DRAFT

CLASSROOM HATCHERY PROGRAM

GRADE 6 LESSON GUIDE

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Grade 6 Classroom Hatchery Activities

#1 Biodiversity Stations

Time Frame: 60 minute class period: 45 minutes for station rotation with 7-8 minutes at each station

Setting: Classroom

Objectives:
These biodiversity stations will hook students into learning the concept of biodiversity, what it means and how it plays a role within our ecosystem and the animals that surround us.

Materials:
-Organize It! Vocabulary Cards: Picture/short sentences and word and definition cards (attached)
-2 envelopes to keep the vocabulary cards organized separately: one envelope for sorting the picture with the short sentence and the other enveloped for sorting the word and definition
-Explore It! Biodiversity Go Fish! Cards and instructions (attached)
-1 envelope or Ziploc bag to hold the Biodiversity Go Fish Cards
-Research It! Adaptation and Biodiversity: Fish (attached)
-Personal technology that can be used for the Research It! station
-Write It! Identify Invertebrate and Vertebrates sorting and classify activity (attached)
-Read It! Animal adaptations reading comprehension (attached)
-5 bins with the labels of each station to keep each activity, to be placed on the tables around the classroom
-Classroom or digital timer: to be set at 7-8 minute intervals to indicate rotation between stations

Curriculum Links
Overall Expectations
Science and Technology- Understanding Life Systems: Biodiversity
-Biodiversity includes diversity of individuals, species and ecosystems
-Because all living things are connected, maintaining diversity is critical to the health of the planet
Language- Oral Communication
-Listen in order to understand and respond appropriately in a variety of situations for a variety of purposes
Language- Reading
-Read and demonstrate an understanding of a variety of literary, graphic, and informational texts, using a range of strategies to construct meaning
-Use knowledge and words and cueing systems to read fluently
Language- Writing
-Generate, gather, and organize ideas and information to write for an intended purpose and audience

Specific Expectations
Science and Technology- Understanding Life Systems: Biodiversity
1.2 assess the benefit that human societies derive from biodiversity and the problems that occur when biodiversity is diminished
2.2. investigate the organisms found in a specific habitat and classify them according to a classification system
2.3 use scientific/ inquiry/research skills to compare the characteristics of organisms within the plant or animal kingdoms

2.4 use appropriate science and technology vocabulary, including classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics, and organism in oral and written communication

3.1 identify and describe the distinguishing characteristics of different groups of plants and animals and use these characteristics to further classify various kinds of plants and animals

3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species or plants and animals in communities, and among communities and the physical landscapes that support them.

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 (*e.g. ask questions to deepen understanding and make connections to the ideas of others; summarize or paraphrase information and ideas to focus or clarify understanding; use vocal prompts in dialogues or conversations to express empathy, interest, and personal regard:* That's really interesting. You must have been excited)

2.2 demonstrate an increasingly sophisticated understanding of appropriate speaking behaviour in a variety of situations, including paired sharing, dialogue, and small-and-large groups discussions (*e.g. acknowledge different points of view; paraphrase to clarify meaning; adjust the level of formality to suit the audience and purpose for speaking)*

Language- Reading

1.1. Read a wide variety of texts from diverse cultures, including literary texts (*e.g., short stories, poetry, myths, legends, fantasies, novels, plays)* ,graphic texts (*e.g. graphic novels, advertisements, atlases, graphic organizers, charts and tables),* and informational texts (*e.g., biographies, textbooks, and other non-fiction materials; articles and reports; print and online editorials, various electronic texts, webquest texts)*

1.5 develop interpretations about texts using stated and implied ideas to support their interpretations

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

3.2 predict the meaning of and rapidly solve unfamiliar words using different types of cues

Language- Writing

1.4 sort and classify information for their writing in a variety of ways that allow them to view information from different perspectives and make connects between ideas (*e.g., by underlining or highlighting key words or phrases; by using a graphic organizer such as a fishbone chart, a T-chart, or an "Agree/Disagree" chart)*

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)*

Preparation:

1. There is a total of 5 stations that are set up around the classroom. Two of the stations are for exploring new information about the concept of biodiversity and the other three stations help students reflect and assess their learning.

2. Students will be in groups of 4-5 students and will each rotate to the stations around the room. The teacher will assume the role of facilitator and ensure students are on task and understanding the new information rather than feed the information to the students. Each station is set up with a different learning style in mind which helps differentiate the content.

3. **What does each station look like?** Below is a list of each of the different stations that will be used during this activity:

- Organize It! This is a hands-on station which allows students to work with a manipulative in order to show mastery of the concept. Using vocabulary and illustrations, students are able to create connections on learning new vocabulary and concepts that will be covered during this unit of study.

- Explore It! At this station students will get to explore the concept with hands on learning. This station is meant to get the students thinking about biodiversity and how life cycles alter or change throughout the growth of an animal. This can provide an opportunity to relate this station to previous knowledge, a demonstration or have the students do the activity that helps explain the concept. The point of this station is to allow students to explore.
- Research It! This station allows the students to get online and research the topic being taught. Incorporating technology for the station will allow students to create their own learning connects and learn how adaptations play a role in biodiversity.
- Write It! This station will challenge the students to sort and classify invertebrates and vertebrates and organize them in a chart in their response. Students are able to demonstrate their thinking and connections when labelling the animals correctly as well as recording key identification features associated with their chosen animals in their recorded notes.
- Read It! The Read It! station is setup to allow students to gain information from a traditional reading passage. They read a half-page article which is relevant to the content and following the reading there are comprehension questions that come from the reading. Encouragement of using information from the text to support their answers and practice similar responses that can be reflected in EQAO will also provide an additional connection to students learning. Require students to respond in complete sentences as middle school students really need practice in this area.

Tips and strategies to set up science stations:

- Depending on the class and management, you can choose the lab groups or have the students select their groups.
- If you have 45-minute class periods, each group will visit the stations for 7-8 minutes (allotting for rotation between stations), with a 15-20 minute outline of expectations during station rotation, clean up and the order of the rotation.
- With classes that have 30+ students in them, you need to double up the stations.
- Technology is not a requirement for the Research It! station as textbooks or supplemental materials could substitute the technology at this station.

Procedure

1. Begin the period with a whole group lesson where you discuss the expectations while they are moving around and working at each station. Introduce the classroom timer and mention the fact that each rotation will be 7-8 minutes in length. Outline that time is complete, that students are to gather all of their materials at the station into the science bin and they are to place their completed work into their desk or a central gathering area for completed work (for example, a "Done Bin" or "In Box", where students can have their work marked and/or returned to be placed into their science binders or duotangs, etc.).

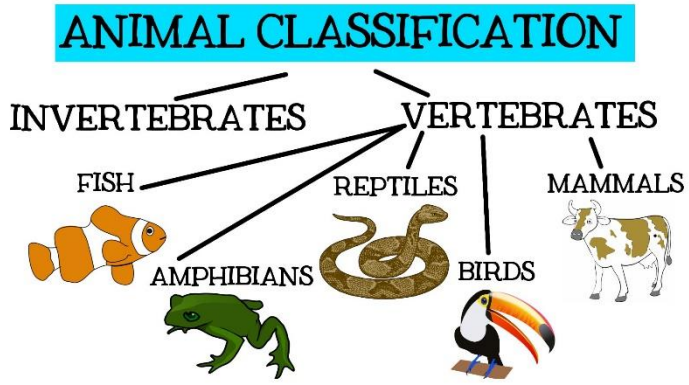
The expectations that will be covered during the whole class learning are as follows:
Rotation: Rotation will take place counter clockwise.
What it should sound like during station time: using partner voices to avoid distraction to others in the class.
What it should look like during station time: on task work, everyone completing the work as a group or individually depending on if the station is a group or individual activity.
What to do when the timer is complete: place all of the materials into the science bin, place completed work into (teacher specified central hand in spot) and rotate to the next station once their area is cleaned up.

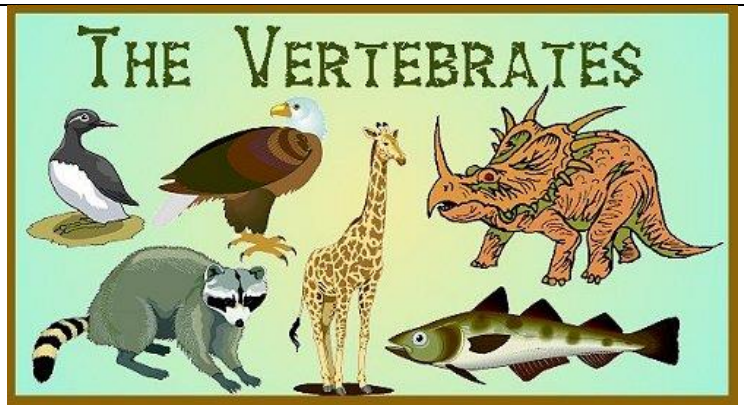
2. After all the instructions and expectations, release the learning to the students where they will begin the rotations. Start the timer once students have settled at the station. You will have the chance to circulate and provide support to the variety of stations and engage students in comprehension questions as they explore and learn this new science concept.
3. Once the students have visited each station, ask the final rotation to clean up the bins and bring them to you and gather at a central learning area. If time permits this would be a prime opportunity to discuss as a class the learning connections and observations that were completed during the station time.

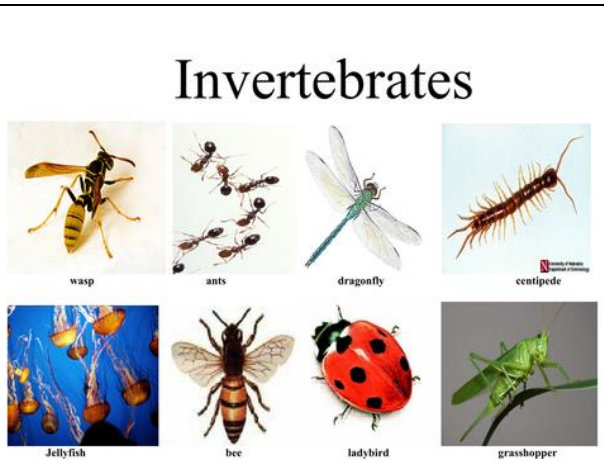
Teacher prep: cut out the instructions and each card. Be sure to cut the illustration card and definition card so they are separate and place them into 1 envelope.

