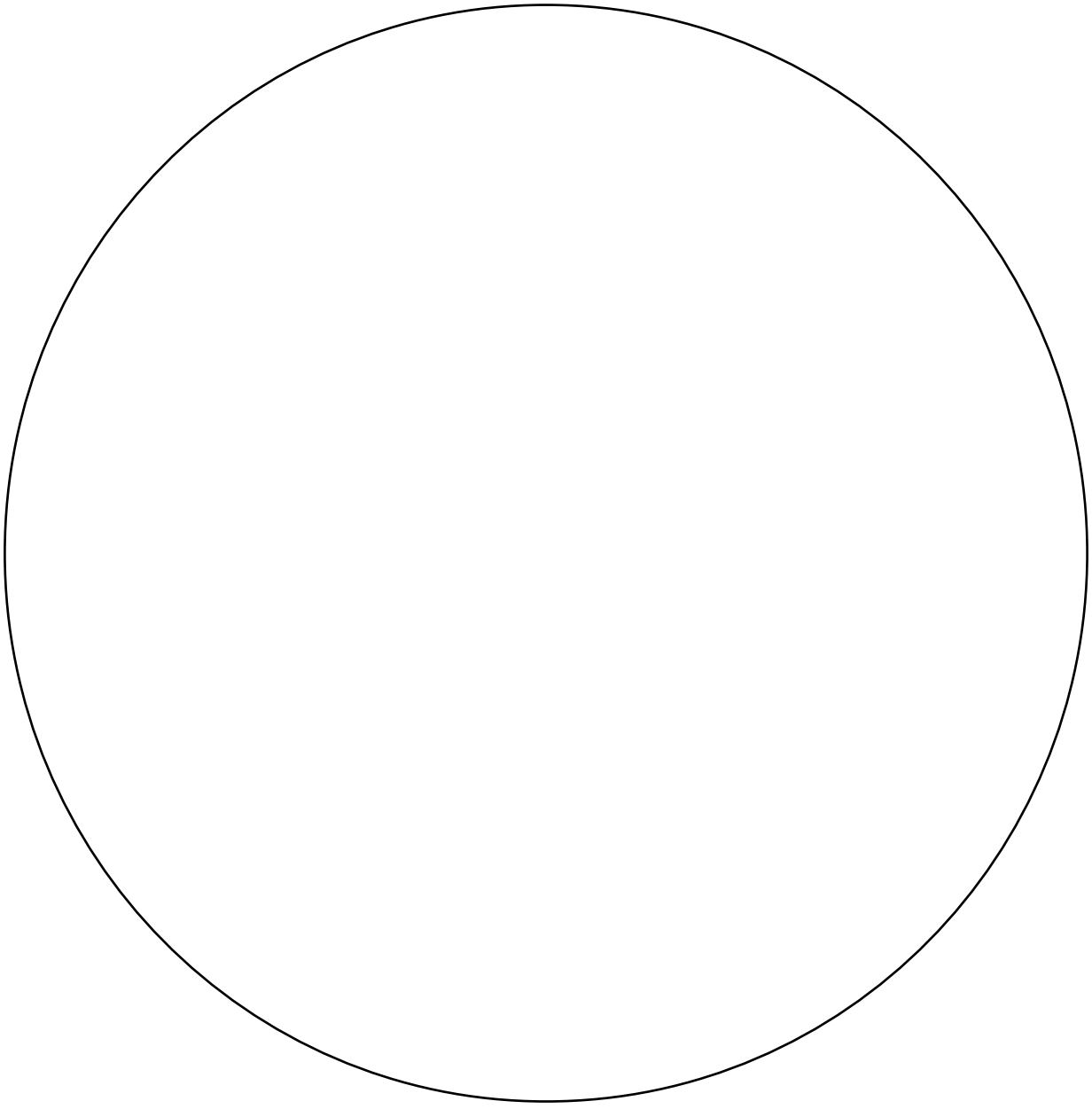
Atlantic Salmon Federation
P. O. Box 5200, St. Andrews, NB E5B 3S8
P. O. Box 807, Calais, ME 04619-0807
(506) 529-4581
www.asf.ca

Suggestions for Colour of Beads Chart

Salmon Stages	**Predators**
Orange: egg Red: alevin Dark blue: fry Teal blue: smolts Light blue: parr Gray: adult salmon Light green: spawning adults	Purple: large fish Dark gray: seal Black: whale Yellow: humans Brown: bear
Habitat	**Food**
Dark green: fresh water Clear: ocean/lake	Light brown: insects Pink: shrimp

Atlantic Salmon Life Cycle Puzzle

What to do: divide the circle into six equal parts (like slicing a pie). In each section record each word for one part of the salmon life cycle (***spawning adults, eggs, alevin, fry, parr, smolts***). After recording each stage on each portion of the circle, draw a picture to show each stage. When drawings are complete, cut the circle out and cut out each section.



Grade 4 Classroom Hatchery Activities

#4 Unwinding Atlantic Salmon Food Webs

As adapted from: Trout in the Classroom: Trout Food Webs

Time Frame: 30 minutes

Class size: 20-30

Setting: Classroom or large learning area with ample space; can be outside

Objectives:
Through this interactive activity, students will explore the fragile nature of food webs in a typical Atlantic Salmon stream and learn about how important a food web is to help support a healthy habitat and system for continued growth of the Atlantic Salmon in Ontario waters.

Materials:
-Whiteboard or large chart paper
-Creature index cards (one per student) (attached)
-Masking tape or paper clips (optional)
-Ball of string or twine

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
-Plants and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitats
-Changes to habitats (whether caused by natural or human means) can affect plants and animals and the relationships between them
-Society relies on plants and animals
Health & Physical Education- Living Skills
-Demonstrate personal and interpersonal skills and the use of critical and creative thinking processes as they acquire knowledge and skills in connections with the expectations in the Active Living, Movement Competence, and Healthy Living strands for this grade
Health & Physical Education- Active Living
A1. Participate actively and regularly in a wide variety of physical activities, and demonstrate an understanding of factors that encourage lifelong participation in a physical activity
A3. Demonstrate responsibility for their own safety and the safety of others as they participate in physical activities

Specific Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
1.1. Analyse the positive and negative impacts of human interactions with natural habitats and communities (*e.g., human dependence on natural materials)*, taking different perspectives into account (*e.g., the perspectives of a housing developer, a family in need of housing, an ecologist)*, and evaluate ways of minimizing the negative impacts

1.2. Identify reasons for the depletion or extinction of a plant or animal species (*e.g., hunting, disease, invasive species, changes in or destruction of its habitat)*, evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletions or extinctions from happening

2.2 build food chains consisting of different plants and animals, including humans

2.3 use scientific inquiry/research skills to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs

2.5 use appropriate science and technology vocabulary, including *habitat, population, community, adaptation* and *food chain* in oral and written communication

3.1 demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life (*e.g., food, water, air, space and light)*

3.2 demonstrate an understanding of food chains as systems in which energy from the sun is transferred to producers (plants) and then to consumers (animals)

3.3 identify factors (*e.g., availability of water or food, amount of light, type of weather)* that affect the ability of plants and animals to survive in a specific habitat

3.4 demonstrate an understanding of a community as a group of interacting species sharing a common habitat (*e.g., the life in a meadow or in a patch of forest)*

3.10 describe ways in which humans are dependent on natural habitats and communities (*e.g., for water, medicine, flood control in wetlands, leisure activities)*

Health & Physical Education- Living 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 *(e.g., Active living: use encouraging words to support teammates when playing in small groups; Movement competence: signal with one hand or another to indicate whether they want to receive a pass using their dominant or non-dominant hand*

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

Health & Physical Education- Active Living

A 1.1 actively participate in a wide variety of program activities (*e.g., lead-up and small-group games, recreational activities, cooperative games, fitness activities, dance activities)* according to their capabilities, while applying behaviours that enhance their readiness and ability to take part (*e.g., taking the initiative to be involved in the activity, being open to playing different positions and playing in different groups, respecting others' ideas and opinions, encouraging others, speaking kindly, maintaining self-control at all times)*

A 3.1 demonstrate behaviours and apply procedures that maximize their safety and that of others during physical activity (*e.g., cooperating with others, monitoring their own actions and maintaining control of their bodies and equipment, using equipment such as hula hoops and playground apparatus appropriately, ensuring all chairs are pushing in before beginning DPA in the classroom)*

Procedure

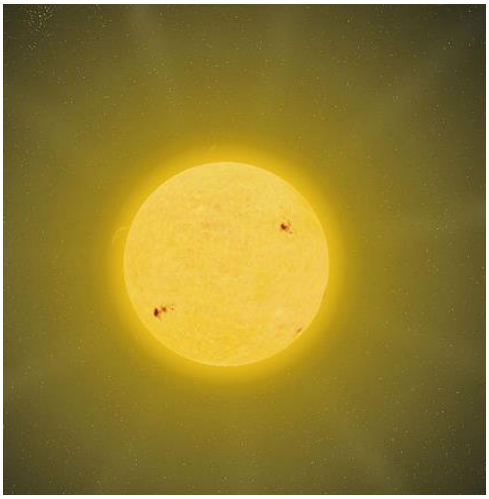
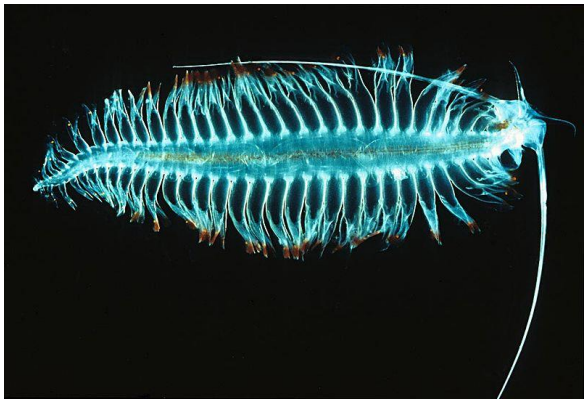
1. KWL chart: on the whiteboard or on large chart paper, illustrate a chart separated into 3 columns with the following headings.

What we KNOW about food chains	What we WANT TO KNOW about food chains	What we have LEARNED about food chains

As a whole class, ask students to add pieces of information that will help complete the first two sections of the KWL chart. The first column is where students can share their current knowledge and connections while the second section of the table is for wonderings or questions that students have when considering or thinking about the topic of food chains and a food web. The final column of the table *What we have*

learned…. is to be completed following the whole class food web activity. Keep the table displayed for easy reference throughout the following activity and accessible to add further connections in the wrap up portion of the activity.

2. Review with students how energy moves through a food web. Explain that the activity they will do helps demonstrate the connection among members of an ecosystem. Have students sit or stand in a large circle. Provide each student one creature card. **Optional:** you can attach each card to student's shirts using masking tape or paper clips to help free up hands so that they can hold the ball of yarn with both hands.
3. Give the ball of string to the student with the *Sun* card. Have the Sun choose an organism that is dependent on it for survival (plant). The Sun should continue holding onto the end of the string and pass the ball to the plant creating the first string of the web. The plant chooses an organism that is dependent on it for survival (insect) and passes the ball to the insect. Each time the ball of yarn is passed from one student to another, students are to hold onto a portion of the yarn in order to create a continuous link to the sun and the organism they pass the ball of yarn to.
4. After students have passed the ball several times, suggest to them that the organism holding the string has just died. Ask: *What eats dead matter? (insects, worms).* The organism holding the ball passes it on to an insect or earthworm. The game continues until all the students are holding the string by at least one point. There will be a large web of string in the circle.
5. Discuss with students what they observe about the activity. Ask: *what would happen if one of the organisms disappeared?* To demonstrate, as the students who has passed the ball of string the most often to drop it. Have students directly affected by the loss gently tug the string. As the slack is taken up, ask other students to gently tug on the string as well until all of the students are affected.
6. After the activity, discuss what affect the loss of even the smallest organism will have on the food web. Ask: *What do you think would happen if the acid rain or some other environmental pollution prevented the hatching of insect larvae?*
7. **Wrap up:** Discuss the possible consequences that invasive species such as Japanese knotweed, Didymo and Asian Longhorned Beetles can have on an established food web.
   Take this time as well to ask students to add their connections and what they have learned from the class activity and how the flow of energy plays a key role on the health and development of Atlantic Salmon in Ontario streams.

Sun 	**Algae** 
Plankton 	**Leeches** 

Minnow 	**Mollusk** 
Frog 	**Salamander** 

Mayfly

Caddisfly Larva

Image source: Wikimedia Commons- images

Dragonfly

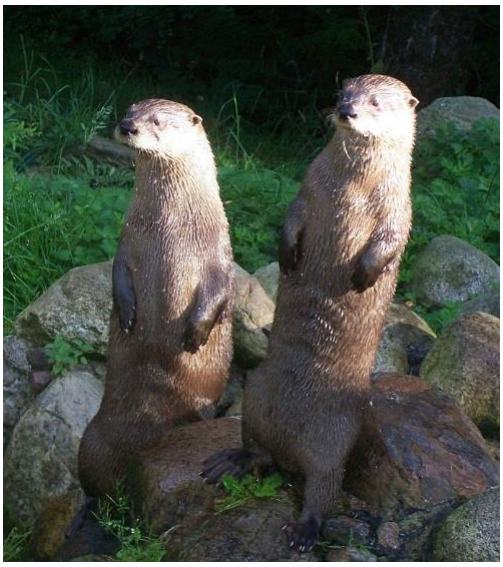
Garter Snake

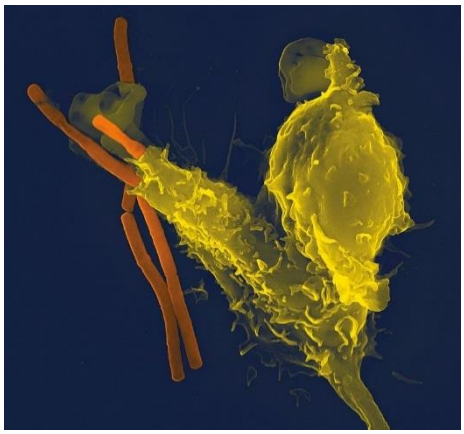
Crayfish

Snail

Atlantic Salmon

River Otter



Worm 	**Bacteria** 
Damselfly 	**Mink** 
Great Blue Heron 	**Yellow Perch** 

Grade 4 Classroom Hatchery Activities

#5 Salmon Life Stages Game

As adapted from: Trout in the Classroom Salmon Survival Game & Salmonids in the Classroom: Life Cycle Game

Time Frame: 40 minutes

Class size: 20-30 students

Setting: Classroom

Objectives:
In the interactive group game-based exploration, students will discover the obstacles and threats that salmon face throughout their lives, the survival rate of salmon in each life stage, the pattern of anadromous fish migration and the reproductive strategy of salmon. This game will show the number of salmon that complete all the stages of their life cycle.

Materials:
-10 lbs. red lentils, in a container or two
-small 4-6 ounce cups to hold each participant's lentils
-64 ounce plastic food storage containers (1 per group of 4-5 students) (to be used as a lentil receptacle for disposed of red lentils)
-One copy per each group of 4-5 students: *Salmon Life Cycle Board Game* (attached) (laminated)
-One copy per each group of 4-5 students: *Salmon Life Cycle Game Rules* (attached) (laminated)
-One copy per each group of 4-5 students: *Salmon Life Cycle Stewardship cards* (attached) (laminated
-One die
-Counters of different colour to use as game markers (1 colour per 4-5 students)
-Optional: salmon life cycle handout (attached)

Curriculum Links
Overall Expectations
Science & Technology: Understanding Life Systems: Habitats and Communities
-Plants and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitats
-Changes to habitats (whether caused by natural or human means) can affect plants and animals and the relationships between them
-Society relies on plants and animals

Specific Expectations
Science & Technology: Understanding Life Systems: Habitats and Communities
1.1 analyse the positive and negative impacts of human interactions with natural habitats and communities (*e.g., human dependence on natural materials)* taking different perspectives into account (*e.g., the*

perspectives of a housing developer, a family in need of housing, an ecologist), and evaluate ways of minimizing the negative impacts

1.2 identify reasons for the depletion or extinction of a plant or animal species (*e.g., hunting, disease, invasive species, changes in or destruction of its habitat)*, evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletions or extinctions from happening

2.3 use scientific inquiry/ research skills to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs

2.5 use appropriate science and technology vocabulary, including *habitat, population, community, adaptation,* and *food chain* in oral and written communication

3.1 demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life (*e.g., food, water, air, space and light)*

3.3. identify factors (*e.g., availability of water or food, amount of light, type of weather)* that affect the ability of plants and animals to survive in a specific habitat

3.4 demonstrate an understanding of a community as a group of interacting species sharing a common habitat (*e.g., the life in a meadow or in a patch of forest)*

3.8 explain why changes in the environment have a greater impact on specialized species than on generalized species

3.9 demonstrate an understanding of why all habitat have limits to the number of plants and animals they can support

3.10 describe ways in which humans are dependent on natural habitats and communities (*e.g., for water, medicine, flood control in wetlands, leisure activities*

Preparation

Print and laminate the Salmon Life Cycle game board, rules and stewardship cards. Create enough copies to supply groups of 4-5 students 1 copy each for class wide game play.

Overview

Each game participant starts the game with a cup of lentils - this is their "redd" (nest) where salmon eggs are laid. Each lentil represents one salmon egg that could eventually grow into an adult salmon. In fact, the number of lentils that is in each cup is approximately the number of eggs that an adult salmon would lay in a redd. You can pre-measure all the cups for the students or you can measure out the cups while you distribute each 4-6 ounce container to each student depending on preference and layout for classroom management.

Procedure

1. Once each player has been provided with their own 4-6 ounce container filled with lentils, they will select one coloured counter and place it on the start square on the game board. Each player rolls the die. The highest number goes first and each player goes in clockwise order from the first player that moved their playing chip on the board.
2. Game play will continue with players moving clockwise around the life cycle game board. Roll the die and enter the life cycle at the top left corner. Players move their chip the number of squares that show on the die. If a player lands on a Hazard Square (black, bold text), they place the fraction of their salmon eggs (lentils) into the centre container of the playing space. Remind the players that the fraction they read is to be applied to however many lentils are left in the cup (not the total that they started with). For example, if the player rolls that ½ of their salmon are eaten by a big fish, then they pour **½ of their remaining lentils** into the receptacle in the middle of the playing space before moving on.
3. If students have their counter land on the Safe Square (shaded gray), they stay there until their next turn. If they land on a Stewardship card space, they pick a card from the pile and save it. Next time they land on a hazard square, they can use it to move ahead to the next safe square. Once they use the card, they have to place it on the bottom of the stewardship card pile.
4. Everyone wins when they have moved around the board and back to the New Redd.

5. **Discussion:** Following game completion, discuss with the class what the game shows. Ask questions such as:
   - *How many salmon die at the egg stage?*
   - *How many are left to grow to the next stage?* (Most salmon die. Only a few make it to the next stage)
   - *What if two spawners do not survive?* (There are no eggs, but eggs from other spawners might survive and take their place)
   - *How do stewardship cards help salmon finish the life cycle?* (They help the salmon survive the hazard squares)
   - *What can people do to make sure enough spawners survive?* (Protect salmon and their environment, catch only those permitted)

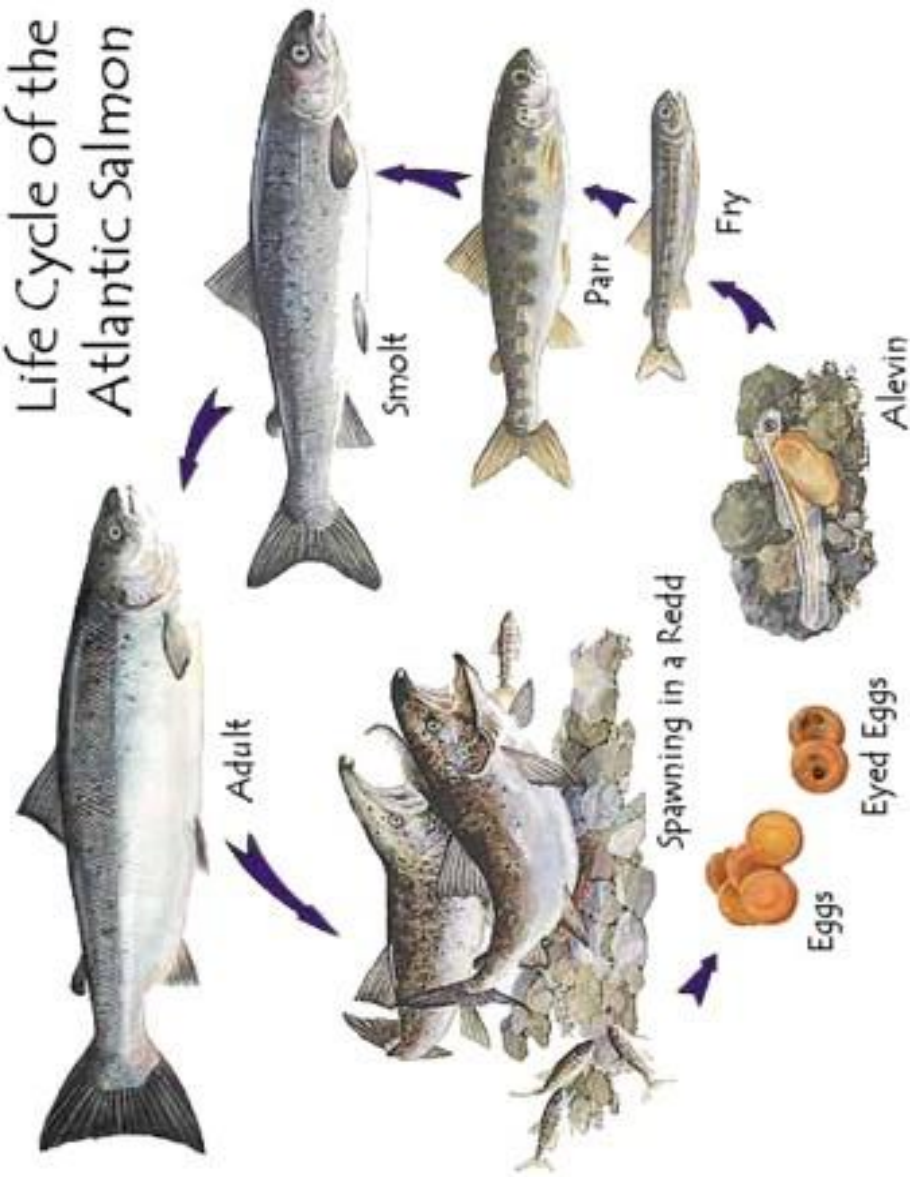
Life Cycle Game Rules

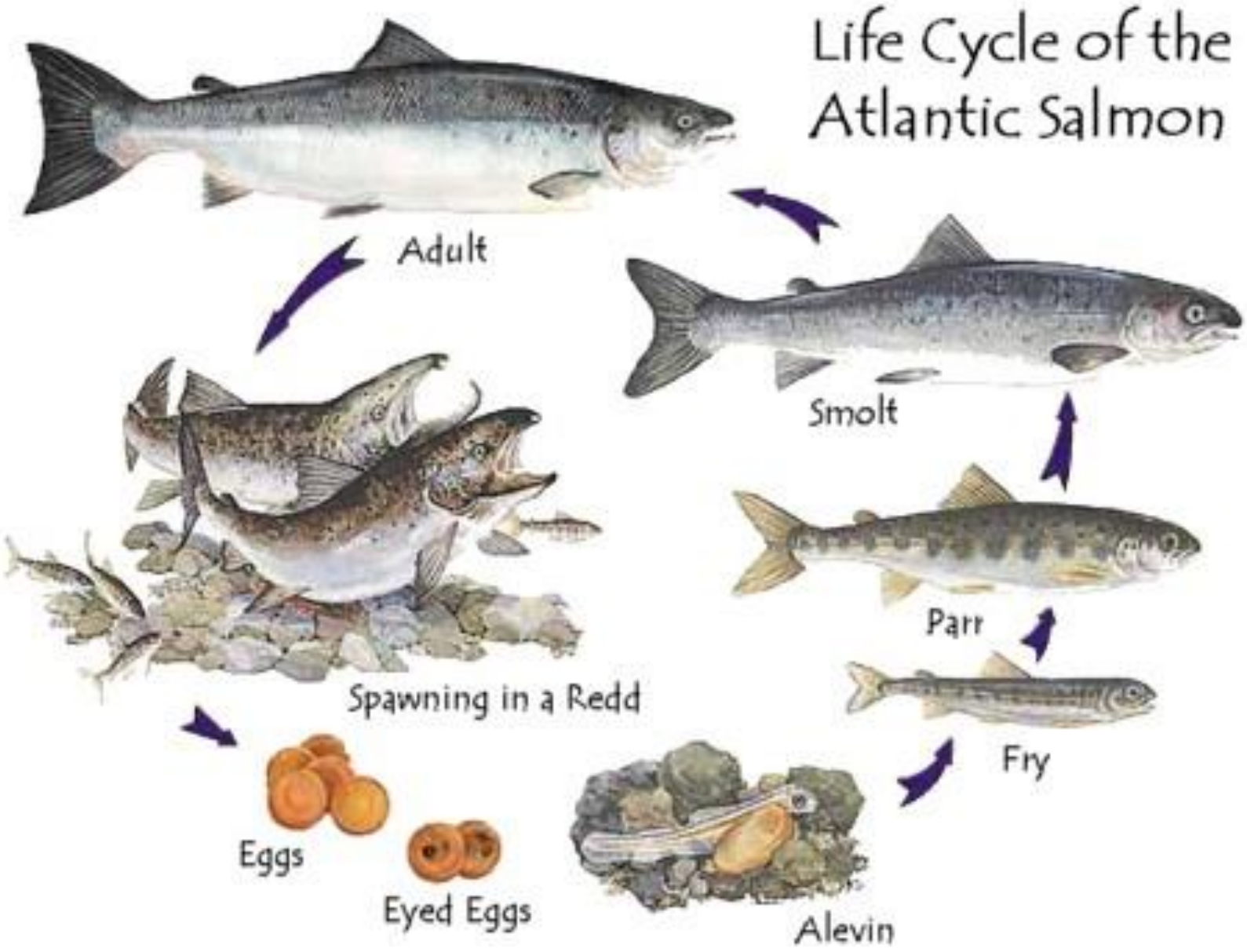
1. Each player starts with their own container filled with lentils, which are Atlantic Salmon eggs. Select one coloured counter that you will use as your playing piece to move around the game board.
2. Start at the new redd. Each person rolls the die. The highest number goes first and each player goes in clockwise order from the first person that placed their chip on the game board.
3. Players move clockwise around the life cycle game bard. Roll the die and enter the life cycle at the top left corner. Move the number of squares that show on the die.
4. If you land on a Hazard Square (black, bold text), place the fraction of your salmon eggs (lentils) into the large centre container. Note: the fraction that you read includes the lentils that are left in the cup (not the total that you started with). For example, if you roll that ½ of you salmon are eaten by a big fish, then you pour **½ of your remaining lentils** into the large container.
5. If you land on the Safe Square (shaded gray), stay on that spot until your next turn.
6. If you land on a Stewardship card space, you pick a card from the pile and save it. Next time you land on a hazard square you can use it to move ahead to the next safe square. Once you use a card, place it on the bottom of the stewardship card pile.
7. Everyone wins when they have moved around the board and have returned back to the New Redd space.

Stewardship Card You protect salmon habitat. You can move to the next Safe Square.	**Stewardship Card** You protect salmon habitat. You can move to the next Safe Square.	**Stewardship Card** You protect salmon habitat. You can move to the next Safe Square.
Stewardship Card You protect salmon habitat. You can move to the next Safe Square.	**Stewardship Card** You protect salmon habitat. You can move to the next Safe Square.	**Stewardship Card** You protect salmon habitat. You can move to the next Safe Square.
Stewardship Card You protect salmon habitat. You can move to the next Safe Square.	**Stewardship Card** You protect salmon habitat. You can move to the next Safe Square.	**Stewardship Card** You protect salmon habitat. You can move to the next Safe Square.
Stewardship Card You protect salmon habitat. You can move to the next Safe Square.	**Stewardship Card** You protect salmon habitat. You can move to the next Safe Square.	**Stewardship Card** You protect salmon habitat. You can move to the next Safe Square.

Migrate this way! ➡

FINISH You have successfully spawned again!!	**Start a New Redd**	**½ eggs freeze**	**SAFE REDD**	**½ eggs eaten by trout**	**1/3 eggs killed by disease**	STEWARDSHIP CARD
2/3 spawners lay eggs. Roll again						**½ eggs smother in silt**
SAFE STREAM						**½ alevin washed away in flood**
2/3 spawners eaten by eagle						**2/3 fry eaten by birds**
½ spawners eaten by bears						**SAFE POOL**
SAFE LAKE						**2/3 fry overheat in the sun**
½ spawners blocked by dam						**1/3 fry can't find food to eat**
1/3 spawners caught in nets						**SAFE STREAM**
SAFE RIVER						**2/3 fry can't find pools to rest in**
2/3 adults caught on fishing line						**½ fry can't swim past dam**
STEWARDSHIP CARD						**1/3 smolts eaten by eels. Roll again**
½ adults eaten by mackeral						STEWARDSHIP CARD
SAFE OCEAN	**½ adults caught in nets**	**2/3 adults don't find food**	**SAFE ESTUARY**	**1/3 smolts eaten by heron**	**½ smolts poisoned by pollution**	**SAFE ESTUARY**




Life Cycle of the Atlantic Salmon
Adult
Smolt
Parr
Fry
Alevin
Eggs
Eyed Eggs
Spawning in a Redd

Grade 4 Classroom Hatchery Activities

#6 Balance in Art and Science

Time Frame: 40-60 minutes

Class size: 20-30 students

Setting: Classroom

Objectives:
Through an art and science activity, students will be engaged by observing a piece of art that depicts an ecosystem and discuss how balance is important in both science and art. Following the exploration of the art piece, students will be able to create their own oval basin that depicts life within a stream habitat.