Vocabulary Cards- Instructions

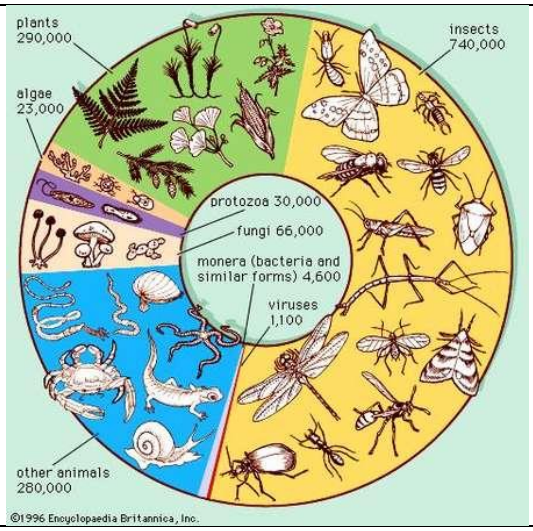
1. With your group, you have to match the picture with the correct short sentence cards.
2. Once you have matched the picture with the short sentence cards, you have to match the word card with the correct definition.

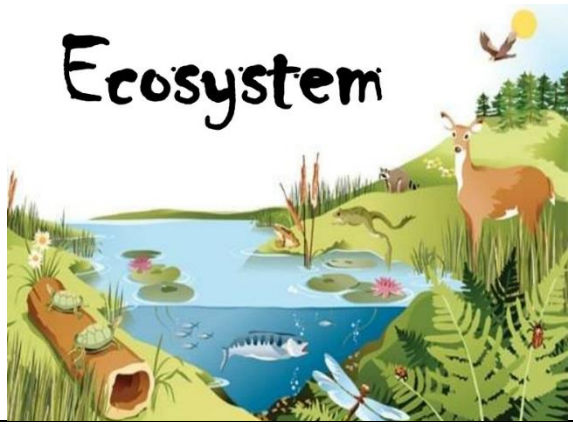
	The act of grouping living things by using a set of rules and similarities
	The variety of plants, animals, fungi, and bacteria that exist

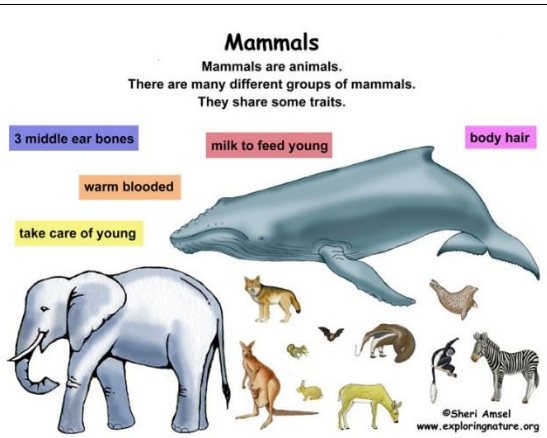
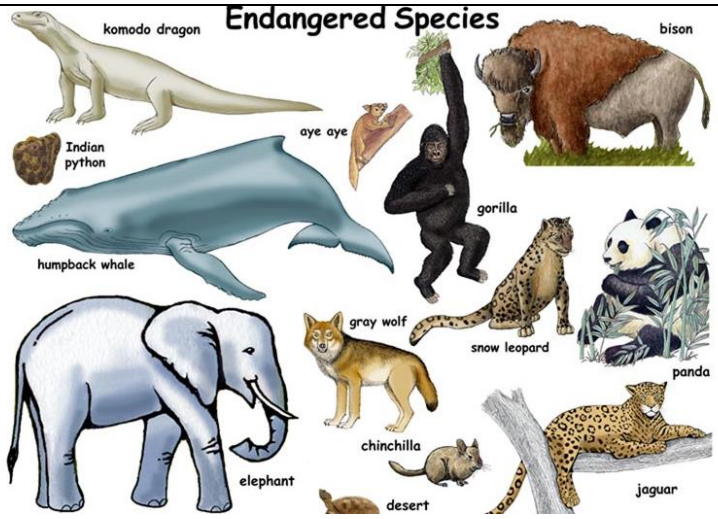
	A group of plants and animals and their physical environment. An example of a natural community is a rainforest, which includes the wildlife, the plants, and environmental factors such as soil and moisture
	The way in which each of two or more things is related to others. For example, a Bluegill Sunfish and an Atlantic Salmon are two different species of fish but are both from the same taxonomic Class
	An animal that has a backbone (i.e. mammals, birds, reptiles, amphibians and fish)

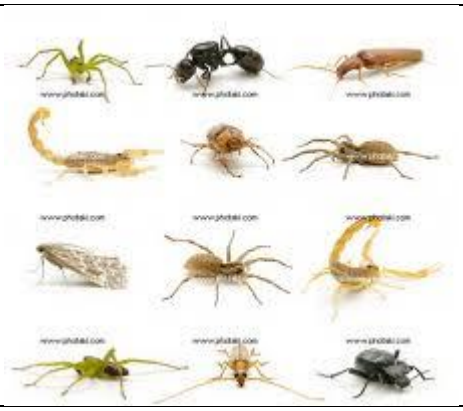
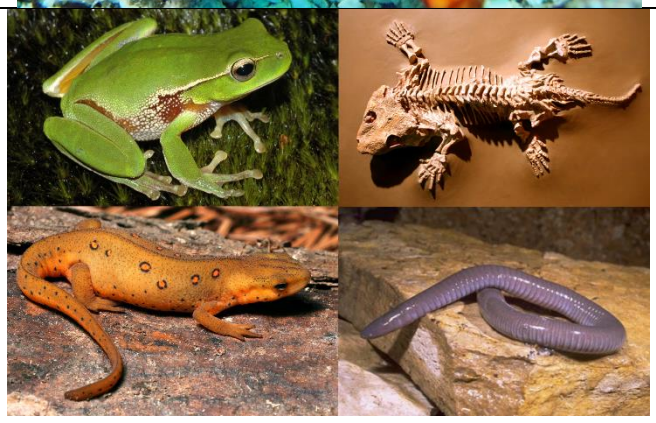
	An animal that does not have a backbone (e.g., annelids, insects, crustaceans, arachnids, jellyfish)
	The ability to be stable: such as having the strength to survive or endure
	A special quality or appearance that makes an individual or a group different from others

	An individual animal or plant
	The natural home or environment of an animal, plant, or other organism
	Means living organism within a specific environment

	Means non-living and includes factors in an environment such as sunlight, temperature, wind, rain, snow, and sleet
	A group of living organisms that can produce offspring
	A group of people or living things living in the same place or having a particular characteristic in common

	All the plants and animals that live in a particular area together that includes both living and nonliving parts such as air, water and soil
	The study of living things, their environment and their relation between each other
	A particular section, group, or type of animals living in an area or country
	A group of warm-blooded animals that have flexible hands and feet, each with five digits (e.g., humans, great apes, monkeys and lemurs)

	A vertebrate, warm-blooded animal that feeds its young with milk produced by the mother and has skin usually covered with hair (e.g., cow, dog, mouse, bear, or human being)
	An invertebrate animal which has specialized stingers in the tentacles surrounding the mouth (e.g. jelly fish, sea anemone, or coral)
	A species of animal or plant that exists in such small numbers that it is in danger of becoming extinct.

	A type of invertebrate having a segmented body divided into two parts, four pairs of legs but no antennae (e.g., spiders, scorpions, mites, and ticks)
	An invertebrate animal with tube feet and a five-part symmetrical body (e.g., starfish, sea urchin)
	A cold-blooded vertebrate animal that has gills and lives in water in the larval state but breathes air as adults (e.g., frogs, toads, salamanders)

Teacher prep: cut out each card. Be sure to cut the word card and definition card so they are separate and place them into 1 envelope.

Vocabulary Cards- Instructions

1. With your group, once you have matched the picture with the short sentence cards, you have to match the word card with the correct definition.