Materials:
-Image of Bernard Palissy: Oval Basin (to be displayed to whole class or printed in colour to be distributed to class)
-Oval basin handout
-Illustrations of stream species, reference books and/or technology
-Pencils, erasers, and pencil crayons
-Chart paper, whiteboard or Smartboard

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
-Plants and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitat
-Changes to habitats (whether caused by natural or human means) can affect plants and animals and the relationship between them
-Society relies on plants and animals
The Arts- Visual Arts
-Creating and Presenting: apply the creative process 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
-Reflecting, Responding, and Analysing: apply the critical analysis process to communicate feelings, ideas, and understandings in response to a variety of art works and art experiences

Specific Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
2.1 build food chains consisting of different plants and animals, including humans
2.3 use scientific inquiry/research skills to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs.
2.5 use appropriate science and technology vocabulary, including *habitat, population, community, adaptation* and *food chain* in oral and written communication

3.1 demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life (*e.g., food; water; air; space; and light)*
3.2 demonstrate an understanding of food chains as systems in which energy from the sun is transferred to producers (plants) and then to consumers (animals)
3.3 identify factors (*e.g., availability of water or food, amount of light, type of weather)* that affect the ability of plants and animals to survive in a specific habitat
3.4 demonstrate an understanding of a community as a group of interacting species sharing a common habitat (*e.g., life in a meadow or a patch of the forest)*
3.5 classify organisms, including humans, according to their role in a food chain (*e.g., producer; consumer; decomposer)*

The Arts- Visual Arts

D 1.2 demonstrate an understanding of composition, using selected principles of design to create narrative art works or art works on a theme or topic
D 1.3 use elements of design in art works to communicate ideas, messages and understandings
D 1.4 use a variety of materials, tools, and techniques to determine solutions to design challenges (*e.g., drawing)*
D 2.2 analyse the use of elements and principles of design in a variety of art works, and explain how they are used to communicate meaning or understanding

Background

Created in the 16th century by Bernard Palissy, the oval basin is live casted so the objects on the dish are moulds of actual animals.

Procedure

1. Display on the Smartboard or provide groups of students with colour copies of Bernard Palissy: Oval Basin. Image of the oval basin can be found at http://www.getty.edu/art/collection/objects/1196/attributed-to-bernard-palissy-oval-basin-french-about-1550/ and can also be downloaded for students to observe and study.
2. Provide students with a few minutes to view the basin. Read aloud: *Look at the oval plate before you. Imagine the water's edge, a place where these creatures may feel at home. Small frogs hop off rocks into a pond, lizards shimmy on their way to their next mea,l and fish dart under water among the plants. The natural world is as fascinating to us today as it was over 500 years ago when Bernard Palissy created this dish.*

Ask students: *What do you see in the picture?*

Tell students about the artist and the oval basin and how it was created: *Bernard Palissy was an artist who was inspired by nature as well as a scientist interested in careful observation. He used real plants and animals to cast the decorations on this plate, accurately capturing their form and detail. The small clay objects were then arranged and attached to the clay plate before it was hardened with heat. Palissy chose colours that would make the plants and animals more lifelike and used a special clear and runny glaze to give the plate a watery look.*

3. By drawing attention to the animals and plants that were included in this piece of art, students can understand that this plate is representing one habitat. Encouraging the students to view the art piece almost like a snapshot within a habitat, ask students if they feel this habitat would be sustainable or balanced (scientifically and artistically).
4. Ask students: *Can anyone give me the definition of balance?*
   Scientifically, we often understand balance as sustainability and the role of food chains and food webs. Artistically, we understand balance as the shadow, line and colour of an art piece.
5. On chart paper, whiteboard or chalkboard, record the roles of the animals that are found within the art piece.
   Looking at the art piece through the eyes of an ecosystem, identify the producers, primary consumer, secondary consumer, and decomposers.

Create a chart where students will list the animals that are in the art piece and the role they play within an ecosystem. Students are displaying their understanding of how the animals interact within an ecosystem rather than identifying the species.

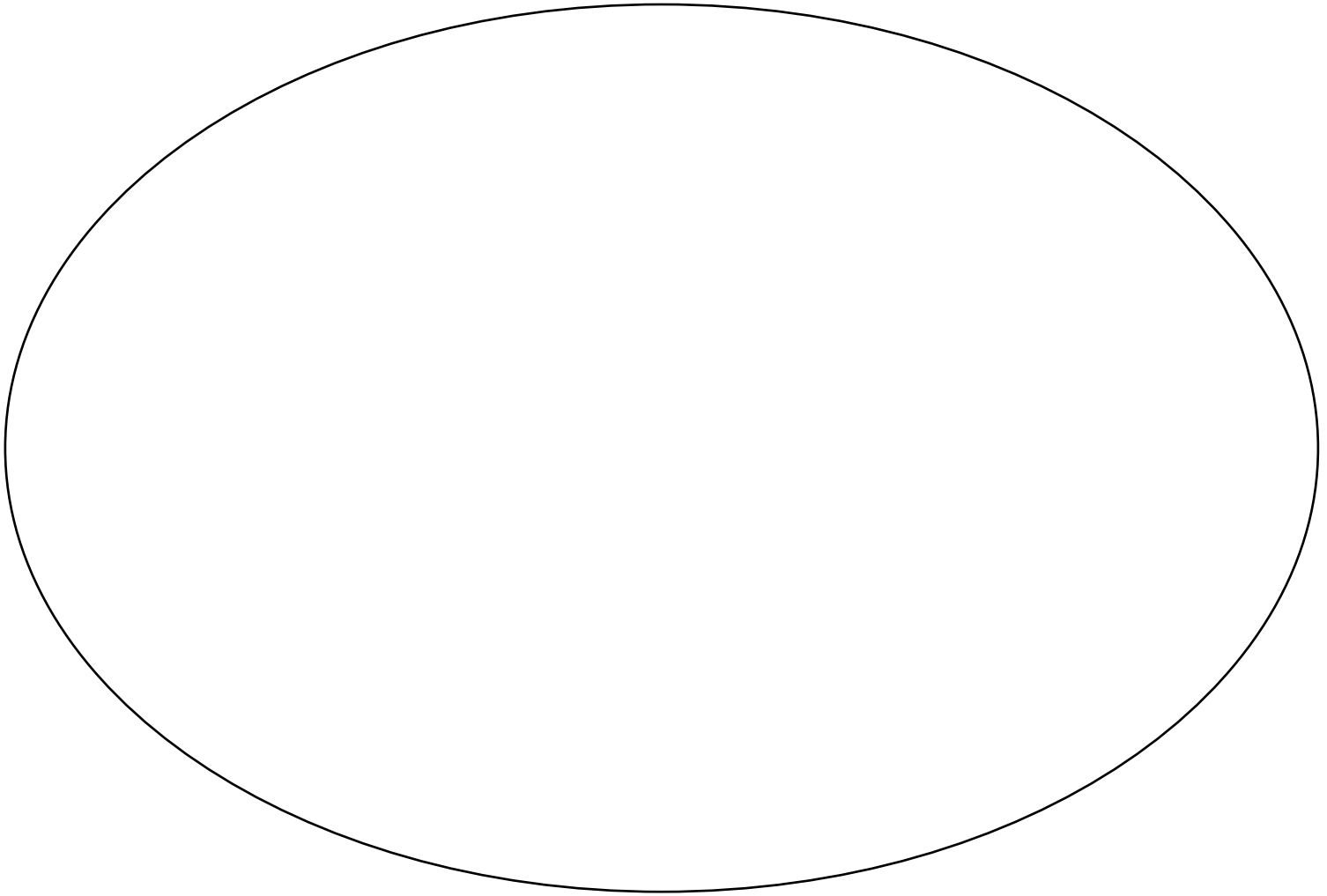
Producer	**Primary Consumer**	**Secondary Consumer**	**Decomposers**
Fern	Fish	Snake	Snail
		Lizard	
		Crayfish	

Ask: *If all of these features come from one habitat, what would the habitat be? Do we think it is freshwater or do we think it is saltwater and why?*

6. After identifying the different flora and fauna on the art piece, ask students: *Is this a balanced ecosystem, or artistically, is this balanced as a piece of art?*
   Ask students to point out exact details in the art piece that support their claim of why a balance is depicted in the piece.
   After students have had a chance to listen to each other's ideas, understandings and views, ask the students by a show up *thumbs up, thumbs down* if they feel the art piece is a balanced ecosystem. Thumbs up = balanced ecosystem, thumbs down = unbalanced ecosystem.
   Draw attention to the fact that artistically most of the students viewed the art piece as either balanced or unbalanced while scientifically, students could see by the chart outlining the role of the producers and consumers that the art piece was unbalanced.
7. Students will now create their own oval basin but use the species from a stream ecosystem. Students need to show a balanced ecosystem using organisms they know about from the stream habitat. Encourage students to use their own personal knowledge and connections, reference materials as found in the class or school library, online illustrations from personal research or teacher provided visual images as prompts and inspiration.
8. After students have sketched out their basins, colour will be added following this step, then have students display their artwork on a display board or their personal desks and complete a classroom "gallery walk". Ask students to comment or provide feedback on each other's or their own artwork. During the whole class gallery walk, enquire with students if their artwork displays a balanced ecosystem and what can be added or altered to depict a balanced ecosystem.
9. Following the gallery walk, students will revisit their artwork and modify it so that is depicts a sustainable ecosystem. Remind students to be sure that all species have food to eat before moving on to adding colour to their art basin using pencil crayons as their colouring medium.

My Oval Basin Of A Stream Habitat

Create your own oval basin but use only the species from a stream ecosystem. Sketch first and then add colour after the gallery walk as a class.



Name:_____

Grade 4 Classroom Hatchery Activities

#7 Smell Your Way Home

As adapted from: National Oceanic and Atmospheric Association

**** Be sure to check for any allergies to spices and vinegar prior to completing this activity ****

Time Frame: 40 minutes

Class size: 20-30 students

Setting: Classroom

Objectives:
Through an interactive class activity, students will be able to learn how toxins in watersheds can affect the olfactory function of salmon which impacts their ability to find their natal stream and reduce their ability to respond to chemical predation clues. By becoming familiar with six different scents and being able to match an initial scent to its match, students will be able to identify one river via smelling an index card, and interpret that fish need clean water to find their way home.

Materials:
-large chart paper or whiteboard to record KWL chart
-12: 3 x 5 index cards or pieces of cardstock with herbs or spices glued on. Six different scents, one of the cards in a pair labelled with a letter and the other card in the pair labelled with a number
-6 watershed signs with letters & matching index cards (6 release site locations for Atlantic Salmon) placed around the room (with approx. 50 yd. radius apart)
-Life Cycle poster
-1 or 2 dice (not necessary but provides an additional hands-on element to the activity)

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
-Plants and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitats
-Changes to habitats (whether caused by natural or human means) can affect plants and animals and the relationships between them
-Society relies on plants and animals

Specific Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
1.1 analyse the positive and negative impacts of human interactions with natural habitats and communities (*e.g., human dependence on natural materials)*, taking different perspectives into account (*e.g., the perspectives of a housing developer, a family in need of housing, an ecologist)* and evaluate ways of minimizing the negative impacts

1.2 identify reasons for the depletion or extinction of a plant or animal species (*e.g., hunting, disease, invasive species, changes in or destruction of its habitat)*, evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletions or extinctions from happening
2.3 use scientific inquiry/research skills to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs
2.5 use appropriate science and technology vocabulary, including *habitat, population, community, adaptation,* and *food chain* in oral and written communication
3.1 demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life (*e.g., food, water, air, space, and light)*
3.3 identify factors (*e.g., availability of water or food, amount of light, type of weather)* that affect the ability of plants and animals to survive in a specific habitat
3.4 demonstrate an understanding of a community as a group of interacting species sharing a common habitat (*e.g., the life in a meadow or in a patch of forest)*
3.7 describe structural adaptations that allow plants and animals to survive in specific habitats
3.8 explain why changes in the environment have a greater impact on specialized species than on generalize species
3.10 describe ways in which humans are dependent on natural habitats and communities (*e.g., for water, medicine, flood control in wetlands, leisure activities)*

Background

All fish can smell. Located on a fish's snout are paired holes or **nares**, used for detecting odours in the water. Some fish, like catfish and eels, have a heightened sense of smell. The nares are made up of many capsules, each containing numerous chemical receptors. Water flows through the nares as the fish swims or while they are facing into a current. Behind the nares, in a chamber, are sensors (chemical receptors) that detect chemicals that are dissolved in the water. Once an odour is detected, the nerves send signals to the fish's brain that interpret the smells. These smells might attract the fish or keep it at bay depending on whether the fish interprets the smell to represent food or danger. The sense of smell of the Atlantic Salmon is approximately 1,000 times greater than that of a dog. It is thought this superior sense of smell is used to aid the fish with navigation during their migration.

Preparation

On 12: 3 x 5 index cards or pieces of cardstock, place a thin patch of white glue over the letter and numbers on each label for the index cards. While it is still wet, sprinkle on a powdered herb or spice such as cinnamon, pepper, or more exotic scents such as coriander or Spanish paprika. Each of the 6 spices is to appear on two cards, with 6 pairs of cards in total. Placing the index card in a resealable bag or Tupperware container can provide a physical object (more than an index card) as well as can centralize the scent of the card directly into the container or bag so that student can track the smell more easily. Each pair of cards will be assigned a home river or stream (pictures of each stream and river are attached and will be assigned to each group as their home stream depending on the scent and the number they rolled on the dice).

Create an answer key for your own reference of what letter and number corresponds to each river or stream. For example, if index card A matches index card 4, assign these two cards to a river or stream for example: Credit River. Be sure to record A + 4 = Credit River; B + 2 = Ganaraska River, etc. on a separate piece of paper that you can match following the class exploration.

Procedure

1. On large chart paper or on the whiteboard, illustrate the following KWL chart with these headings:

What we **KNOW** about how fish find their home stream	What we **WANT TO KNOW** about how fish find their home stream	What we **HAVE LEARNED** about how fish find their home stream

Ask the students if they know how salmon return to their natal stream? Ask: *How do we know this? What other hypothesis could explain how the salmon return to their natal (home) streams?* (Potential answers could be: magnetic navigation, passive drift, random searching, temperature and salinity gradients, etc.)

2. Explain to students that salmon don't have noses like humans do. They "breathe" by taking in water through their mouth, and then it goes over and out of the gills. However, they do have NARES in which they can smell.
3. Have each student roll the dice smell the corresponding numbered and lettered index cards, remember the # and smell.
4. After becoming familiar with the newly assigned scent, they will visit all 6 rivers smelling each lettered index card to match it to their numbered index card they initially smelled and see which river that salmon would return to. Once they have found their home stream or lake, they will remain at that lake until their fellow salmon join them. If they didn't get it right the first time, ask how similar that might be for salmon? Is that realistic, yes!
5. Once each student has found their home stream, confirm their findings by matching the scent with the correct stream (use your notes from prior recording of what index cards match with each home stream as mentioned previously in activity plan). Conclude with facts and connections they have about how the salmon find their home stream. Such connections can be recorded in the **WHAT WE HAVE LEARNED** portion of the KWL chart.
    - Every stream has a unique smell
    - Salmon can tell the different between the odours of different streams
    - Salmon retain a memory of their home stream odour, this is called imprinting
6. Ask the students what may cause salmon not to smell or be confused with the odours? Toxins that enter our streams and rivers either by runoff or from sewage outfalls which can affect the olfactory cells, reducing the surface area to smell.
7. Challenge the students to consider the top 10 things to protect a habitat and reduce toxins from entering waters in the first place.

Scented Index Cards: Labels with letters

On 12: 3 x 5 index cards or pieces of cardstock, place a thin patch of white glue. While it is still wet, sprinkle on a powdered herb or spice such as cinnamon, pepper, or more exotic scents such as coriander or Spanish paprika. Each of the 6 spices is to appear on two cards, with 6 pairs of cards in total. Placing the index card in a resealable bag or Tupperware container can provide a physical object (more than an index card) as well as can centralize the scent of the card directly into the container or bag so that student can track the smell more easily.