Classification	The act of grouping living things by using a set of rules and similarities
Biodiversity	The variety of plants, animals, fungi, and bacteria that exist
Natural community	A group of plants and animals and their physical environment. An example of a natural community is a rainforest, which includes the wildlife, the plants, and environmental factors such as soil and moisture
Interrelationships	The way in which each of two or more things is related to others. For example, a Bluegill Sunfish and an Atlantic Salmon are two different species of fish but are both from the same taxonomic Class
Vertebrate	An animal that has a backbone (e.g. mammals, birds, reptiles, amphibians and fish)
Invertebrate	An animal that does not have a backbone (e.g., annelids, insects, crustaceans, arachnids, jellyfish)
Stability	The ability to be stable, such as having the strength to survive or endure

Characteristic	A special quality or appearance that makes an individual or a group different from others
Organism	An individual animal or plant
Habitat	The natural home or environment of an animal, plant or other organism.
Biotic	Means living organism within a specific environment
Abiotic	Means non-living and include factors in an environment such as sunlight, temperature, wind, rain, snow and sleet
Species	A group of living organisms that can produce offspring
Community	A group of people or living things living in the same place or having a particular characteristic in common
Ecosystem	All the plants and animals that live in a particular area together that includes both living and nonliving parts such as air, water and soil.
Ecology	The study of living things, their environment and their relation between each other
Population	A particular section, group, or type of animals living in an area or country
Primate	A group of warm-blooded animals that have flexible hands and feet, each with five digits (e.g., humans, great apes, monkeys and lemurs)

Mammal	A vertebrate, warm-blooded animal that feeds it young with milk produced by the mother and has skin usually covered with hair (e.g., cow, dog, mouse, bear, or human being)
Cnidarian	An invertebrate animal which has specialized stingers in the tentacles surrounding the mouth (e.g. jelly fish, sea anemone, or coral)
Endangered Species	A species of animal or plant that exists in such small numbers that it is in danger of becoming extinct
Arachnid	A type of invertebrate having a segmented body divided into two parts, four pairs of legs but no antennae (e.g., spiders, scorpions, mites, and ticks)
Echinoderm	An invertebrate animal with tube feet and five-part symmetrical bodies (e.g., starfish, sea urchin)
Amphibian	A cold-blooded vertebrate animal that has gills and lives in water in the larvae state but breathes air as adults (e.g., frogs, toads, salamanders)

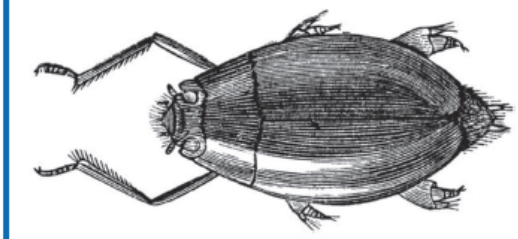
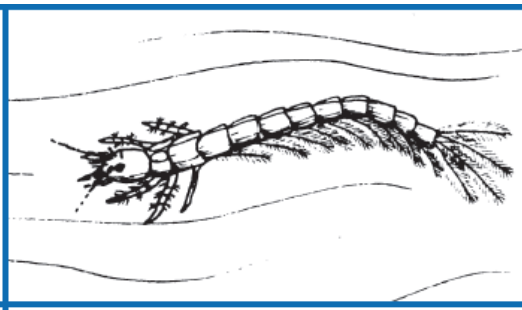
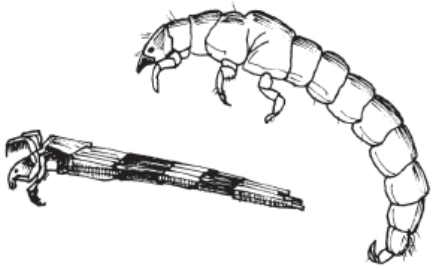
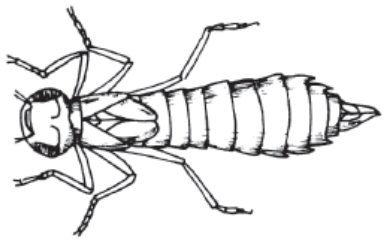
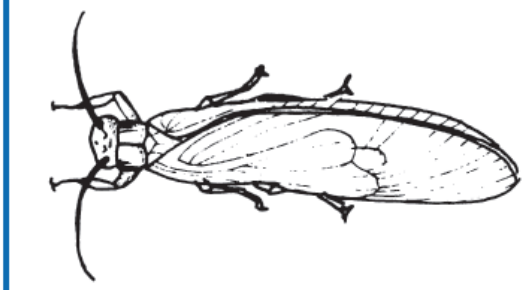
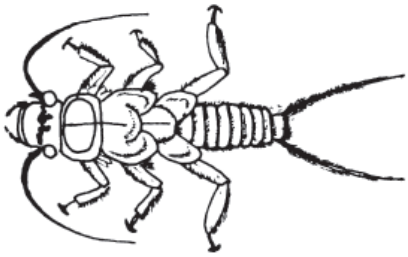
Play/Model: Biodiversity Go Fish!

How to play: Each player gets 7 cards. The rest of the deck is placed in the middle of the players face down. Each player gets a turn in a clockwise order (to the player's left). During a turn, a player asks another player if they have the juvenile (baby) or adult card of the species card to make a match. For example, a player would ask for the mosquito larva (juvenile/baby of a mosquito) to match to their adult mosquito species card. If the player doesn't have the matching species card, they say "go fish". When players "go fish" they can take a card from the deck in the middle of the group.

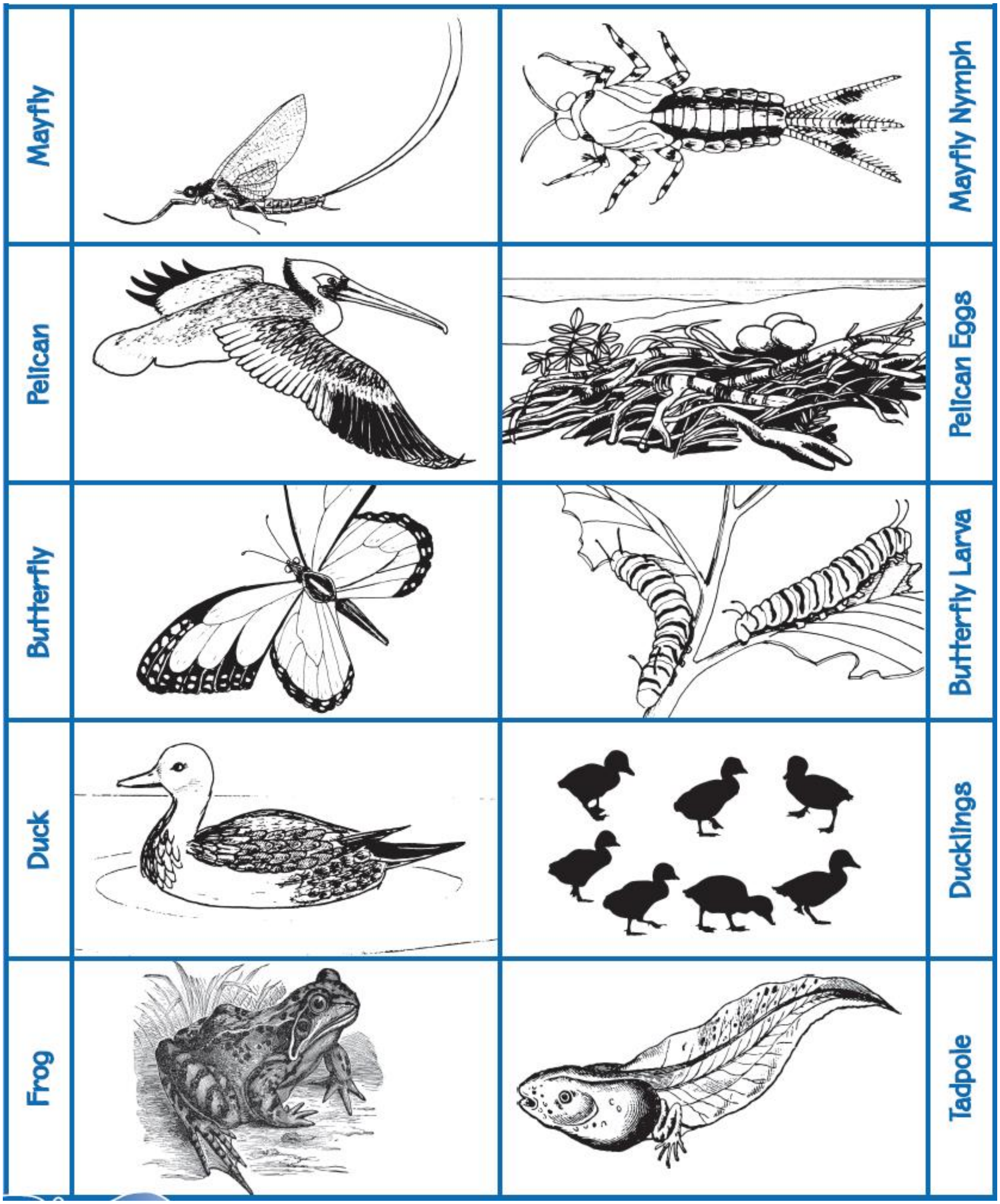
Play continues with players trying to find the match to their species card. Biodiversity Go Fish is over when one player runs out of cards and there are no more cards in the middle to pick up. The winner is the player with the most species cards matched in front of them.

Teacher prep: cut out each animal card so that each adult and juvenile species is separate from each other. Place all cards into 1 envelope.

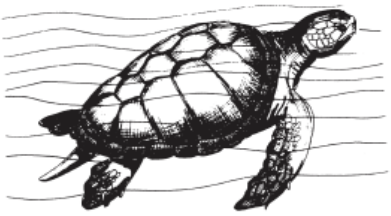
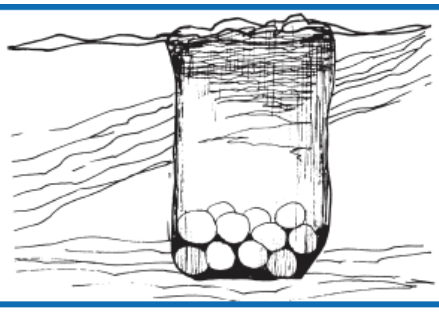
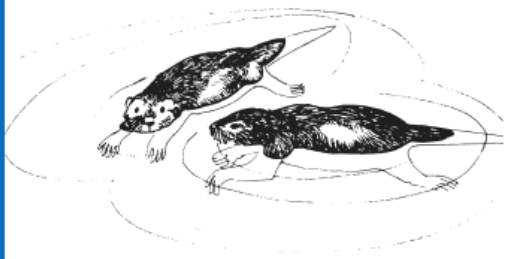
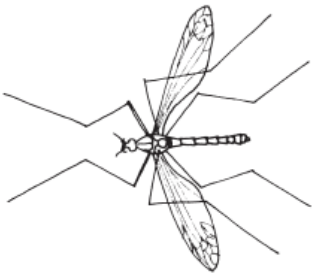
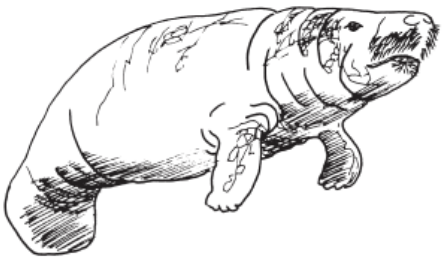
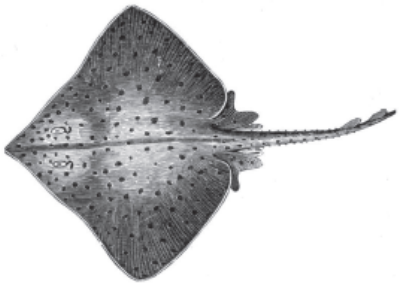
Biodiversity Go Fish! Cards:

Whirligig Beetle			Whirligig Larva
Caddisfly			Caddisfly Larva
Dragonfly			Dragonfly Nymph
Stonefly			Stonefly Nymph
Osprey			Osprey Chicks

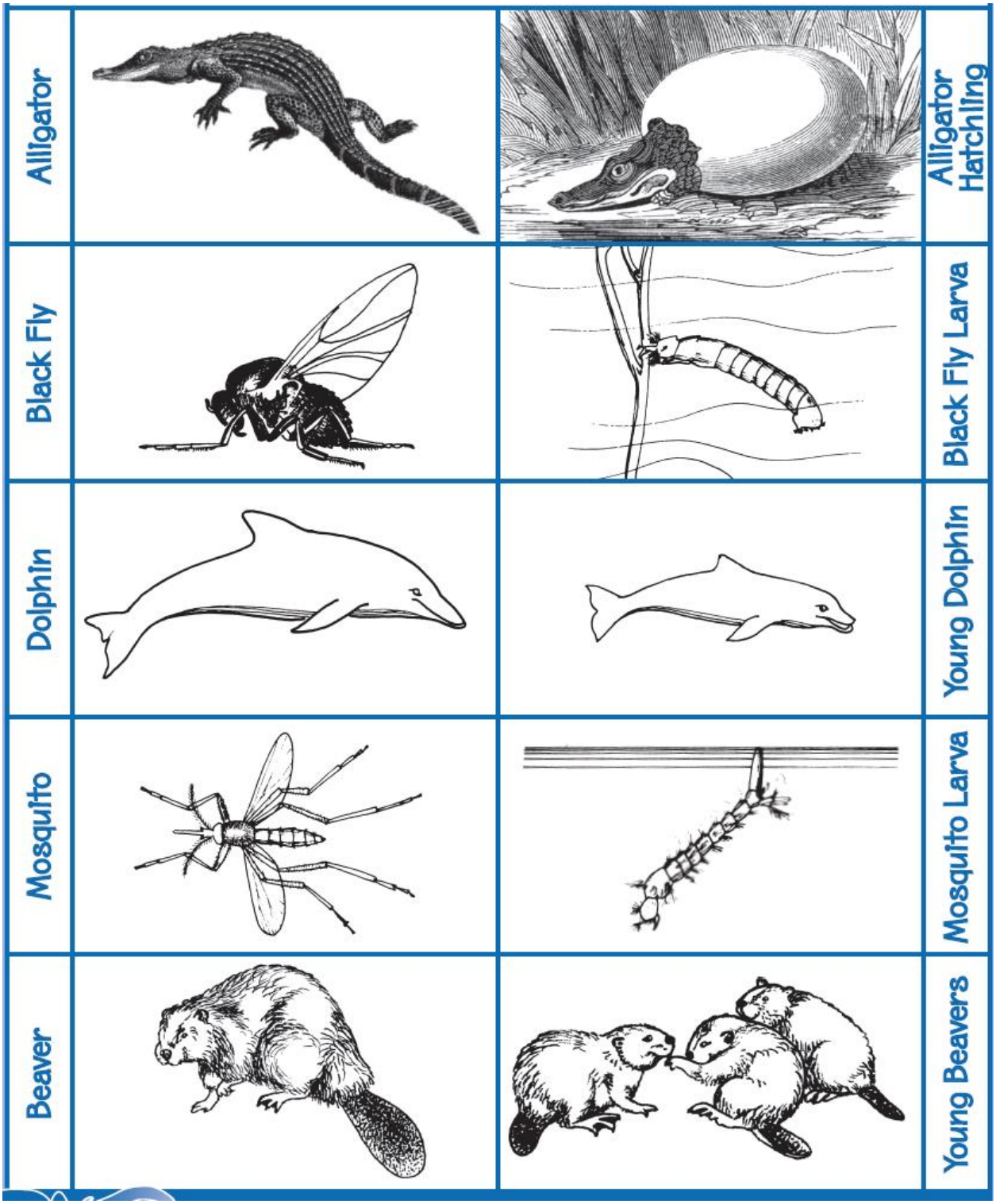
<u>Biodiversity Go Fish! Cards:</u>



Biodiversity Go Fish! Cards:

Sea Turtle			Sea Turtle Eggs
Sea Otter			Young Sea Otters
Cranefly			Cranefly Larva
Manatee			Young Manatee
Skate			Skate Egg Case

Biodiversity Go Fish! Cards:

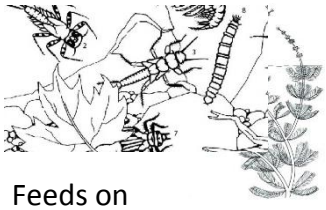
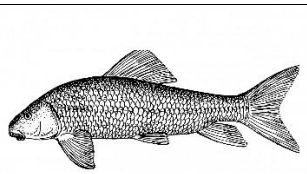
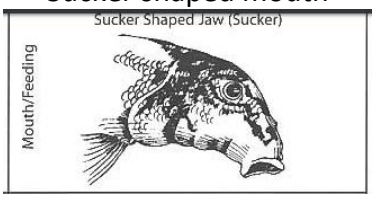
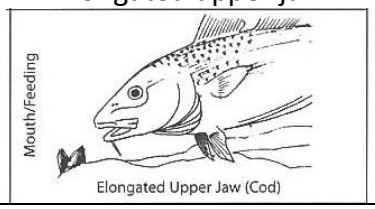
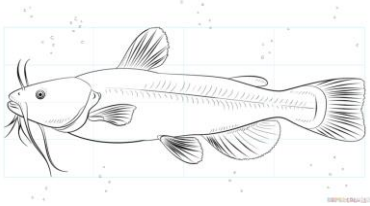
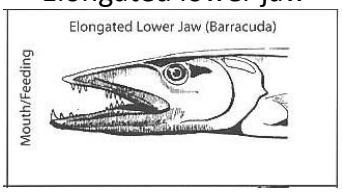
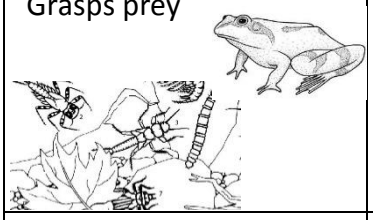
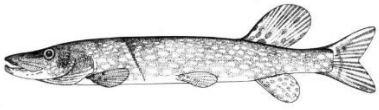
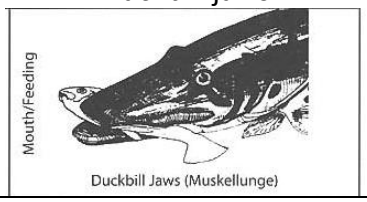
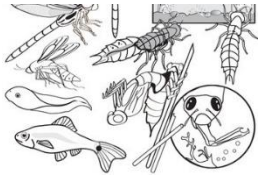
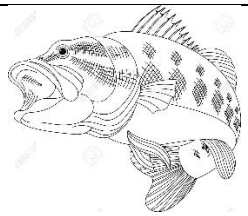
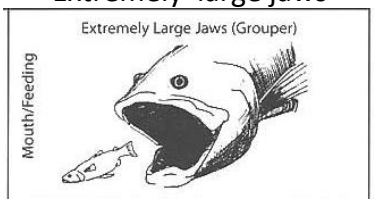


Adaptations and Biodiversity

Fish

Cut out each of the fish food sources and jumble them up.

Next try to rematch the fish and its food source with the correct mouth, discussing with a partner why and how each mouth is suited for its purpose.

What they eat	Fish	Mouth
 Feeds on very small plants and animals	 Sucker, carp	Sucker shaped mouth 
 Feeds on prey it looks down on	 Spoonbill, sturgeon	Elongated upper jaw 
Feeds on prey it sees above 	 Barracuda, flathead catfish	Elongated lower jaw 
Grasps prey 	 Muskellunge, pike	Duckbill jaws 
 Surrounds prey	 Bass, grouper	Extremely large jaws 

Name: _____

Identify Invertebrates and Vertebrates

Many different animals share our planet with us. Scientists **classify** animals based on their similarities. One way scientists group animals is by whether or not they have a backbone.

Some animals like dogs, cats, birds, lizards, fish, and humans have backbones. Scientists classify backboned animals as **vertebrates.**

Other animals, such as squid, worms, insects, and clams do not have backbones. Scientists call these animals **invertebrates.**

Choose **five animals** from the list below. Write the animal's name, whether it is a vertebrate or invertebrate, and two important traits in the chart below. An example has been provided for you.

Scorpion Fox Octopus Hawk Snail Rabbit Wolf

Deer T-Rex Spider Fish Jellyfish Turtle Beetle

Animal	Vertebrate/ Invertebrate	Two important traits
Rabbit	Vertebrate	1. A rabbit has long ears 2. A rabbit is a mammal

Name: _____

Animal Adaptations

Learn about animal adaptations

Read the passage and answer the questions.