Match the scent below with correct number: A Once you have found the correct match, return to your home stream	Match the scent below with correct number: B Once you have found the correct match, return to your home stream	Match the scent below with correct number: C Once you have found the correct match, return to your home stream
Match the scent below with correct number: D Once you have found the correct match, return to your home stream	Match the scent below with correct number: E Once you have found the correct match, return to your home stream	Match the scent below with correct number: F Once you have found the correct match, return to your home stream

Scented Index Cards: Labels with numbers

On 12: 3 x 5 index cards or pieces of cardstock, place a thin patch of white glue. While it is still wet, sprinkle on a powdered herb or spice such as cinnamon, pepper, or more exotic scents such as coriander or Spanish paprika. Each of the 6 spices is to appear on two cards, with 6 pairs of cards in total. Placing the index card in a resealable bag or Tupperware container can provide a physical object (more than an index card) as well as can centralize the scent of the card directly into the container or bag so that student can track the smell more easily.

Match the scent below with correct letter: 1 Once you have found the correct match, return to your home stream: **Credit River**	Match the scent below with correct letter: 2 Once you have found the correct match, return to your home stream: **Duffins Creek**	Match the scent below with correct letter: 3 Once you have found the correct match, return to your home stream: **Cobourg Creek**
Match the scent below with correct letter: 4 Once you have found the correct match, return to your home stream: **Humber River**	Match the scent below with correct letter: 5 Once you have found the correct match, return to your home stream: **Bronte Creek**	Match the scent below with correct letter: 6 Once you have found the correct match, return to your home stream: **Ganaraska River**

Home Stream:

1

Credit River

Home Stream:
2

Duffins Creek

Home Stream:

3

Cobourg Creek

Home Stream:
4

Humber River

Home Stream:
5

Bronte Creek

Home Stream:

6

Ganaraska River

Grade 4 Classroom Hatchery Activities

#8 Eroding Homes

As adapted from: Discovery Education - Erosion Rates

Time Frame: 60-70 minutes

Class size: 20-30 students

Setting: Classroom

Objectives:
Students will conduct simple investigations to collect data on erosion rates of different Earth materials (waves, wind, water, glaciers). Students will be able to recognize that waves, wind, water and glaciers all break rock and soil into smaller particles and move them around and rank their investigations to evaluate the most efficient agent of erosion.

Materials:
- Small tray
- Cup of water
- Aluminum baking pan
- Sand
- Water
- Metric ruler
- Piece of cardboard
- Drinking straw
- Ice cube
- Modeling clay
- Meter stick
- Soil
- Dropper
- Station cards (attached)
- Student observation response sheets (attached)
- Frayer vocab sheet (attached)
- Smartboard or large whiteboard with Frayer vocab diagram illustrated x3

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
-Plants and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitats
-Changes to habitats (whether caused by natural or human means) can affect plants and animals and the relationships between them
-Society relies on plants and animals

Specific Expectations

Science & Technology- Understanding Life Systems: Habitats and Communities

1.1 analyse the positive and negative impacts of human interactions with natural habitats and communities (*e.g., human dependence on natural materials)*, taking different perspectives into account (*e.g., the perspectives of a housing developer, a family in need of housing, an ecologist)*, and evaluate ways of minimizing the negative impacts

1.2 identify reasons for the depletion or extinction of a plant or animal species (*e.g., hunting, disease, invasive species, changes in or destruction of its habitats)*, evaluate the impacts on the rest of the natural community, and propose possible actions from preventing such depletions or extinctions from happening

2.3 use scientific inquiry/research skills to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs

2.5 use appropriate science and technology vocabulary, including *habitat, population, community, adaptation,* and *food chain*, in oral and written communication

2.6 use a variety of forms (*e.g., oral, written, graphic, multimedia)* to communicate with different audiences and for a variety of purposes

3.1 demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life (*e.g., food, water, air, space, and light)*

3.3 identify factors (*e.g., availability of water or food, amount of light, type of weather)* that affect the ability of plants and animals to survive in a specific habitat

3.4 demonstrate an understanding of a community as a group of interacting species sharing a common habitat (*e.g. the life in a meadow or in a patch of forest)*

3.8 explain why changes in the environment have a greater impact on specialized species than on generalized species

3.9 demonstrate an understanding of why all habitats have limits to the number of plants and animals they can support

3.10 describe ways in which humans are dependent on natural habitats and communities (*e.g., for water, medicine, flood control in wetlands, leisure activities)*

Background

Earth is always changing. New mountains, lakes and rivers are being made, and old ones are disappearing. Internal and external forces cause changes on Earth. Sometimes the changes are fast, and sometimes the changes are slow. Erosion, weathering, and glaciation are due to slow processes while hurricanes, flooding, landslides, and volcanoes are quick processes. Gravity is the natural force that causes changes in Earth's surface features. The major agent erosion is running water as it has had the largest impact on Earth's land surface. Erosion is different from weathering because weathering is the process that breaks down rock and other substances at the Earth's surface while erosion is the movement of rock particles by water and wind.

Preparation

Before students arrive, print station cards and make enough copies of the student observation response sheets. Materials should be arranged at each station ready to be used prior to students coming into the class. Depending on your class size, you might want to provide multiple setups of each station.

For the warm-up activity, have sand in trays prepared and cups of water off to the side of the classroom. Prepare enough for pairs of students.

Procedure

Warm-up Activity

1. Provide students with a small amount of sand, a small tray, safety googles, and cup of water. Challenge them to move the sand from one end of the tray to the other using as many different methods as they can.

Students should record their methods and share with the class. One method for example might be blowing the sand it is important students wear safety goggles while investigating.
Ask students to identify the processes they are demonstrating. At this point, students are likely to give very general/common descriptions of the processes. They might use terms such as blowing, pushing, and rolling. Students should be prompted to use the term erosion by clarifying erosion is process in which water, ice, or wind move pieces of rock and soil.

2. As a whole class, guide students to define the terms erosion, sediment and gravity. Provide each student with their own copy of the Frayer model (x 3) and have them complete their own copy using the information from the class model. On the Smartboard or Whiteboard, begin by writing the definition in the middle oval and fill out the four sections. Students will copy the information as it is creating and lead by the staff. The following terms that will be of focus are: ***erosion***, ***sediment*** and ***gravity***. These terms will be used frequently throughout the lesson.
3. Explain that there are four stations around the room that investigate systems that impact Earth's surface. They will be observing that all stations demonstrate a different agent of erosion and its effect on Earth's surface. Allot for 5 minutes at each station for 4 students in pairs to conduct each experiment. (providing multiples of each station will accommodate larger class numbers)

Station #1: **Waves**
Materials: aluminum baking pan, sand, water, metric ruler, and piece of cardboard
Students will build a small hill on one side of a tray with sand. On the other end, they will pour a cup of water. Students will create different sized waves using the piece of cardboard. Ask students to observe how the sand moves. Students will observe the sand being carried into the water and back onto the sand pile.

Station #2: **Wind**
Materials: aluminum baking pan, cornmeal or sand, and drinking straw
Students cover the pan with a layer of sand or cornmeal 1-2 cm thick. They will use a straw to gently blow over the layer of sediment. Ask students to observe how the sand moves. Students will observe the sand or sediment being carried by their breath of air and being dropped down after they stop blowing. Students might use the term gravity to explain how the sediment dropped.

Station #3: **Glaciers**
Materials: Ice cube, modelling clay, sand, cardboard
Students slide an ice cube over the clay and sand. They then leave the ice cube to melt at the end of the path. Ask students to observe how the sand moves. Students will observe the ice picking up particles of sand and that they are making a path. Where the ice melts they will observe the sand making a small pile.

Station #4: **Water**
Materials: Petri dish, soil, water, pipette, meter stick
Students will fill a petri dish with 1 cm of soil. They will place the dish on a paper and fill a dropper with water. Students will squeeze a large water drop from a height of 1 m onto the surface of the soil. They will measure the distance the soil splashed from the dish. They will repeat these steps at a height of 2 m. Ask students to observe how the dirt moves. Students will observe that the greater height the soil splashed further. The splash caused the sediment to move from one place to another.

4. As a whole class, encourage students to discuss with their elbow partners and debate a ranking of most efficient agent of erosion to the least efficient based on their observations. Ask students to consider the amount of sediment that was moved from one place to another. More sediment moved is evidence of a more efficient method.
5. Following the elbow-partner discussion, share with students that human activities can also affect the Earth's surface. Ask students to consider how erosion is impact when you plant trees on Earth's surface.

Deforestation is the process of removing all the trees and vegetation. How could this process impact erosion?
(Students will identify that by planting trees you can stop sediment from moving. Trees slow down water as it runs and the roots can use the water. If trees are removed, sediment can continue to move freely.)
Ask students how erosion and deforestation can affect a shoreline and ask how eroding shorelines can cause unhealthy habitats for fish, such as Atlantic Salmon.
(*Deforestation will cause the water temperature to increase whicht will impact the aquatic life that is in the stream including Atlantic Salmon. Atlantic Salmon require cold and clear water in their streams for a healthy habitat and for their eggs to be able to survive and not suffocate in muddy water. With mud and silt, finding the appropriate nutrition, a safe area for eggs to hatch, and cold water temperatures, fish like Atlantic Salmon would be required to find an alternate healthy habitat that could meet their needs.)*

Station Cards

Waves
Wind
Glaciers
Water

**** Provide each station with 1 copy per student of each card after cutting them out**

Name:_____

Waves

Waves carry sand and other materials. As waves move over land, they drop off the materials they carry. As waves hit the shore, they break down rocks and other materials into small pieces. Erosion is the movement of pieces from one place to another.

Do large waves erode MORE than small waves?

1. Build a small sand hill on one side of the pan.
2. Add water and make waves with the small piece of cardboard.
3. Make small waves and then large waves.
4. What did you notice about the size of waves and erosion?

_____

_____

Name:_____

Wind

Wind shapes the land in place where there are few plants to hold the soil in place. Wind carries sand that can grind down other rock. Wind carries sand and drops it creating hills, like sand dunes.

How does moving air affect sediment?

1. Cove the bottom of a pan with a layer of cornmeal or sand (1-2 cm deep).
2. Gently blow over the layer of sediment (cornmeal or sand) using a straw to direct your breath. Observe what happens.
3. What changes did the wind you created make in the flat layer of sediment?

_____

_____

Name:_____

Glaciers

Glaciers can form only in an area where more snow falls than it can melt. The movement of a glacier changes the land beneath it. They move slowly and can pick up rocks and dirt as they move. These sediments can scrape against the land as it flows with the glacier. When a glacier melts it will drop the sediments creating new landforms.

How do glaciers affect sediment?

1. There is a modeled landscape made out of clay with sand at your station, sprinkle with extra sand it needed.
2. Slide an ice cube over the clay and sand.
3. Leave the ice cube to melt at the end of the path.
4. Write a description of how the sand moved.

_____

_____

Name:_____

Water Erosion

Water in all forms can cause erosion. Raindrops splash moving particles of soil. In streams, water moves picking up and dropping sediment.

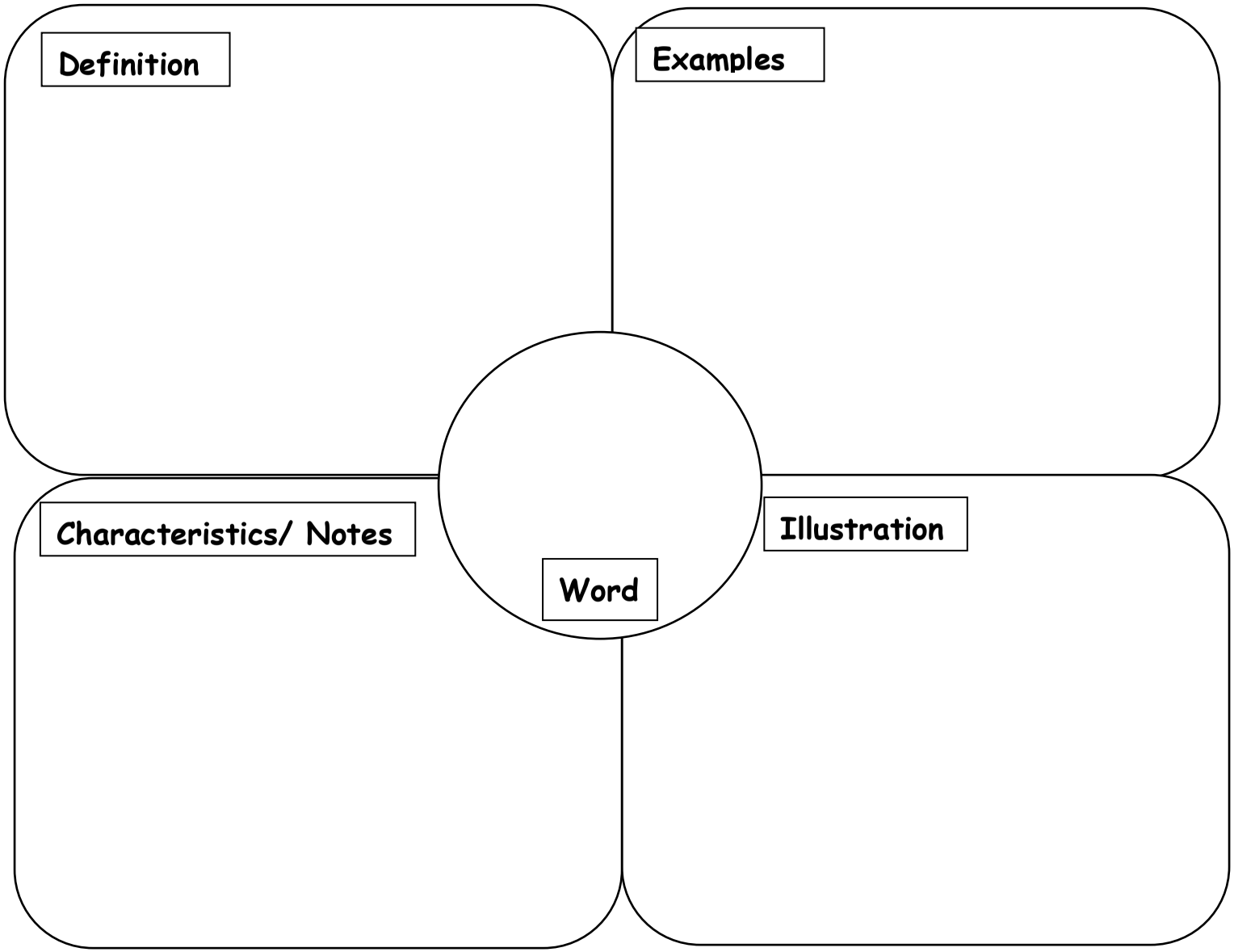
How does the force of falling raindrops affect soil?

1. Fill a Petri dish with fine textures soil to a depth of about 1 cm. Make sure the soil is flat but not hardly packed.
2. Place the dish on paper.
3. Fill a dropper with water. Squeeze a large water drop from a height of 1 m onto the surface of the soil. Repeat 4 times.
4. Use a meter stick to measure the distance the soil splashed from the dish.
5. Repeat steps 1 through 4, this time from a height of 2 m.
6. Which travelled further, the splash from 1 m or the splash from 2 m?
7. Which test produced the greater amount of erosion? Why?