An adaptation is a genetic change that helps an animal survive in its environment. Animals depend on their physical features to get food, build homes, keep safe, withstand weather and attract mates. These features are called physical characteristics because they allow the animal to live in a certain place. These adaptations don't happen during one animal's life but over generations. Some examples of physical adaptations are the shape of a bird's beak, the number of fingers, colour of fur, and the shape of an ear or nose. These things can help an animal survive. For example, if there are a lot of squirrels in one wooded area and some of them are white and some are tan with brown spots, the white squirrels are very easy for the hawk to spot in the trees. The tan and brown spotted ones blend (camouflage) in the trees and are harder to see, making it hard for the hawks to spot them. The hawks would eat a lot more white squirrels. Fewer and fewer white squirrels would be alive, resulting in fewer white squirrels born. This is an example of how evolution by natural selection leads to an adaptation.

1. Give an example of a physical adaptation. How might this help an animal survive?

_____
_____
_____

2. Can an animal adapt within its lifetime?

_____

_____

3. According to the example, which colour squirrel would you expect to see more of in ten years? Explain how you know.

_____
_____
_____

Grade 6 Classroom Hatchery Activities

#2 Habitat Lap Sit

As adapted from: Project Wild

Time Frame: 30 minutes

Class size: 15-45 students

Setting: Outdoors preferred (open playing field or school yard area), or indoors (gymnasium or large open area in classroom)

Objectives:
In this interactive activity, students will identify components of a habitat, recognize how humans and other animals depend upon a habitat, and understand the significance of loss or change in a habitat.

Materials:
-Large poster paper with graffiti questions recorded on them (x4)
-Pencils (students own)
-Masking tape (if attaching graffiti reflections onto the wall) or to avoid moving of paper on desks while students write

Curriculum Links

Overall Expectations

Science & Technology- Understanding Life Systems: Biodiversity
-Biodiversity includes diversity of individuals, species and ecosystems
-Because all living things are connected, maintaining diversity is critical to the health of the planet
-Humans make choices that can have an impact on biodiversity

****Note: Health & Physical Education expectations originated from 2010 Interim Edition: Re-issued 2018 ****

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
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: Oral Communication
1. Listen in order to understand and respond appropriate in a variety of situations for a variety of purposes

Specific Expectations

Science & Technology- Understanding Life Systems: Biodiversity
1.2 assess the benefits that human societies derive from biodiversity and the problems that occur when biodiversity is diminished

2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics* and *organism* in oral and written communication

3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plants and animals in communities, and among communities and the physical landscapes that support them.

3.5 describe interrelationships within species between species, and between species and their environment, and explain how these interrelationships sustain biodiversity

***Note: Health & Physical Education expectations originate from 2010 Interim Edition: Re-issued 2018 ***

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.

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 games, recreational activities, fitness activities, dance)* according to their capabilities, while applying behaviours that enhance their readiness and ability to take part (*e.g., being engaged and moving throughout the activity, using time effectively, being open to new activities, displaying fair play by taking turns and sharing, listening to others, not blaming or take advantage of others)*

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

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

B 2.1 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: 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 (*e.g., ask questions to deepen understanding and make connections to the ideas of others)*

Procedure

1. Ask the students to number off from "one" to "four". All of the "ones" go to one corner of the room, the "twos" to another corner, etc. Depending on classroom dynamics, you can also assign students their numbers in order to aid in classroom management.
2. As the students move to their corners, clear a space in the centre of the room. If outside a clear, grassy area can act as your central spot. The "ones" should sit or stand together, the "twos" together, etc.
3. Assign each group a label such as: "ones" = food; "twos" = water; "threes" = shelter; "fours" = space.
4. The group will now form a circle. This is done by building the circle in chains of food, water, shelter and space. A student from each of the four groups walks toward the cleared area. The four students stand next to each other, facing in toward what will be the centre of the circle. Four more students - one from each group - join the circle. Keep adding to the circle in sets of four until all the students are in the circle.
5. All students should be standing shoulder to shoulder, facing the centre of the circle.
6. Ask the students to turn to the **right**, at the same time taking one step toward the centre of the circle. They should be close together, with each student looking at the back of the head of the student in front of him or her.
7. **Ask everyone to listen carefully**. Everyone should place their hands on the shoulders of the person in front of them. At the count of three, you want the students to **sit down on the knees of the person**

behind them, keeping their own knees together to support the person in front of them. You then say, *"Food, water, shelter and space-in the proper arrangement* (represented by the student's intact, "lap-sit" circle) *are what is needed to have a suitable (good) habitat.*

8. The students at this point may either fall or sit down. When their laughter has subsided, talk with them about the necessary components of suitable habitat for people and wildlife.
9. After the students understand the major point - that food, water, shelter and space are necessary for any animal's survival and, in their appropriate arrangement, comprise a suitable habitat - let the students try the circle activity again! This time ask them to hold their lap-sit posture. As students lap-sit - still representing food, water, shelter, and space in their appropriate arrangement - identify a student who represents "water". Then say, "*It is a drought year. The water supply is reduced by the drought conditions".* At this point, have the students who are called "water" remove themselves from their positions in the lap-sit circle, and watch the circle collapse, or at least suffer some disruption in arrangement. You could try this in several ways, removing one or more students from the circle. Conditions could vary from pollution to water supply, urban sprawl, limiting availability of all components, soil erosion, impacting food and water supplies, etc. Since animal's habitat needs depend upon food, water shelter, and space in their appropriate arrangement, "removal" of any will have an impact.

Variation of lap sit activity:

Have students form a circle, holding hands. Walk around the circle, first naming one student as an animal of a particular ecosystem. Name the next four students in the circle as food, water, shelter, and space for that animal. Repeat the process until all the students are involved. Any "extras" can be identified as elements of habitat e.g., resulting from a particularly good year for habitat needs for the last animal named. When all of the students have been designated as an animal or as components of an animal's habitat, comment on the fact that they are holding hands. This represents the idea that all things in an ecosystem are interrelated. Briefly discuss the idea of interrelationships. Then move the students into position to do the "lap sit" described above. Remind the students that they noticed all elements were interrelated when they were holding hands. Now they are going to find out they all are dependent on another as well. Do the "lap sit" and then discuss interrelationships and interdependencies in ecological systems.

10. Returning to the classroom, introduce graffiti reflections. Placing the reflection questions around the class (either on desks or displayed on walls), each student will rotate to each reflection response and record their answers. Remind students that they only have 1 minute to rotate to each response and that their responses can be simply rapid fire one-word connections, quick illustrations and it can be repeated from what has already been recorded on the sheet- the idea for this portion of the activity is for students to create a concrete understanding of what habitats are, the key parts that make up a habitat, species that are found within a habitat and some effects that may alter a habitat.

Graffiti questions are as stated:

- *What are the five essential components of a habitat?*
- *What are examples of habitats?*
- *What are examples of species that can be found in a habitat?*
- *What are some effects that may alter a habitat?*

Upon completion of the graffiti activity, you can ask students to share their response as a class discussion.

Grade 6 Classroom Hatchery Activities

#3 Sorting Survival Needs: A Venn Diagram activity

As adapted from: The Beautiful Basis: Project Wild

Time Frame: 30 minutes

Class size: 20-30 students

Setting: Classroom or large outdoor learning space (enough room to create Venn diagram as a whole class and have class sit around hula hoops during the sorting portion of activity)

Objectives:
Guiding students toward an understanding of the Venn diagram, this activity will allow students to be able to identify the basic survival needs of all living things and to recognize that all people and all animals have similar basic needs by physically manipulating hula hoops or circles created by skipping ropes. Following this activity, students will be able to solve problems as they sort, compare and contrast the survival needs of animals and display and share information using the Venn diagram as a graphic organizing tool while working cooperatively in a group.

Materials:
-3 hula hoops or 3 jump ropes to create three overlapping Venn diagram circles
-Laminated key survival needs and headings (in **BOLD)** to label each separate Venn circle
-Opaque bag or paper bag
-Venn diagram graphic organizer (attached)

Curriculum Links
Overall Expectations
Science & Technology: Biodiversity
-Biodiversity includes diversity of individuals, species and ecosystems
-Because all living things are connected, maintaining diversity is critical to the health of the planet
Mathematics: Data Management and Probability
-Collect and organize discrete or continuous primary data and secondary data and display the data using charts and graphs, including continuous line graphs
-Read, describe and interpret data, and explain relationships between sets of data

Specific Expectations
Science & Technology: Biodiversity
1.2 assess the benefits that human societies derive from biodiversity and the problems that occur when biodiversity is diminished.
2.3 use scientific/inquiry/ research skills to compare the characteristics of organisms within the plant or animal kingdoms.
2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics,* and *organism* in oral and written communication.
3.1 identify and describe the distinguishing characteristics of different groups of plants and animals and use these characteristics to further classify various kinds of plants and animals.

Mathematics: Data Management and Probability

-Select an appropriate type of graph to represent a set of data, graph the data and justify the choice of graph
-Determine, through investigation, how well a set of data represents a population on the basis of the method that was used to collect the data
-Read, interpret, and draw conclusions form primary data and from secondary data, presented in charts, tables, and graphs
-Demonstrate, through investigation, an understanding of how data from charts, tables and graphs can be used to make inferences and convincing arguments

Background:

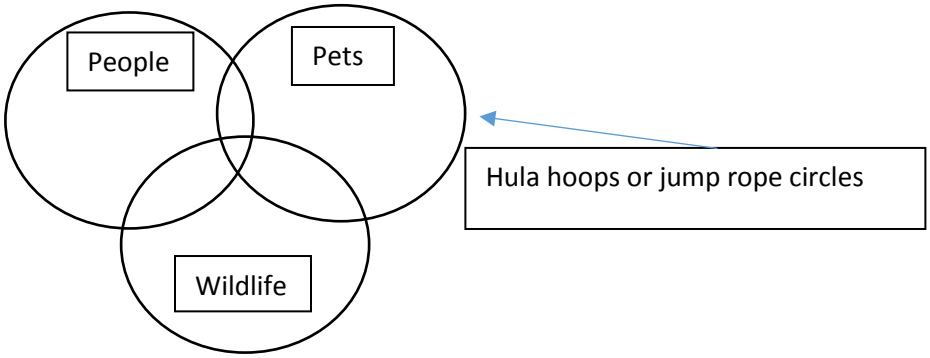
Venn diagrams are a commonly used sorting tool. Each circle is used to contain all the objects with a particular characteristic. The name of the sorting rule is shown as a label for each circle; in this case the label for each group - people, pets and wildlife. Providing a hands-on outlet, students will use 3 hula hoops or 3 large rings of jump rope to serve as concrete Venn diagram circles.