_____

_____

Frayer Vocab Model



Grade 4 Classroom Hatchery Activities

#9 Race To The Redd

As adapted from: NOAA

Time Frame: 40 minutes

Class size: 20-30 students

Setting: Classroom

Objectives:
Through a class-wide read aloud, students will become familiar with how Atlantic Salmon lay their eggs and the creation of a redd in the bed of the stream. In partners, students will further their familiarity with the life cycle of Atlantic Salmon through the interactive play of the Race to the Redd board game.

Materials:
-Salmon Spawners reading handout (1 copy per pair of students) (attached)
-Pebbles or small counters to be used as markers (1 per student)
-Race to the Redd game board (1 per pair of students) (laminated for re-use)
-Race to the Redd game challenge cards (1 per pair of students) (laminated for re-use)
-1 coin per partner to play heads/tails (1 per pair of students)

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
-Plants and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitats
-Changes to habitats (whether caused by natural or human means) can affect plants and animals and the relationships between them
-Society relies on plants and animals
Science & Technology- Understanding Earth and Space Systems: Rock and Minerals
-Rock and minerals have unique characteristics and properties that are a result of how they were formed
Language- Reading
1. Read and demonstrate an understanding of a variety of literary, graphic, and informational texts, using a range of strategies to construct meaning
2. Use knowledge of words and cueing systems to read fluently

Specific Expectations
Science & Technology-Understanding Life Systems: Habitats and Communities
1.1. Analyse the positive and negative impacts of human interactions with natural habitats and communities (*e.g., human dependence on natural materials)*, taking different perspectives into account (*e.g., the perspectives of a housing developer, a family in need of housing, an ecologist)*, and evaluate ways of minimizing the negative impacts

1.2. Identify reasons for the depletion or extinction of a plant or animal species (*e.g., hunting, disease, invasive species, changes in or destruction of its habitats),* evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletions or extinctions from happening

2.3 use scientific inquiry/research skills to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs

2.5 use appropriate science and technology vocabulary, including *habitat, population, community, adaptation,* and *food chain,* in oral and written communication

3.1 demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life (*e.g., food, water, air, space and light)*

3.3 identify factors *(e.g., availability of water or food, amount of light, type of weather)* that affect the ability of plants and animals to survive in a specific habitat

3.4 demonstrate an understanding of a community as a group of interacting species sharing a common habitat (*e.g., the life in a meadow or in a patch of forest)*

3.8 explain why changes in the environment have a greater impact on specialized species than on generalized species

3.9 demonstrate an understanding of why all habitats have limits to the number of plants and animals they can support

3.10 describe ways in which humans are dependent on natural habitats and communities (*e.g., for water, medicine, flood control in wetlands, leisure activities)*

Science & Technology- Understanding Earth and Space Systems: Rock and Minerals

2.4 use scientific inquiry/ research skills to investigate how rocks and minerals are used, recycled, and disposed of in everyday life

Language- Reading

1.1 read a variety of texts from diverse cultures, including literary texts (*e.g., myths, plays, short stories, chapter books, letters, diaries, poetry)* graphic texts *(e.g., graphic novels, diagrams, brochures, graphs and graphic organizers, charts and tables, maps),* and informational texts *(e.g., textbooks, non-fiction books on a range of topics, print and online newspaper and magazine articles or reviews, print and online encyclopedia's and atlases, electronic texts such as e-mails and zines)*

1.3 identify a variety of reading comprehension strategies and use them appropriately before, during, and after reading to understand texts (*e.g., activate prior knowledge throughout brainstorming; ask questions to focus or clarify reading; use visualization to clarify details about such things as the sights, sounds, and smells in a medieval castle; make and confirm predictions based on evidence from the text; synthesize ideas during reading to generate a new understanding of a text)*

1.4 Demonstrate understanding of a variety of texts by summarizing important ideas and citing supporting details (*e.g., make an outline of a section from a textbook in another subject to prepare for a test)*

1.5 Make inferences about texts using stated and implied ideas from the text as evidence

1.6 Extend understanding of texts by connecting the ideas in them to their own knowledge, experience, and insights to other familiar texts, and to the world around them

1.8 express opinions about the ideas and information in texts and cite evidence from the text to support their opinions

3.1 automatically read and understand high-frequency words, most regularly used words, and words of personal interest of significance in a variety of reading contexts

3.2 predict the meaning of and rapidly solve unfamiliar words using different types of cues, including: semantic cues, syntactic cues and graphophonic cues

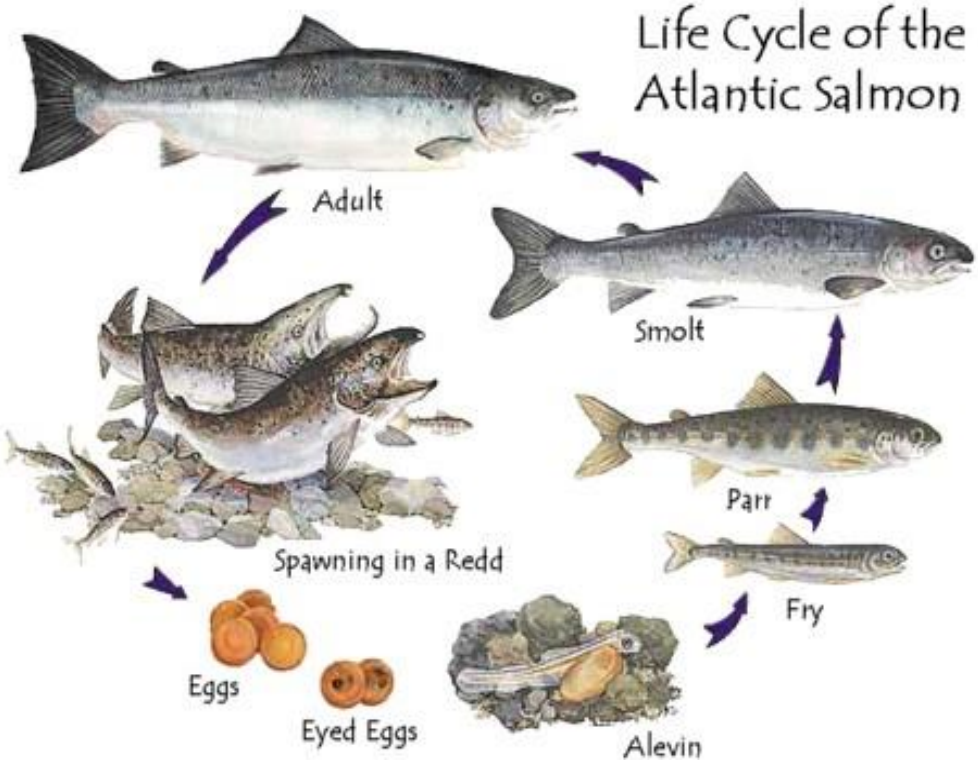
3.3 read appropriate texts at a sufficient rate and with sufficient expression to convey the sense of the text readily to the reader and an audience

Procedure

1. As a whole class, read aloud the *Salmon Spawners Reading*; partners can read along silently while volunteers read the handout aloud. Have students use the salmon life cycle illustration as included in the reading to explain what a redd is, who makes it, how and why. If necessary, prompt the students with questions such as:
    - *Where do you see a redd in the life cycle illustration?*
    - *Who is making the redd?* The female salmon.
    - *Where does she make the redd?* In the bed of the stream.
    - *How does the salmon make the redd?* She uses her tail to create a current which moves rocks in a depression.
    - *What is the redd made of?* Rocks and gravel.
    - *Why does she make a redd?* To protect the eggs that she lays.

2. In pairs, students will play *Race To The Redd* board game. Using pebbles or small counters as markers, partners will place them on *THE REDD*. Flipping a coin to see which player moves first, students will take turns flipping the coin with heads = move 2 spaces and tails = move 3 spaces. Students must find a fish ladder and go up it in order to return to the redd first to spawn. Students will draw challenge cards from the challenge card pile during game play to face challenges that Atlantic Salmon have to overcome while they make the trek to return to their redd to spawn and lay their eggs. Game boards and challenge cards can be laminated for re-use with multiple classes or replay over the course of the school year.

Demonstrating game play can be an option prior to releasing students to independent play or you can provide pairs of students with the game board, game pieces and a coin and they will continue on with game play at their own pace. Students may require some presentation and/or practice of flipping a coin if needed and instruction on how to identify heads vs. tails.

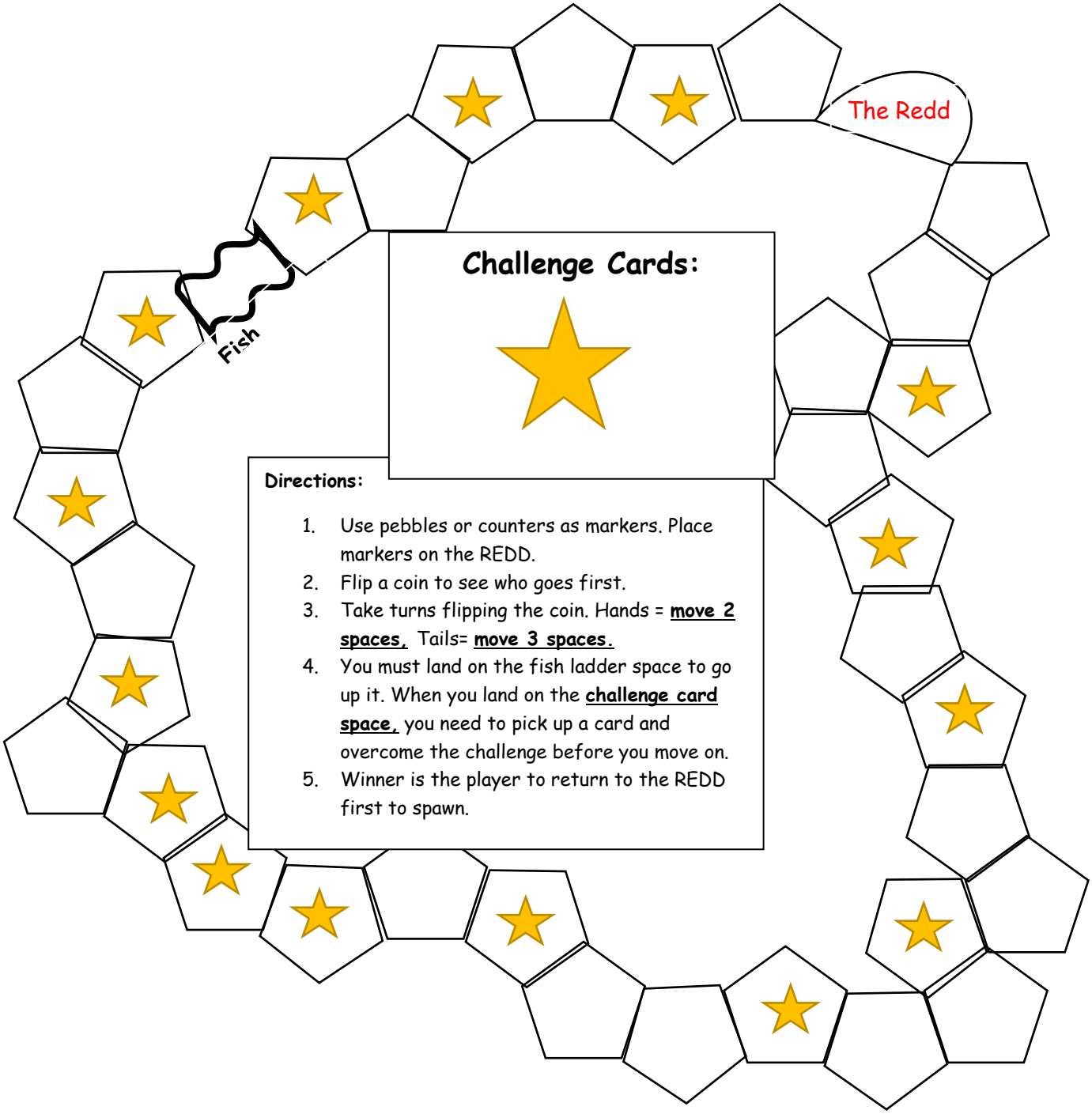


Salmon Spawners Reading

Lake Ontario Atlantic Salmon spawners leave the lake to travel upstream to the stream where they were born.

On the long trip upstream, spawners rarely eat. Their shape and colour changes. Males develop a hooked jaw.

As they swim, they face many dangers. They must jump waterfalls and rapids. Human anglers try to catch them. Eagles may try to eat them. Spawners smell the water to find their natal stream. When they reach their natal stream, the *female* builds a *redd.* She sweeps her tail to create a current, which moves rocks and gravel to make a stone nest. She lays her eggs in the redd. The male deposits his *milt* so the eggs are fertilized. The female covers the eggs.


The Redd
Fish
Challenge Cards:
Directions:
1. Use pebbles or counters as markers. Place markers on the REDD.
2. Flip a coin to see who goes first.
3. Take turns flipping the coin. Hands = move 2 spaces, Tails= move 3 spaces.
4. You must land on the fish ladder space to go up it. When you land on the challenge card space, you need to pick up a card and overcome the challenge before you move on.
5. Winner is the player to return to the REDD first to spawn.

Challenge Cards: Kids plant trees on stream bank so water is cool and clean, keeping you healthy. **Swim forward 4 spaces.**	**Challenge Cards:** A person fishing steps on your redd. **Start over.**	**Challenge Cards:** Yum! Mayflies are your favourite food. **Take another turn.**
Challenge Cards: Yuck! Dog waste in the river. **Go back 2 spaces to recover.**	**Challenge Cards:** River cleanup day! People pick up litter. **Frolic ahead 1 space.**	**Challenge Cards:** Spring rainstorm makes you want to move! Swim towards the lake. **Move 1 space.**
Challenge Cards: **Lose 1 turn** while you get used to the stream water.	**Challenge Cards:** You reach the lake and find a school of alewife. **Grow bigger and leap ahead 2 spaces!**	**Challenge Cards:** Yikes! Caught on a hook! **Wiggle back 3 spaces to get loose.**

Challenge Cards: Bass in the water! **Lose 1 turn while you hide.**	**Challenge Cards:** Time to find your home river! **Jump ahead 2 spaces.**	**Challenge Cards:** Someone cut trees along the river. The water gets hotter and makes it hard for you to breathe. **Lose a turn.**
Challenge Cards: You found the fish ladder! **Jump up the ladder.**	**Challenge Cards:** Dead end! A large dam is in your way. **Go back 5 spaces and try to find the fish ladder.**	**Challenge Cards:** You find lots of gravel. **Skip ahead to the redd and lay your eggs!**

Classroom Hatchery Activities

#10 Salmon Migration

As adapted from: American River Salmon Festival Schools

Time Frame: 50 minutes

Class size: 20-30 students

Setting: Classroom

Objectives:
Through a hands-on interactive mathematical board game, students will describe the seasonal migration of anadromous fish, like Atlantic Salmon, and identify a variety of natural and human factors that affect the reproductive success of Atlantic Salmon and apply mathematical skill to biological problems.