All animals, either directly or indirectly, depend on plants, sunlight, water, soil, and air. All animals - including people, pets, and wildlife - need food, water, shelter, and space in which to live. Because animals need food, water, shelter, and space to be available in a way that is suitable to their needs, we say that these things must be available in a suitable "arrangement".

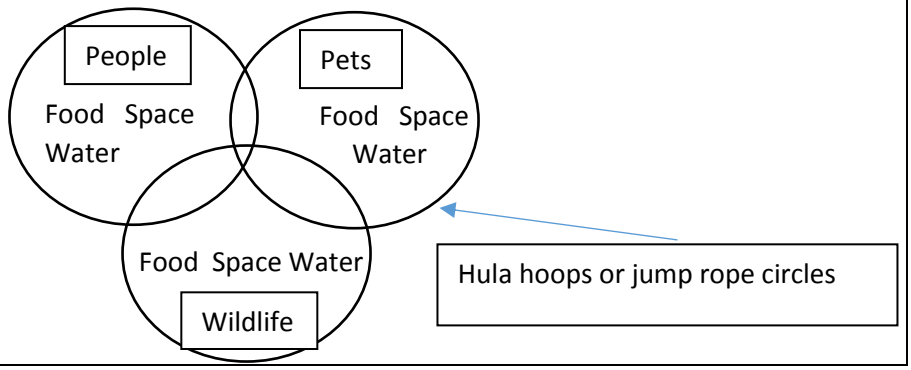
Procedure:

1. Place the three hula hoops (or jump rope circles) and assemble students on the floor, sitting around the hoops.
2. One student at a time, ask for volunteers to place the headings at the top of each circle.

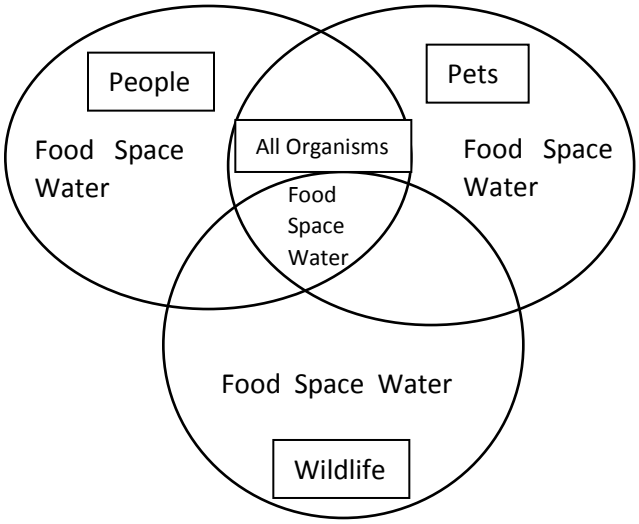
The layout should look similar to this:



3. Once each circle has been correctly labelled, explain to students that inside the opaque bags, there are labels of each survival need for animals in the bag. Have one student at a time pull one survival need and place it under the correct heading of the animal that requires it. Continue having students pull the survival needs until the bag is empty.



4. Using the remaining key survival need terms (that are in **Bold)** students will outline the overlapping needs that have been placed under each the animals. Add the title *All Organisms* to the middle overlapping area. ***Ask*** the students what they notice in each of the circles and ask if there are any overlap or repeat of needs for each animal? Once there is the connection that there is repeat of similar needs between animals, provide the students with the correct survival need to place in the middle of the Venn diagram. During this time, emphasize to the students that the overlap between the 3 hoops tells us that they are repeat or the same characteristics for the animals that have been sorted into each separate hoop.

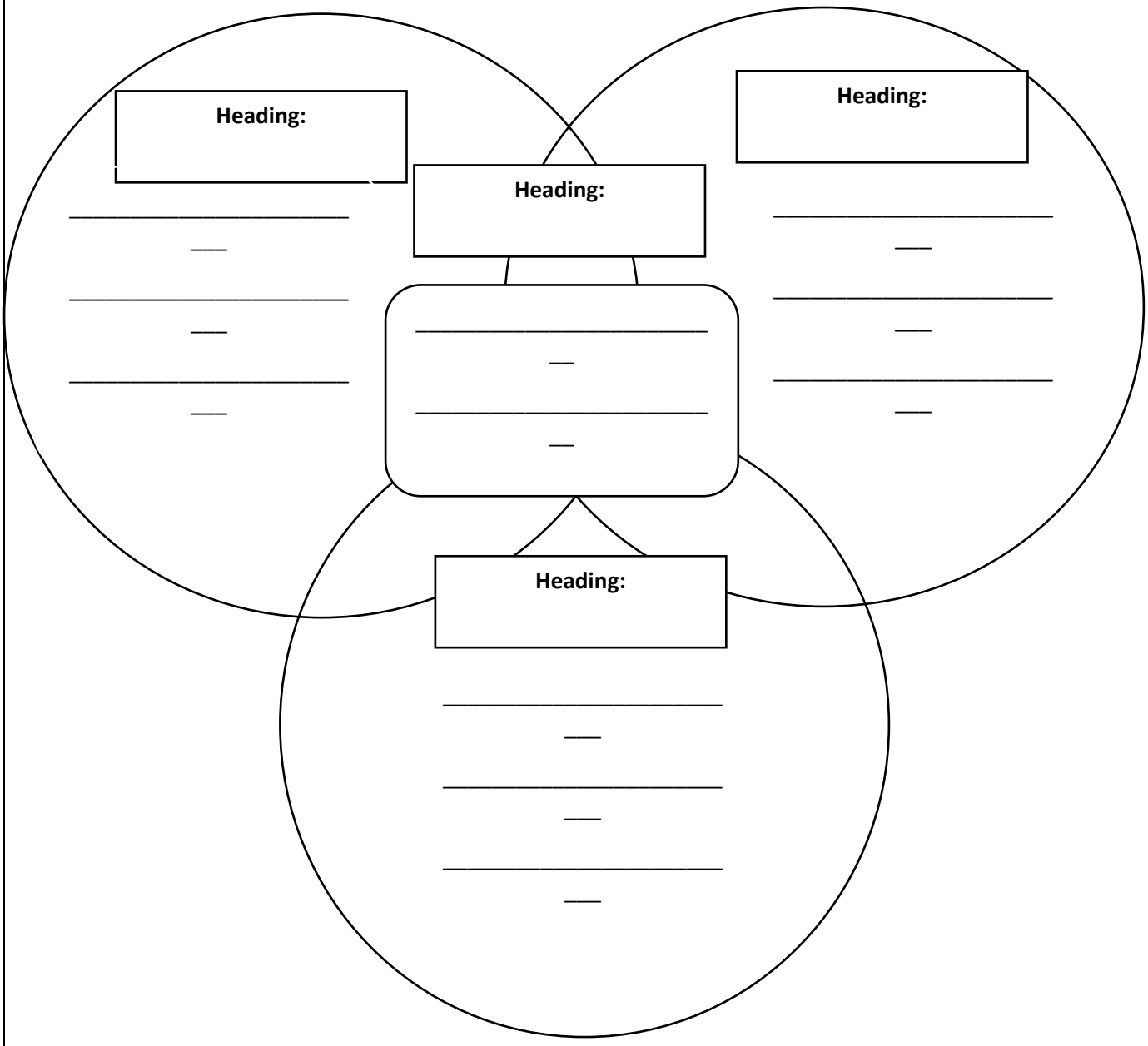


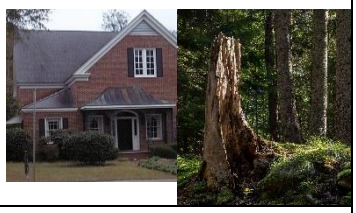
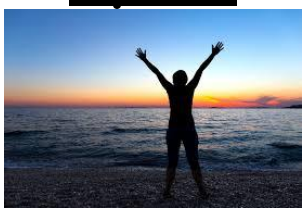
5. Once the headings and survival need labels have been placed correctly into the Venn diagram, provide each student with their own copy of the Venn Diagrams Graphic Organizer. Students can work with elbow partners while recording their own connections on their own sheet or they can work independently completing the graphic organizer. Students are expected to label the Venn diagram graphic organizer using the data that has been laid out in each of the circles.

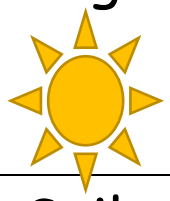
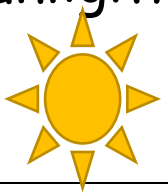
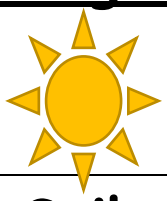
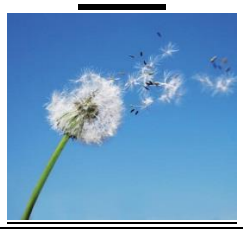
Name:_____

Animal Survival Needs Venn Diagram Graphic Organizer

Use the Venn diagram to record the headings for each circle. Once you have placed the headings, write the survival needs in each circle including the overlapping needs by using the information and example we created as a class using the hula hoops or jump ropes.