Materials:
-Atlantic Salmon life cycle (attached)
For each group of 2-4 players:
-Game board (attached)
-*Salmon Migration* worksheets to keep score (double sided)
-sets of cards (make a set of cards for each 4 players)
-a die
-2-4 salmon or other counters for players to move
-storage box, such as a shirt box
-vocab sheets
-calculator (optional)
-Whiteboard or chart paper

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Habitats and communities
-Analyse the effects of human activities on habitats and communities
-Investigate the interdependence of plants and animals within specific habitats and communities
-Demonstrate an understanding of habitats and communities and the relationships among the plants and animals that live in them
Mathematics: Number Sense and Numeration
-Solve problems involving the addition, subtraction, multiplication, and division of single and multi-digit whole numbers, and involving the addition and subtraction of decimal numbers to tenths and money amounts, using a variety of strategies

Specific Expectations
Science & Technology- Understanding Life Systems: Habitats and communities
1.1 analyse the positive and negative impacts of human interactions with natural habitats and communities (e.g., *human dependence on natural materials)*, taking different perspectives into account (*e.g., the perspectives of a housing developer, a family in need of housing, an ecologist)*, and evaluate ways of

minimizing the negative impacts

1.2 identify reasons for the depletion or extinction of a plant or animal species (*e.g., hunting, disease, invasive species, changes in or destruction of its habitats),* evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletions or extinctions from happening

2.3 use scientific inquiry/research skills to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs

2.5 use appropriate science and technology vocabulary, including *habitat, population, community, adaptation*, and *food chain*¸ in oral and written communication

3.1 demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life (*e.g., food, water, air, space, and light)*

3.3. identify factors *(e.g., availability of water or food, amount of light, type of weather)* that affect the ability of plants and animals to survive in a specific habitat

3.4 demonstrate an understanding of a community as a group of interacting species sharing a common habitat (*e.g., the life in a meadow or in a patch of forest)*

3.8 explain why changes in the environment have a greater impact on specialized species than on generalized species

3.9 demonstrate an understanding of why all habitats have limits to the number of plants and animals they can support

3.10 describe ways in which humans are dependent on natural habitats and communities (*e.g., for water, medicine, flood control in wetlands, leisure activities)*

Mathematics: Number Sense and Numeration

-Represent fractions using concrete materials, words, and standard fractional notation, and explain the meaning of the denominator as the number of the fractional parts of a whole or a set, and then numerator as the number of fractional parts being considered

-Solve problems that arise from real-life situations and that relate to the magnitude of whole numbers up to 10,000

-Add and subtract two-digit numbers, using a variety of mental strategies

-Solve problems involving the addition and subtraction of four-digit numbers, using student-generated algorithms and standard algorithms

-Solve problems involving the multiplication of one-digit whole numbers, using a variety of mental strategies

-Multiply whole numbers by 10, 100, and 1000, and divide whole numbers by 10, and 100, using mental strategies

-Multiply two-digit whole numbers by one-digit whole numbers, using a variety of tools (e.g., base ten materials or drawings of them, arrays), student- generated algorithms and standard algorithms

-Divide two-digit whole number by one- digit whole numbers, using a variety of tools

-Use estimation when solving problems involving the addition, subtraction, and multiplication of whole numbers, to help judge the reasonableness of a solution

-Describe relationships that involve simple whole-number multiplication

-Determine and explain, through investigation, the relationship between fractions (*i.e., halves, fifths, tenths)* and decimals to tents, using a variety of tools (*e.g., concrete materials, drawings, calculators)* and strategies

Background

Migration is the movement of animals from one area to another. Many species migrate seasonally. In this activity, salmon seasonally migrate from the open ocean through estuaries and into freshwater rivers and streams where they spawn (lay their eggs). The newly hatched young must them migrate back down the rivers to the ocean. Fish that follow this pattern are said to be anadromous from the Greek word for "running upward". Both the adults and the young face a number of hazards, some natural and some from humans. As the students play this game, they will learn about these hazards.

Preparation

1. Print and cut out the game board and game cards. For repeated use, laminate game pieces. Copy the cards and glue to different colours of construction paper. Copy the worksheet.

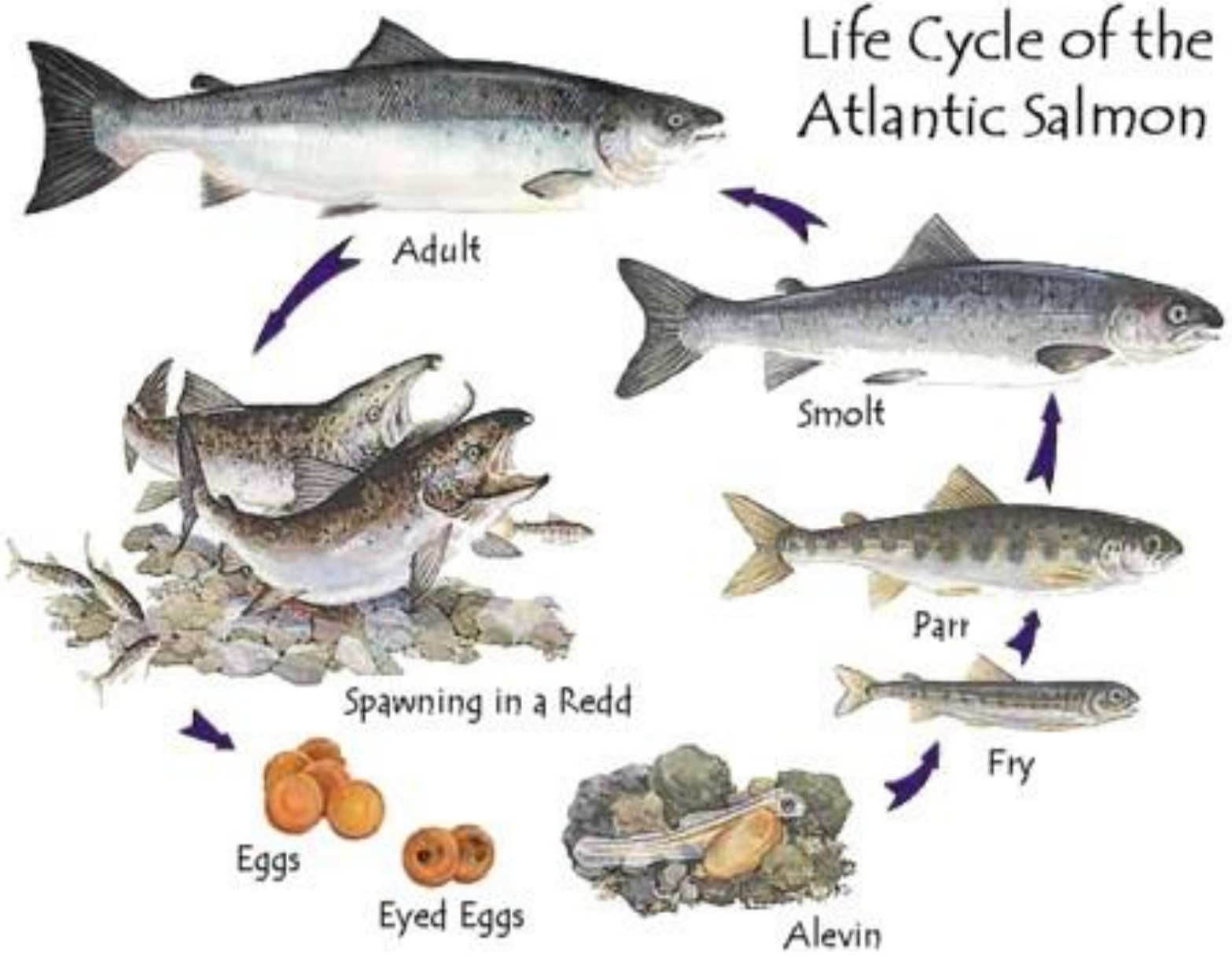
Procedure

1. Ask students what they know about migration. Have students name animals that migrate. Some questions you can ask include:
    - *Why do animals seasonally migrate?*
    - *Is it climatic changes that affect food supply and reproductive potential?* Example: Canadian geese migrate each spring to breed in the northern U.S. and Canada, and then migrate south each fall to winter on feeding grounds in the southern regions of the United States. *What about fish?*
2. Review the life cycle of salmon - you can use the attached handout.
3. Introduce the Salmon Migration Game. In this game, students will be salmon migrating from the ocean (where they feed and grow into adults) into rivers and creeks to spawn and release eggs, which are fertilized outside the female's body.
4. Have the students predict some of the hazards they are likely to encounter during their migration. Make a list of the predictions on the whiteboard or chart paper.
5. The students will keep track of their population size on worksheets. Graph the decline of fish as they swim upriver and the decrease of offspring as they swim down to feeding grounds in the sea.
6. Following the game, review with the students, and update the list of hazards they encountered while playing the game. Enquire if they included:

-predation by a wide variety of predators
-food supplies
-changes in water level from lack of rainfall
-abnormal temperatures
-unusually severe storms
-parasites and diseases
-water pollution
-sediment from runoff
-obstructions to migration such as dams
-fishing

7. Ask students: *Which of these hazards are natural and which are a result of humans?* Discuss the fact that even if humans were completely out of the picture, far more salmon are spawned than will ever survive to reproduce. Each species of animal or plant is capable of producing more offspring than are needed to just replace the individuals already alive. This allows species to survive predation and recover from natural changes or disasters. It also means that when natural controls, such as predators, are removed, populations may explode in size.

Life Cycle of the Atlantic Salmon



Salmon Migration Game Sheet

You have a run of salmon trying to reach the spawning grounds. There are 1,000 fish in this run. There are many dangers ahead. Each time you meet a hazard, subtract the number of fish that died. Use this chart to keep track of your fish population.

Ocean	Estuary	Streams

The number of adult fish that reached the spawning ground is: _____

How many alevin were produced? Calculate as follows:

1. Roll the die. Your number was:_____
2. Multiply this times 10 _____ x _____ = _____
3. Multiply this number by the total number of adult fish to get the number of baby salmon that start downstream:_____

Now the fingerling/fry salmon head for the ocean. Keep track of the changes in the number of fish as they swim.

Ocean	Estuary	Streams

The number of young salmon that reached the ocean is:_____

The average number of young salmon that reached the ocean for the group playing the game: Add all young together and divide ÷ by the number of players: _____

Are the total number of salmon increasing each year or decreasing?

_____

_____

If you were a fisheries biologist, what actions would you take that could increase the number of salmon in future years?

_____

_____

START HERE

Ocean Card

Ocean Card

Ocean Card

Ocean Card

Ocean Card

Ocean Card

Ocean Card

Ocean Card

Estuary Card

Estuary Card

Estuary Card

Estuary Card

Estuary Card

Estuary Card

Estuary Card

Stream Card

Stream Card

Stream Card

Stream Card

Stream Card

Stream Card

Stream Card

SPAWNING GROUNDS

Game Rules

Goal:

You are a salmon, and you are to produce as many offspring as possible by successfully swimming to the spawning grounds. After spawning and hatching of young salmon, the fingerlings/fry swim back to the ocean. The player with the most fingerlings/fry making it to the ocean wins! But beware, there are many hazards lurking along the way.

How to play:

1. Shuffle the hazards card sets and place them beside the game board where they are easy to access for when you have to pick up a card.
2. Select your marker or counter and place it in the Open Ocean (START HERE). From the ocean you will swim into the estuary and then upstream to spawn. Young salmon then swim back to the ocean.
3. To start you have 1,000 salmon; record this number on the worksheet.
4. Roll the die. The highest number starts first. Play continues clockwise around the table.
5. Roll the die to determine the number of spaces to move. If you land on a space instructing you to draw a card, do so and read it aloud. Record the change in the number of fish on your worksheet.
6. While going to the spawning grounds, draw only ADULT cards.
7. Salmon may lay as many as 8,000 eggs, but not all of them hatch. Use the instructions of the worksheet to determine the number of alevin or sac-fry that will grow into fingerlings/fry and head back to the ocean.
8. When returning to the ocean, draw only YOUNG SALMON cards.
9. The player who gets the **most** fish back to the ocean wins.

Ocean Adult $\frac{1}{2}$ of your school is caught by commercial anglers	**Ocean Adult** $\frac{1}{2}$ of your school is eaten by a school of hungry whales which heard the fish while eating them
Ocean Adult $\frac{1}{4}$ of your school is caught by a party boat of sports anglers	**Ocean Adult** $\frac{1}{2}$ of your school is lost. It is an El Nino year. There is a lack of plankton and consequently less krill for the salmon to eat.
Ocean Adult $\frac{1}{4}$ of your school is caught by commercial anglers for the retail market	**Ocean Adult** $\frac{1}{4}$ of your school is eaten by predators including sharks and seals
Ocean Adult None of your school dies; it has found enough food, has not been caught by predators, and has encountered normal weather	**Ocean Adult** $\frac{1}{2}$ of your school dies as a result of large ocean storms which upset the food balance
Ocean Adult None of your school dies as the weather has been perfect. **MOVE AHEAD 1 SPACE**	**Ocean Adult** $\frac{1}{4}$ of your school has eaten small fish which has consumed plastic pollution. They do not supply enough nutrients for you to live

Young Salmon Stream ½ of your school is eaten by predatory fish in the stream	**Young Salmon Stream** ½ of your school dies when they enter a water diversion pipe without a screen cover
Young Salmon Stream ¼ of your school is killed by pesticide runoff from a nearby farm	**Young Salmon Stream** ½ of your school dies because insects and larvae are not available to feed the young salmon
Young Salmon Stream ½ of your school is killed before it even hatches when mud from a new housing development smothers the eggs	**Young Salmon Stream** ¼ of your school dies after swimming into an area of very hot water where the stream is being used to cool water
Young Salmon Stream ½ of your school dies after passing through toxic chemicals leaking into the stream from an illegal waste dump	**Young Salmon Stream** None of your salmon die as the spawning grounds are protected by laws which preserve their natural state. **MOVE AHEAD 1 SPACE**
Young Salmon Stream ¼ of your school dies after entering a section of the stream where industrial pollutants have been dumped	**Young Salmon Stream** ¼ of your school is left stranded in shallow pools by a passing flood. They cannot get back to the creek, so they die

Stream Adult $\frac{1}{4}$ of your school are caught by commercial anglers. They are sold fresh to a seafood market	**Stream Adult** $\frac{1}{2}$ of your school dies after entering a stream that has high pesticides because of runoff from a farm
Stream Adult $\frac{1}{2}$ of your school dies because improper farming methods have choked the stream with mud	**Stream Adult** $\frac{1}{2}$ of your school dies in very low water because it has not rained or snowed this winter or early spring
Stream Adult $\frac{1}{4}$ of your school are caught by eagles and bears	**Stream Adult** $\frac{1}{2}$ of your school dies because the forest along the stream was cut and stumps and logs have formed dams which many Atlantic salmon cannot cross
Stream Adult $\frac{1}{2}$ of your school dies because of a flood control project. Your home stream has been cut into channels. Many of the places to spawn have been destroyed	**Stream Adult** $\frac{1}{4}$ of your school are eaten by predators such as a family of hungry bears
Stream Adult None of your school dies because the stream you enter is protected as part of a park. Dams have been removed, sediment is kept from running into the water, and fishing is limited. **MOVE AHEAD 1 SPACE**	**Stream Adult** $\frac{1}{4}$ of your school are caught by poachers with nets and traps in the shallow, narrow creek