** Teacher prep: cut out each heading and survival need to be placed into opaque bag and sorted into Venn diagram **			
People	**Pets**	**Wildlife**	**All Organisms**
Food 	Food 	Food 	**Food** 
Water 	Water 	Water 	**Water** 
Shelter 	Shelter 	Shelter 	**Shelter** 
Space 	Space 	Space 	**Space** 
Arrangement	Arrangement	Arrangement	Arrangement

√	√	√	√
Sunlight 	Sunlight 	Sunlight 	**Sunlight** 
Soil 	Soil 	Soil 	**Soil** 
Air 	Air 	Air 	**Air** 

Grade 6 Classroom Hatchery Activities

#4 Hanging Atlantic Salmon Habitats

Time Frame: 60 minutes

Class size: 20-30 students

Setting: Classroom

Objectives:
Students will be able to identify the components of a habitat that are essential for Atlantic Salmon to survive. After learning of the habitat requirements of a healthy habitat for an Atlantic Salmon, students will create a habitat mobile that contains both specific habitat elements and key features to be included in Atlantic Salmon habitat.

Materials:
-Scissors
-Pencil crayons
-Paper plate (1 plate per student)
-Piece of 24-inch string/yarn
-Piece of 12-inch string/yarn
-6 pieces of 6-inch string yarn
-Clear tape
-Glue
-Illustration of Atlantic Salmon (attached) or blank white paper if students choose to illustrate their own Atlantic Salmon
-Old fishing or outdoors magazines that include images of habitat features (water, rocky bottom, streams, etc.) and for additional research if desired
-Technology if additional research is required
-Copies of existing art or photography showing the habitat for an Atlantic Salmon (attached)
-Key features of Atlantic Salmon Habitat (attached)

Curriculum Links
Overall Expectations
Science and Technology: Understanding Life Systems- Biodiversity
-Biodiversity includes diversity of individuals, species and ecosystems
-Because all living things are connected, maintaining diversity is critical to the health of the planet
The Arts: Visual Arts
D1. Creating and Presenting: apply the creative process to produce art works in a variety of traditional two- and three-dimensional forms, as well as multimedia art works, that communicate feelings, ideas, and understandings, using elements, principles, and techniques of visual arts as well as current media technologies

Specific Expectations
Science and Technology: Understanding Life Systems- Biodiversity
2.2 investigate the organisms found in a specific habitat and classify them according to a classification system

2.3 use scientific inquiry/research skills to compare the characteristics of organisms within the plant or animal kingdoms
2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate,* and *organism* in oral and written communication
3.1 identify and describe the distinguishing characteristics of different groups of plants and animals and use these characteristics to further classify various kinds of plants and animals
3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plants and animals in communities and the physical landscapes that support them

The Arts: Visual Arts

D 1.1. create two-dimensional, three-dimensional, and multimedia art works that explore feelings, ideas, and issues from a variety of points of view
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, techniques, and technologies to determine solutions to design challenges

Background

Basic life-giving conditions of food, shelter, air, water and space in a suitable arrangement for animals to survive seem obvious, however, water is a sensitive part of the habitat and it must serve to do far more than quench thirst. Water in lakes and streams must meet specific requirements for different aquatic life forms, including Atlantic Salmon. Slight changes in salinity, pH (acidity), dissolved oxygen, and the presence of a wide range of pollutants in water can spell disaster for certain aquatic organisms.

To successfully support Atlantic Salmon in Ontario waters, careful attention must be paid to the range of conditions that each life form can tolerate. For example, Atlantic Salmon require moving water or currents. Other fish prefer almost static conditions. Some fish prefer deep water and others shallow rocky bottoms. The variation in habitats that can be found in Ontario waters is remarkable. The major purpose of this activity is for students to recognize and appreciate the complex life requirements of aquatic species like Atlantic Salmon. Learning about the wide variety of habitats but also making the connection that these species still require the same basic needs as humans, students are able to broaden their understanding of living things, relate it personally to themselves as well as create a foundation of knowing what needs have to be met, especially when raising their own Atlantic Salmon in the classroom.

Procedure

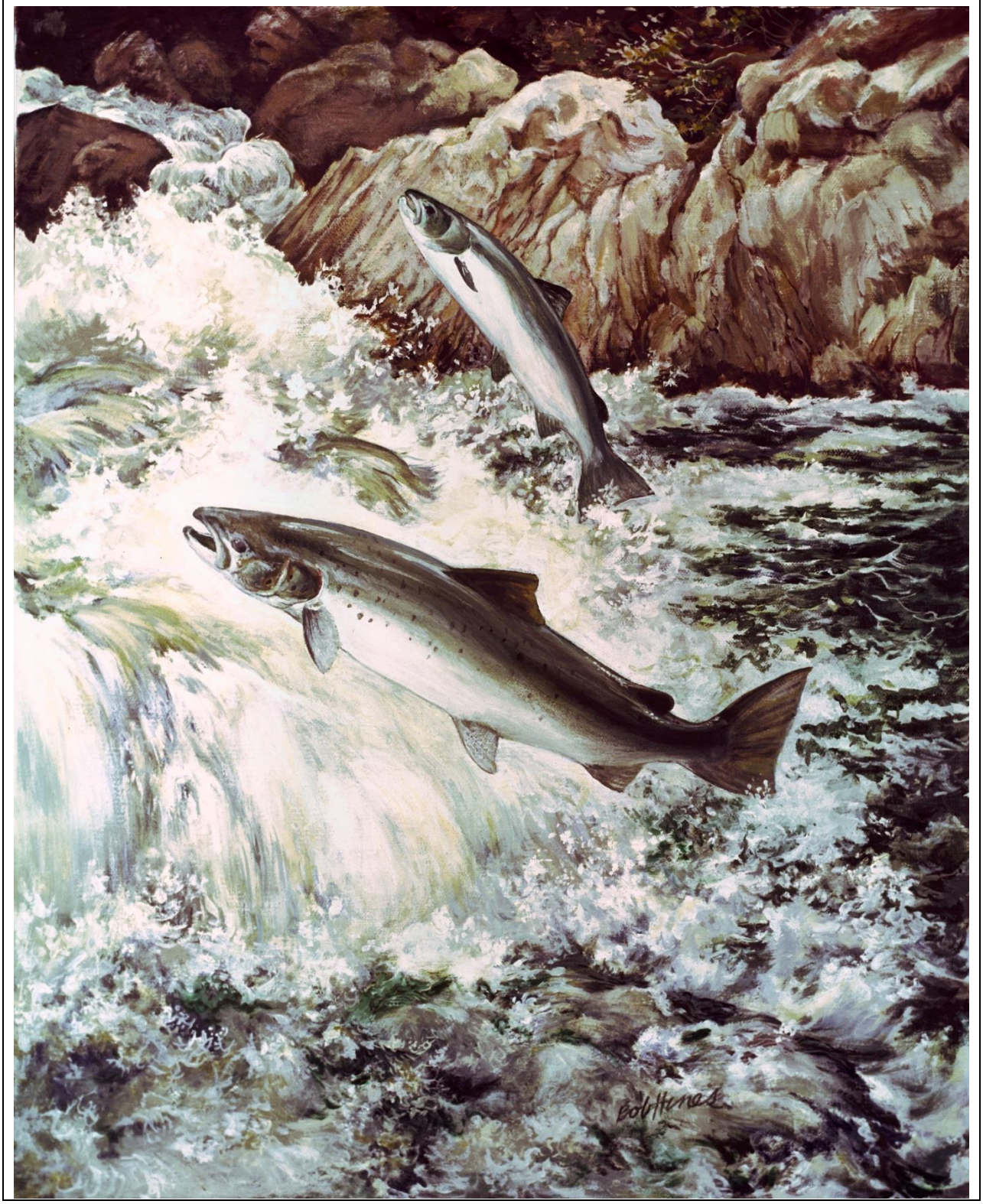
1. Share with students a general discussion about mobiles - moving works of art that are created by suspending and balancing shapes. Explain that students will be creating "fish habitat" mobiles that incorporate important elements of the Atlantic Salmon's habitat. Review the components of a habitat - food, water, shelter and space (physical components such as rocks, logs, etc.). Determine whether additional research is necessary. If so, allow students to conduct it (individually or in groups).
   Point out that it might be difficult to visualize specific fish habitat and how all the parts fit together, since few of us spend much time looking around it. Provide copies of existing art or photography showing habitat for the Atlantic Salmon, or post it on-screen if computers or Smartboards are available. Look for common components that indicate major or important habitat features.
2. Tell students that they will now create a physical well-balanced mobile to depict the specific habitat for Atlantic Salmon. Hand out the following materials to each student: scissors, pencil crayons, glue, paper plate, one 24-inch string, one 12-inch string, six 6-inch strings, tape, and a copy of the Atlantic Salmon illustration (or white paper if they want to illustrate their own salmon).
3. Instruct student to cut out the Atlantic Salmon illustration or illustrate their own salmon on the white paper and then cut it out to be ready for the mobile. Students may colour their pages either before or after they cut. Included on each student page are two Atlantic Salmon illustrations - these images can be

shared between students **or** they can make their salmon on the mobile two-sided by cutting out both images and gluing them together prior to attaching them to the string affixed to the plate.

4. Place the paper plate on the table so that the bottom is facing upwards. Tape one end of the 24-inch string to the rim of the paper plate. Tape the other end of the string to the opposite rim of the paper plate. For extra stability, repeat with another string.
5. Glue an end of the 12-inch string on the back of the Atlantic Salmon illustration. Next tape the free end of the 12-inch string to the middle of the paper plate on the top side (opposite of the 24-inch string). Once the Atlantic Salmon has been attached to the mobile, students are to continue cutting out the key features of a healthy Atlantic Salmon habitat and also illustrate or cut out pictures from old fishing magazines of examples of features that make the habitat successful for salmon. Using the 6-inch string, each key feature is to be attached to a free end of the string, while the opposite end of the string then taped equidistantly around the perimeter on the top of the plate. This will create a tiered effect between the Atlantic Salmon and the habitat features.
   You can suggest to students if they would like to cut their string 6-inch string at varying lengths so that when attached to the plate they can illustrate that features such as aquatic plants would be farther down on the mobile habitat where the water could be close to the top of the mobile to indicate that the water is covering the remaining following items on the mobile habitat.
6. Hang mobiles around the classroom as students can enjoy the concrete examples and see a display of a successful Atlantic Salmon habitat and the conditions that make a healthy habitat for this fish they are studying.