Estuary Adult $\frac{1}{4}$ of your school are eaten by sea lions	**Estuary Adult** $\frac{1}{2}$ of your school are caught by commercial and sport anglers
Estuary Adult $\frac{1}{4}$ of your school dies because the water level of the estuary is too low due to drought this year	**Estuary Adult** None of your school dies because it has found the conditions for the trip through the estuary and up the river to be excellent. **MOVE AHEAD 1 SPACE**
Estuary Adult $\frac{1}{4}$ of your school dies because much of the wetlands has been drained and filled for development	**Estuary Adult** $\frac{1}{2}$ of your school dies because part of the school takes a fork in the river that leads to a dam with no way around
Estuary Adult $\frac{1}{2}$ of your school dies from small sedimentation that has altered the waterway and decreased the water level	**Estuary Adult** $\frac{1}{4}$ of your school dies due to a toxic spill in the estuary
Estuary Adult None of the school dies. The estuary has been restored	**Estuary Adult** $\frac{1}{4}$ of your school are caught by sport fishermen lining the banks of a narrow river channel

Young Salmon Estuary ½ of your school dies after swimming through an area polluted with industrial wastes that would not have harmed the adults, but are toxic to young salmon	**Young Salmon Estuary** None of your school dies as it manages a safe passage toward the sea. **MOVE AHEAD 1 SPACE**
Young Salmon Estuary ½ of your school dies when it swims into an area where an algal bloom has died, using all the oxygen in the water as the algae decompose	**Young Salmon Estuary** ¼ of your school dies after being attacked sea lampreys
Young Salmon Estuary ¼ of your school are eaten by a herd of sea lions, which target salmon	**Young Salmon Estuary** ¼ of your school dies from lack of food caused by salinity changed in the water due to unusually dry weather
Young Salmon Estuary None of your school dies as it has avoided predators, has not been exposed to toxic wastes because laws have helped control wastes, and has found normal food supplies and weather	**Young Salmon Estuary** ½ of your school dies after swimming through water polluted with runoff from farms
Young Salmon Estuary ¼ of your school dies after swimming into the intake pipe of a hydroelectric plant	**Young Salmon Estuary** ½ of your school are eaten by a large school of hungry bass. The rest escape as sport fishermen scare the bass away while moving their boats through the school trying to catch the bass

Young Salmon Ocean None of your school dies as they have found sufficient food and escaped the notice of predators	**Young Salmon Ocean** None of your school dies as you have escaped predators and found plenty of plankton to eat
Young Salmon Ocean A boat of poachers has captured $\frac{1}{2}$ of your school. They will be caught by a warden at the dock. Cut your number by half and **MOVE AHEAD 1 SPACE**	**Young Salmon Ocean** $\frac{1}{2}$ of your school dies due to lack of sufficient plankton, the food on which you depend
Young Salmon Ocean $\frac{1}{2}$ of your school is eaten by a hunger school of bass	**Young Salmon Ocean** $\frac{1}{4}$ of your school dies due to lack of food during an El Nino year when the ocean temperatures are higher
Young Salmon Ocean $\frac{1}{2}$ of your school is caught by commercial fishermen in international waters	**Young Salmon Ocean** $\frac{1}{4}$ of your school are caught by a party boat of sports anglers
Young Salmon Ocean $\frac{1}{4}$ of your school are eaten by a pod of killer whales	**Young Salmon Ocean** $\frac{1}{4}$ of your school are eaten by a pod of sperm whales

Grade 4 Classroom Hatchery Activities

#11 Migration

As adapted from: Project Wild

Time Frame: 40 minutes

Class size: 20-30 students

Setting: Outdoor playing area or gymnasium

Objectives:
In this active game, students simulate Atlantic Salmon and the hazards faced by them in an activity portraying the life cycle and migration of salmon.

Materials:
-A jump rope (3-5 metres long)
-Approx. 150 metres of rope or string
-Pylons for boundaries (optional)
-Two empty cardboard boxes
-100 tokens (7.5 cm x 12.5 cm cards; poker chips, etc.)

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
-Plants and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitats
-Changes to habitats (whether caused by natural or human means) can affect plants and animals and the relationships between them
-Society relies on plants and animals
Health & Physical Education: Living Skills
-Demonstrate personal and interpersonal skills and the use of critical and creative thinking processes as they acquire knowledge and skills in connection with the expectations in the Active Living, Movement Competence, and Healthy Living strands for this grade
Health & Physical Education: Active Living
A1. Participate actively and regularly in a wide variety of physical activities, and demonstrate an understanding of factors that encourage lifelong participation in physical activity
A3. Demonstrate responsibility for their own safety and the safety of others as they participate in physical activities
Health & Physical Education: Movement Competence- Skills, Concepts and Strategies
B1. Perform movement skills, demonstrating an understanding of the basic requirements of the skills and applying movement concepts as appropriate, as they engage in a variety of physical activities
B2. Apply movement strategies appropriately, demonstrating an understanding of the components of a variety of physical activities, in order to enhance their ability to participate successfully in those activities

Specific Expectations

Science & Technology- Understanding Life Systems: Habitats and Communities

1.1 analyse the positive and negative impacts of human interactions with natural habitats and communities (*e.g., human dependence on natural materials),* taking different perspectives into account *(e.g., the perspectives of a housing developer, a family in need of housing, an ecologist)* and evaluate ways of minimizing the negative impacts

1.2 identify reasons for the depletion or extinction of a plant or animal species (*e.g., hunting, disease, invasive species, changes in or destruction of its habitat)*, evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletions or extinctions from happening

2.2 build food chains consisting of different plants and animals, including humans

2.3 use scientific inquiry/research skills to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs

2.5 use appropriate science and technology vocabulary, including *habitat, population, community, adaptation,* and *food chain* in oral and written communication

3.1 demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life *(e.g., food, water, air, space, and light)*

3.3 identify factors (*e.g., availability of water or food, amount of light, type of weather*) that affect the ability of plants and animals to survive in a specific habitat

3.4 demonstrate an understanding of a community as a group of interacting species sharing a common habitat (*e.g., the life in a meadow or in a patch of forest)*

Health & Physical Education: Living 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 (*e.g, Active Living: use encouraging words to support teammates when playing in small groups)*

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 (*e.g., Active Living: play fairly by maintaining self-control and sharing opportunities to play*

Health & Physical Education: Active Living

A1.1 Actively participate in a wide variety of program activities (*e.g., lead-up and small-group games, recreational activities, cooperative games, fitness activities, dance activities)*, according to their capabilities, while applying behaviours that enhance their readiness and ability to take part (*e.g., taking the initiative to be involved in the activity, being open to playing different positions and playing in different groups, respecting others' ideas and opinions, encouraging others, speaking kindly, maintaining self-control at all times)*

A 3.1 demonstrate behaviours and apply procedures that maximize their safety and that of others during physical activity (*e.g., cooperating with others, monitoring their own actions and maintaining control of their bodies and equipment, using equipment such as a hula hoops and playground apparatus appropriately, ensuring all chairs are pushed in before beginning DPA in the classroom)*

Health & Physical Education: Movement Competence- Skills, Concepts and Strategies

B1.2 demonstrate the ability to jump and land, in control, from a low height, (*e.g, jump off a bench and land in a stable position)*

B2.1 demonstrate an understanding of the basic components of physical activities (*e.g., movement skills, game structures, basic rules and guidelines, conventions of fair play and etiquette)* and apply this understanding as they participate in a variety of physical activities (*e.g., lead-up games such as two-on-two soccer, beach-ball volleyball, and small-group keep-away; recreational activities such as scooter-board activities, hula hoop challenges, and throwing and catching a disc; cooperative games, such as keep-it-up, team monster walk, and group juggling; fitness activities such as circuits, running and flexibility exercises; dance activities such as creative movement, folk dance, and First Nation, Métis, and Inuit dances)*

B2.2 identify common features of specific categories of physical activities (*e.g., individual, target, net/wall, striking/fielding, territory)*, and identify common strategies and tactics that they found effective while participating in a variety of physical activities in different categories

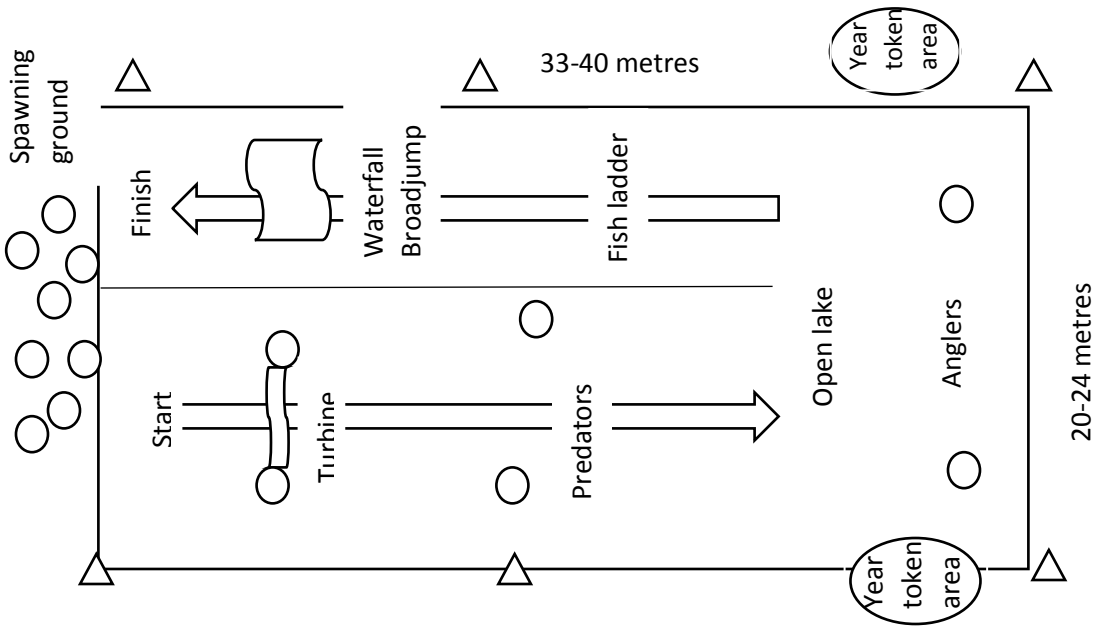
B2.3 apply a variety of tactical solutions to increase their chances of success as they participate in physical activities

Background

Many fish live part of their lives in one habitat and then migrate to another habitat. Some make their migratory journeys to mature and reproduce. Atlantic Salmon are an example of one of the most spectacular of the migrating species. Within the genetics of Atlantic Salmon is an instinct that drives them from the time of hatching along a monumental journey from their freshwater spawning beds downstream into the sea. Once in the sea they spend several years reaching the maturity needed for their return journey to their original hatching ground. Salmon must face a myriad of hazards that serve as limiting factors in the completion of their life cycle. Limiting factors are factors that reduce the populations of living organisms. Sometimes the limiting factors are natural, and sometimes they result from human intervention with natural systems.
The female Atlantic Salmon deposits 2,000 to 8,000 eggs. The eggs are deposited in a shallow gravel depression, known as a redd, that has been scooped out by the female. Once deposited, the eggs are fertilized by the male, and then the females moves the gravel back over the eggs to offer as much protections as possible.

The eggs, before and after hatching, are susceptible to many limiting factors. Smothering silt can be washed in suddenly from watersheds damaged by a variety of land-use practices and events, including erosion following road-building, logging and fires. Predators can eat some of the eggs. Dropping water levels can isolate salmon offspring in streamside depressions. After hatching, the small fish - called alevin - spend their first several weeks hiding in the gravel. Gradually they absorb their yolk sac and become known as fry.
The small ocean-bound salmon, now called smolts, are at once confronted by hazards on their downstream journey. Examples are dams, low water in streams, and predatory birds, mammals and larger fish. Up to 90% of the salmon that hatch never reach the lake or ocean.

In two to three years, Atlantic Salmon start the journey that will guide them back to the rivers and streams leading to their own hatching site. The upstream migration from the ocean is also a series of hazards. For example, dams hinder their journey and would block it completely if fish ladders were not installed. Fish ladders are water-filled staircases that allow the migrating fish to swim upstream, around the dam. Humans who fish, eagles, bears and other predatory mammals also reduce the numbers along the way to the spawning ground. Sometimes landslides provide unexpected new barriers. So too do the natural waterfalls and rapids that the salmon must overcome.



Procedure

1. Begin by asking the students what they know about the life cycle of fish. Do any local fish migrate to spawn? If yes, which ones? (Mullet, shad, lake trout, suckers, carp and salmon are examples of fish that migrate to spawn.) In this activity, students will learn about some of the characteristics of one species of fish that migrates as a part of its life cycle - the Atlantic Salmon.
2. This is a physically active game.

Set up the playing field as shown in the diagram, including spawning grounds, downstream, upstream and open lake. The area must be about 30 metres by 15 metres. Assign roles to each of the students. Some will be salmon, others will be potential hazards to the salmon. Assign the students roles as follows.

- Choose two students to be the turbine team. These are the ones who operate the jump rope, which represents the turbines in hydroelectric dams. Later in the simulation, when all the salmon have passed the turbine going downstream, these students move to the upstream side to become the waterfall-broad jump monitors (see diagram).
- Choose two students to be predatory wildlife. At the start of the simulation, the predators will be below the turbines where they catch salmon headed downstream. Later in the activity, when all the salmon are in the lake, these same two predators will patrol the area above the "broad jump" waterfalls. There they will feed on salmon just before they enter the spawning ground.
- Choose two students to be humans in fishing boats catching salmon in the open ocean. These students in the fishing boats must keep one foot in a cardboard box to reduce their speed and manoeuvrability.
- All remaining students are salmon. Note: These figures are based on a class size of 25 to 30. If the group is larger or smaller, adjust the number of people who are fishing and predatory wild animal accordingly.

3. Begin the activity with all the salmon in the spawning ground. The salmon then start their journey downstream. The first major hazard is the turbines at the dam. At most dams there are escapes wires to guide migrating salmon past the turbines. The student salmon **cannot go around** the jump rope swingers, but they **can slip under** the swinger's arms if they do not get touched while doing so. A salmon dies if it is hit by the turbine (jump rope). The turbine operators may change the speed at which they swing the jump rope.

   Note: Any salmon that "dies" at any time in this activity must immediately become part of the fish ladder. These students become part of the physical structure of the human-made ladders now used by

migrating salmon to get past barriers such as dams. The students who are the fish ladder kneel on the ground on hands and knees, a body wide space between them. Salmon are to "leapfrog" over the fish ladder.

4. Once past the turbines, the salmon must get past some **predatory** wildlife. The predators below the turbine must catch the salmon **with both hands** - tagging isn't enough. Dead salmon are escorted by the predator to become part of the fish ladder. Note: Later, the salmon who survive life in the lake will use the structure of the fish ladder - by passing through it - to return to the spawning ground.
   Note: Both the predatory wildlife in the last downstream area and the people fishing in the lake must take dead salmon to the fish ladder site. This gets the predators and fishing boats off the field regularly, helping to provide a more realistic survival ratio.
5. Once in the open lake, the salmon can be caught by fishing boats. The salmon must move back and forth across the lake area in order to gather four tokens. Each token represents one year of growth. Once each fish has four tokens (four years' growth), that fish can begin migration upstream. The year tokens can only be picked up one token at a time on each crossing. Remember, the salmon must cross the entire lake area to get a token. The "four years" these trips take make the salmon more vulnerable, and thus they are more readily caught by the fishing boats. For purpose of this simulation, the impact of this limiting factor creates a more realistic survival ratio in the population before the salmon begin the return migration upstream.
6. Once four of the year tokens are gathered the salmon can begin upstream. The salmon must go through the entire pattern of the fish ladder. This enforced trip through the fish ladder gives the students a hint of how restricting and tedious the upstream journey can be. **In the fish ladder, predators may not harm the salmon.**
7. Once through the ladder, the salmon faces the broad-jump waterfall. The waterfall represents one of the natural barriers the salmon must face going upstream. Be sure the jumping distance is challenging but realistic. The two former turbine students will monitor the jump. The salmon must jump the entire breadth of the waterfall to be able to continue. If the salmon fails to make the jump, then it must return to the **bottom of the fish ladder** and come through again.
   Note: When playing indoors, the broad-jump waterfall may be changed into a stepping stone jump defined by masking tape squares for safety on hard floors.
8. Above the falls the two predators who started the simulation as the predators below the turbines are now the last set of limiting factors faced by the salmon. They represent bears - one example of predatory wildlife. Again, remember that the predators must catch the salmon with both hands. If they do catch a salmon, they must then take the student they caught to become part of the structure of the fish ladder.
9. This activity ends when all the salmon are gone before the spawning ground is reached- or when all surviving salmon reach the spawning ground.
10. Next engage the students in a discussion. Explore topics such as:
    - The apparent survival-mortality ratio of salmon
    - The role of barriers
    - The role of predatory wildlife and the anglers
    - Where the losses were greatest and least
    - What the consequences would be if all the eggs deposited made the journey successfully

Grade 4 Classroom Hatchery Activities

#12 Jumping with Atlantic Salmon!

Time Frame: 40 – 50 minutes

Class size: 20-30 students

Setting: Gymnasium or outdoor play area; classroom (for line graph creation)

Objectives:
Atlantic Salmon jump to clear obstacles in their path while travelling to their spawning grounds. Salmon eggs hatch in freshwater rivers and after years, swim downstream to reach the ocean, where they mature. When they reach adulthood, the salmon swim back upstream to reach the spawning grounds where they hatched. To travel upstream, salmon have to jump up and over obstacles, such as waterfalls and rapids.
Some salmon have been documented to have jumped obstacles that are 12 feet (3.7m) high; however, Atlantic Salmon max out around 3m, and they cannot clear all objects that lie in their path. Sometimes dams or others structures block the fish's path back to their spawning grounds.

In this active physical activity, based on the roll of the dice, in partners students will learn and practice long and short jump rope skills as well as practice their multiplication and addition skills.

Materials:
-Standard individual jump ropes (1 per pair of students)
-2 dice (2 per student), can provide a third dice to students (optional)
-Atlantic Salmon Jumping Chart (attached) (double-sided)
-Pencils
-Graph paper
-Rulers
-Clipboards (optional)

Curriculum Links
Science & Technology – Understanding Life Systems: Habitats and Communities
-Plant and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitats
-Changes to habitats (whether cause by natural or human means) can affect plants and animals and the relationships between them.
-Society relies on plants and animals
Health & Physical Education: Living Skills
-Demonstrate personal and interpersonal skills and the use of critical and creative thinking processes as they acquire knowledge and skills in connection with the expectations in the Active Living, Movement Competence, and Healthy Living strands for this grade
Health & Physical Education: Active Living
A1. Participate actively and regularly in a wide variety of physical activities, and demonstrate an understanding of factors that encourage lifelong participation in physical activity
A3. Demonstrate responsibility for their own safety and the safety of others as they participate in physical

activities

Health & Physical Education: Movement Competence- Skills, Concepts and Strategies

B1. Perform movement skills, demonstrating an understanding of the basic requirements of the skills and applying movement concepts as appropriate, as they engage in a variety of physical activities

B2. Apply movement strategies appropriately, demonstrating an understanding of the components of a variety of physical activities, in order to enhance their ability to participate successfully in those activities

Specific Expectations

Science & Technology - Understanding Life Systems: Habitats and Communities

1.1 analyse the positive and negative impacts of human interactions with natural habitats and communities (*e.g., human dependence on natural materials),* taking different perspectives into account (*e.g., the perspectives of a housing developer, a family in need of housing, an ecologist)* and evaluate ways of minimizing the negative impacts

1.2 identify reasons for the depletion or extinction of a plant or animal species (*e.g., hunting, disease, invasive species, changes in or destruction of its habitat*), evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletions or extinctions form happening

3.3. identify factors (*e.g., availability of water or food, amount of light, type of weather)* that affect the ability of plants and animals to survive in a specific habitat

3.4 demonstrate an understanding of a community as a group of interacting species sharing a common habitat (*e.g, the life in a meadow or in a patch of forest)*

3.7 describe structural adaptations that allow plants and animals to survive in specific habitats

3.8 explain why changes in the environment have a greater impact on specialized species than on generalized species

Health & Physical Education: Living Skills

1.4 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 (*e.g, Active Living: use encouraging words to support teammates when playing in small groups)*

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 (*e.g., Active Living: play fairly by maintaining self-control and sharing opportunities to play*

Health & Physical Education: Active Living

A1.1 Actively participate in a wide variety of program activities (*e.g., lead-up and small-group games, recreational activities, cooperative games, fitness activities, dance activities)*, according to their capabilities, while applying behaviours that enhance their readiness and ability to take part (*e.g., taking the initiative to be involved in the activity, being open to playing different positions and playing in different groups, respecting others' ideas and opinions, encouraging others, speaking kindly, maintaining self-control at all times)*

A 3.1 demonstrate behaviours and apply procedures that maximize their safety and that of others during physical activity (*e.g., cooperating with others, monitoring their own actions and maintaining control of their bodies and equipment, using equipment such as a hula hoops and playground apparatus appropriately, ensuring all chairs are pushed in before beginning DPA in the classroom)*

Health & Physical Education: Movement Competence- Skills, Concepts and Strategies

B1.2 demonstrate the ability to jump and land, in control, from a low height, (*e.g, jump off a bench and land in a stable position)*

B2.1 demonstrate an understanding of the basic components of physical activities (*e.g., movement skills, game structures, basic rules and guidelines, conventions of fair play and etiquette)* and apply this understanding as they participate in a variety of physical activities (*e.g., lead-up games such as two-on-two soccer, beach-ball volleyball, and small-group keep-away; recreational activities such as scooter-*

board activities, hula hoop challenges, and throwing and catching a disc; cooperative games, such as keep-it-up, team monster walk, and group juggling; fitness activities such as circuits, running and flexibility exercises; dance activities such as creative movement, folk dance, and First Nation, Métis, and Inuit dances)

B2.2 identify common features of specific categories of physical activities (*e.g., individual, target, net/wall, striking/fielding, territory)*, and identify common strategies and tactics that they found effective while participating in a variety of physical activities in different categories

B2.3 apply a variety of tactical solutions to increase their chances of success as they participate in physical activities

Procedure

1. Divide students into partners. Each pair of students will have 1 standard individual jump rope and two dice.
2. Explain to students that Atlantic Salmon jump can jump as high as 10 feet to overcome barriers as they return to spawning grounds. Each student will represent an Atlantic Salmon that has to jump over a barrier (the jump rope) but the "height" of their jump as a salmon is determined by the numbers rolled by the dice.
3. One partner rolls the dice and either multiplies or adds the numbers rolled. The other student jumps the rope that many times (of the answer) indicating how many feet they have jumped on their journey upstream to spawning ground. Once the partner has jumped the number with the jump rope, they switch roles. Students will switch with each other 10 times so that their chart will have a total of 20 data points (multiplied or added numbers following rolling of the dice).
4. Using the Atlantic Salmon Jumping Chart (attached), students will record the 2 numbers rolled and if they multiplied or added the numbers and what the answer was. This is to help them track the highest number and "height" in feet they jumped as an Atlantic Salmon to overcome the barrier during their journey.
5. Once students have completed their copy of the Atlantic Salmon Jumping Chart, they will create a line graph to reflect the variety of heights they jumped when they were Atlantic Salmon overcoming the barrier (the jump rope).
6. Once all students have finished their Atlantic Salmon Jumping Chart, they will move on to create a line graph displaying the data using graph paper.
7. Once the line graph is complete, ask students to gather as a whole class and discuss what their highest and lowest jump height they had. Discuss with them if they found challenges when rolling, multiplying or adding the numbers or displaying the data in the line graph.

Variations:

You may add more dice and have students add the first two dice and multiply by the third dice.

Accommodations for students with disabilities:

Have students who can't jump, turn the rope, roll the dice or practice jumping over a rope lying on the floor. Have different size ropes available, or instead of jumping over the rope, jump on the spot.

Names:_____

_____

Atlantic Salmon Jumping Chart

CONGRATULATIONS! You and your partner are Atlantic Salmon and you are returning from the lake to your spawning ground. There is a problem though, as there are some barriers that you and your fellow salmon have to jump over. You need to roll the dice and add (+) or multiply (X) the two numbers on the dice to see how high you can jump and see if you can overcome the highest barrier!

What to do:

1. One partner will begin jumping the rope while the other partner rolls the dice and either multiplies (X) or adds (+) the numbers rolled.

2. Once the dice have been rolled, the person with the jump rope jumps the rope that many times (of the answer) indicating how many feet you have jumped on your journey upstream to spawning ground. Once the jump rope partner has jumped the number with the jump rope, switch roles.

3. Record the 2 numbers rolled, and whether you multiplied (X) or added (+) the numbers and what the answer was.

JUMP #	DICE NUMBERS	NUMBER PROBLEM (ADDITION OR MULTIPLIED)	ANSWER (SALMON HEIGHT JUMPED IN FEET)
Example:	4 and 5	4 + 5	9 feet
Example:	3 and 3	3 x 3	9 feet
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

BRING BACK THE SALMON
LAKE ONTARIO
supported by ONTARIO POWER GENERATION

Grade 4 Classroom Hatchery Activities

#13 Salmon Spelling

Time Frame: 30-40 minutes

Class size: 20-30 students

Setting: Gymnasium or large open classroom area with desks pushed to the sides

Objectives:
In this active literacy activity, students will become familiar with common terms that are related to science: biodiversity and the stages of growth of the Atlantic Salmon as well as increase muscular endurance.

Materials:
-Spelling mat (laminated) (11 x 17) (1 per student or 1 per 2 students)
-Deck of index cards with spelling words listed (suggested words included)
-Green and red polyspot (or laminated cut out large red and green construction paper spot)

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities
-Plants and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitats
-Changes to habitats (whether caused by natural or human means) can affect plants and animals and the relationships between them
-Society relies on plants and animals
Health & Physical Education- Living Skills
-Demonstrate personal and interpersonal skills and the use of critical and creative thinking processes as they acquire knowledge and skills in connection with the expectations in the Active Living, Movement Competence, and Healthy Living strands for this grade
Health & Physical Education- Active Living
A1. Participate actively and regularly in a wide variety of physical activities, and demonstrate an understanding of factors that encourage lifelong participation in physical activity
A3. Demonstrate responsibility for their own safety and the safety of others as they participate in physical activities
Health & Physical Education- Movement Competence: Skills, concepts and strategies
B1. Perform movement skills, demonstrating an understanding of the basic requirements of the skills and applying movement concepts as appropriate, as they engage in a variety of physical activities
B2. Apply movement strategies appropriately, demonstrating an understanding of the components of a variety of physical activities, in order to enhance their ability to participate successfully in those activities
Language: Writing
-Use editing, proofreading, and publishing skills and strategies, and knowledge of language conventions, to correct errors, refine expression, and present their work effectively

Specific Expectations
Science & Technology- Understanding Life Systems: Habitats and Communities

1.3 identify reasons for the depletion or extinction of a plant or animal species (*e.g., hunting disease, invasive species, changes in or destruction of its habitat*), evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletions or extinctions from happening

2.5 use appropriate science and technology vocabulary, including *habitat, population, community, adaptation* and *food chain* in oral and written communication

Health & Physical Education- Living 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 (*e.g., Active living: use encouraging words to support teammates when playing in small groups)*

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 (*e.g., Active living: play fairly by maintaining self-control and sharing opportunities to play*

Health & Physical Education- Active Living

A1.1 actively participate in a wide variety of program activities (*e.g. lead-up and small-group games, recreational activities, cooperative games, fitness activities, dance activities),* according to their capabilities, while applying behaviours that enhance their readiness and ability to take part (*e.g., taking the initiative to be involved in the activity, being open to playing different positions and playing in different groups, respecting others' ideas and opinions, encouraging others, speaking kindly, maintaining self-control at all times)*

A 3.1 demonstrate behaviours and apply procedures that maximize their safety and that of others during physical activity (*e.g., cooperating with others)*

Health & Physical Education- Movement Competence: Skills, concepts and strategies

B1.1 perform a variety of controlled static balances and transitions between balances, using a variety of body parts and shapes, at different levels, individually, and with partners and equipment

B2.1 demonstrate an understanding of the basic components of physical activities (*e.g., movement skills, game structures, basic rules and guidelines, conventions of fair play and etiquette),* and apply this understanding as they participate in a variety of physical activities

Language: Writing

3.1. Spell familiar words correctly (*e.g., words from their oral vocabulary, anchor charts, and shared-, guided-, and independent reading texts; words used regularly in instruction across the curriculum)*

3.2 spell unfamiliar words using a variety of strategies that involve understanding sound-symbol relationships, word structures, word meanings, and generalizations about spelling

3.3 confirm spellings and word meanings or word choice using different types of resources appropriate for the purpose

Procedure

1. Students will use a spelling mat for this activity (view the diagram as below). The spelling mat is a piece of laminated large construction paper with letters randomly placed on it.
2. Students will be in a push-up position. There will be a "deck" of index cards that have spelling words listed. The students will spell words by touching the letters with their hands (alternating hands with each letter) while remaining in the push-up position.
3. If spelled correctly, they move the card to the green polyspot. If spelled incorrectly, they move the card to the red polyspot. Both polyspots should be located next to the spelling mat.
4. You can use levels for this activity:

Level 1: Students can see the word as they spell

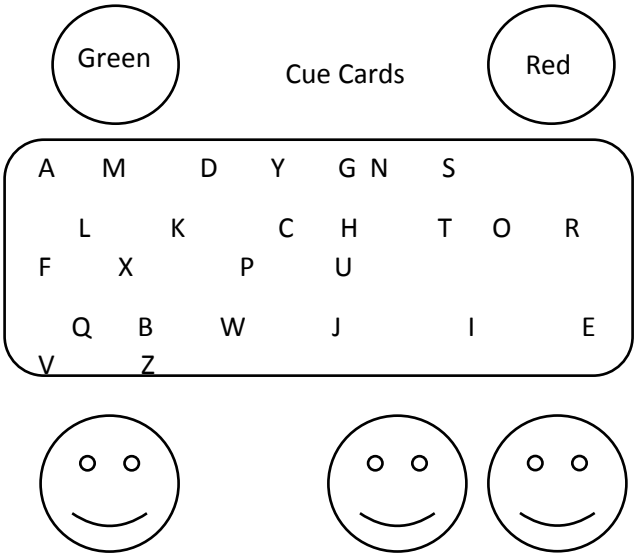
Level 2: They may see the word and then flip it over so they can't see it as they spell.

Level 3: Tell them the word that they have to spell.

Students start at level 1. Once all cards are on the green polyspot, then they may proceed to level 2. Once all cards are on the green polyspot again, then they can proceed to level 3.

Variations:

- Students work at their own pace by using levels
- 2 students use 1 spelling mat each and they alternate touch letters until the word is spelled.



One **or** two students participating using 1 mat

Suggested spelling words for spelling fitness.

Egg	Alevin
Fry	Parr
Smolt	Spawning adult
Food	Adaptation
Water	Community
Air	Population
Space	Habitat
Food Chain	Life cycle
Atlantic Salmon	Lake Ontario