Example of Atlantic salmon habitat:

Example of Atlantic salmon habitat:



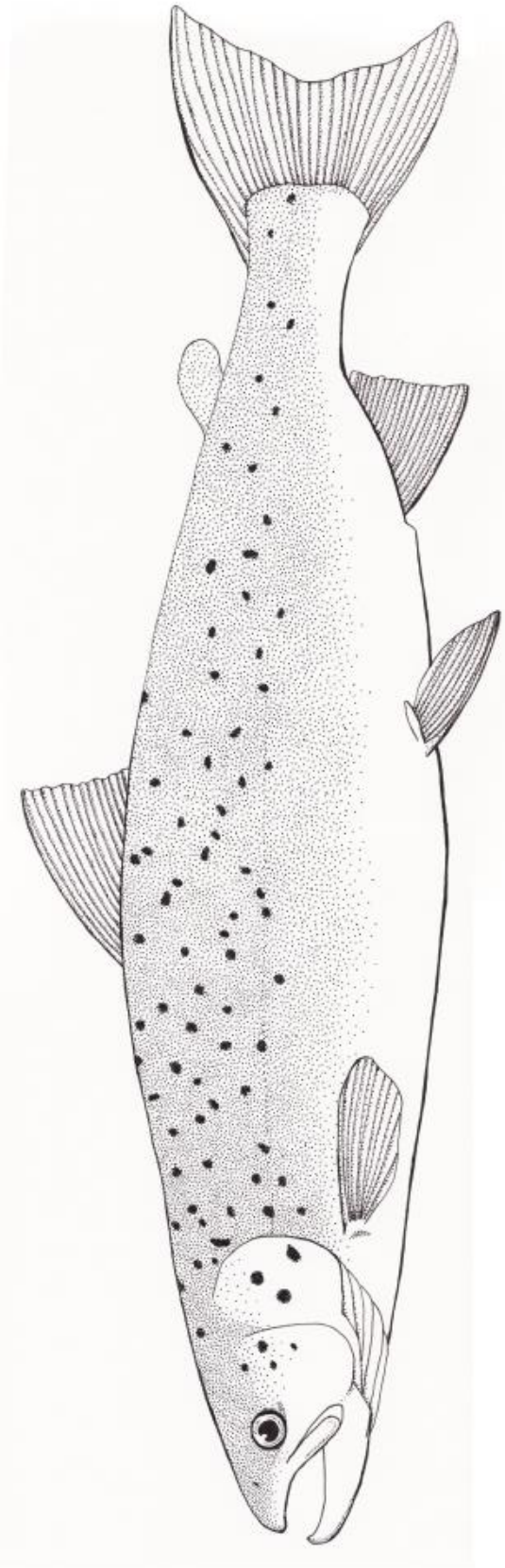
Example of Atlantic salmon habitat:

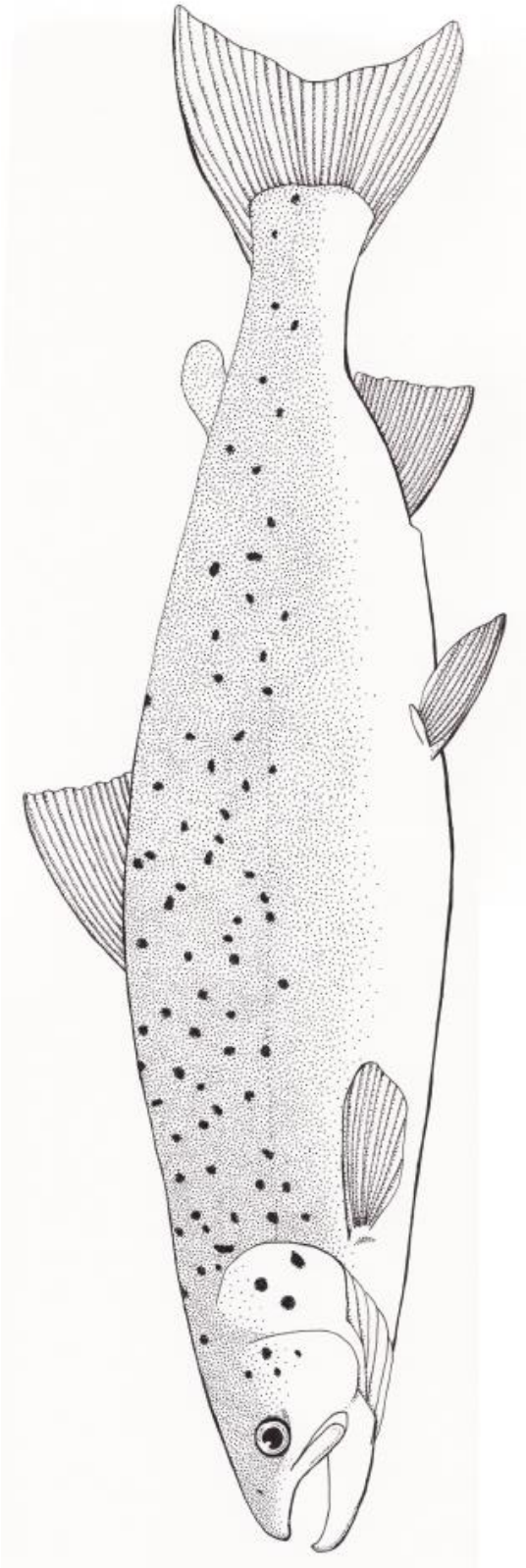
Example of Atlantic salmon habitat:

Key features of Atlantic salmon habitat

What to do: cut out each of the key features to be attached to the 6-inch string on your mobile to label your illustrations and images to complete the mobile habitat.

Atlantic Salmon Habitat	Feeds on: stoneflies, mayflies, caddisflies, and sometimes unguarded salmon eggs. As adults, feeds on other fish.
Clean water below 25° C.	The stream bottom is best when it is stony and has coarse sand, gravel and large boulders
Atlantic Salmon return to the stream for spawning	Female Atlantic Salmon create a redd or nest in the rocky bottom of the stream to deposit eggs in a safe spot





Grade 6 Classroom Hatchery Activities

#5 Life in freshwater

Describe the variety of organisms living in freshwater and then examine some of the interactions among them.

Time Frame: 30 minutes

Class size: 20-30 students

Setting: Classroom: available large area for class to view demonstration (large table) or in a circle on the floor

Objectives:
In this class-wide demonstration discovery, students learn that only a small proportion of the Earth's water supply is freshwater. Following the class activity, students will create and display the data in a water pie chart to create a visual representation of the percentage of water that covers the earth and where it is placed across the world.

Materials:
-Map of world or globe
-97 blue cube or circle counters **or** Unifix cubes; 1 red cube or circle counter **or** Unifix cube, 2 green cube or circle counters or Unifix cubes
-Pie chart template handout (attached)
-Pencil crayons (blue, green and red)

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Biodiversity
-Because all living things are connected, maintaining diversity is critical to the health of the planet.
-Humans make choices that can have an impact on biodiversity
Mathematics: Data Management and Probability
-Collect and organise discrete or continuous primary data and secondary data and display the data using charts and graphs
-Read, describe, and interpret data, and explain relationships between a set of data

Specific Expectations
Science & Technology- Understanding Life Systems: Biodiversity
1.1 analyse a local issue related to biodiversity, taking different points of view into consideration, propose actions that can be taken to preserve biodiversity, and act on the proposal
1.2 assess the benefits that human societies derive from biodiversity and the problems that occur when biodiversity is diminished
3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plants and animals in communities, and among communities and the physical landscapes that support them
3.5 describe interrelationships within species between species, and between species and their environment, and explain how these interrelationships sustain biodiversity

Mathematics: Data Management and Probability

-Collect data by conducting a survey or an experiment to do with themselves, their environment, issues in their school or community or content from another subject, and record observations or measurements

-Read, interpret, and draw conclusions from primary data and from secondary data presented in charts, tables, and graphs

-demonstrate, through investigation, an understanding of how data from charts, tables, and graphs can be used to make inferences and convincing arguments

Procedure

Water around the globe

1. Look at the globe or map with the students. Ask if the students can find where they live in the world and ask them to point out the lakes, rivers and oceans. Explain that these are called surface waters.
2. Enquire with the students what it means for a waterbody to be saltwater and what it means for a waterbody to be freshwater. Ask any students if they have ever tasted salt water?
3. Exploring the map or globe, ask the students if they think there is more water or land on the globe? *Is there water beneath the surface of the ground that we cannot see?*

Demonstrating with manipulatives

1. Spread the counters out on a table or floor area with the students sitting around the demonstration area. Explain that there are 100 counter pieces that represents all (100%) of the water in the world.
2. Using the concept of percentages, ask the students if they know what the red and green counters represent. See if they can estimate percentages. Explain that the two green counters represent water that is stored as ice in glaciers and at the poles (2%). The lonely red counter represents the freshwater that is available for plants, animals, and people (1% of all the water on the earth). Ask the students what the remaining blue counters represent.
   They represent the water that's in the ocean, 97% of all the water on earth.
3. Ask the students what we should do to take good care of the water we use and why is it important that we thinking of how we use and consume water?
4. Provide students with their own copy of the water pie. The circle as a whole represents all the water in the world (100%). Ask students to colour in two of the pie slices (2%) green to represent glaciers and ice, one slice of the pie (1%) red to represent the amount of fresh water and the remaining slices blue to represent the ocean (97%). After colouring in the slices, students will label the water pie.

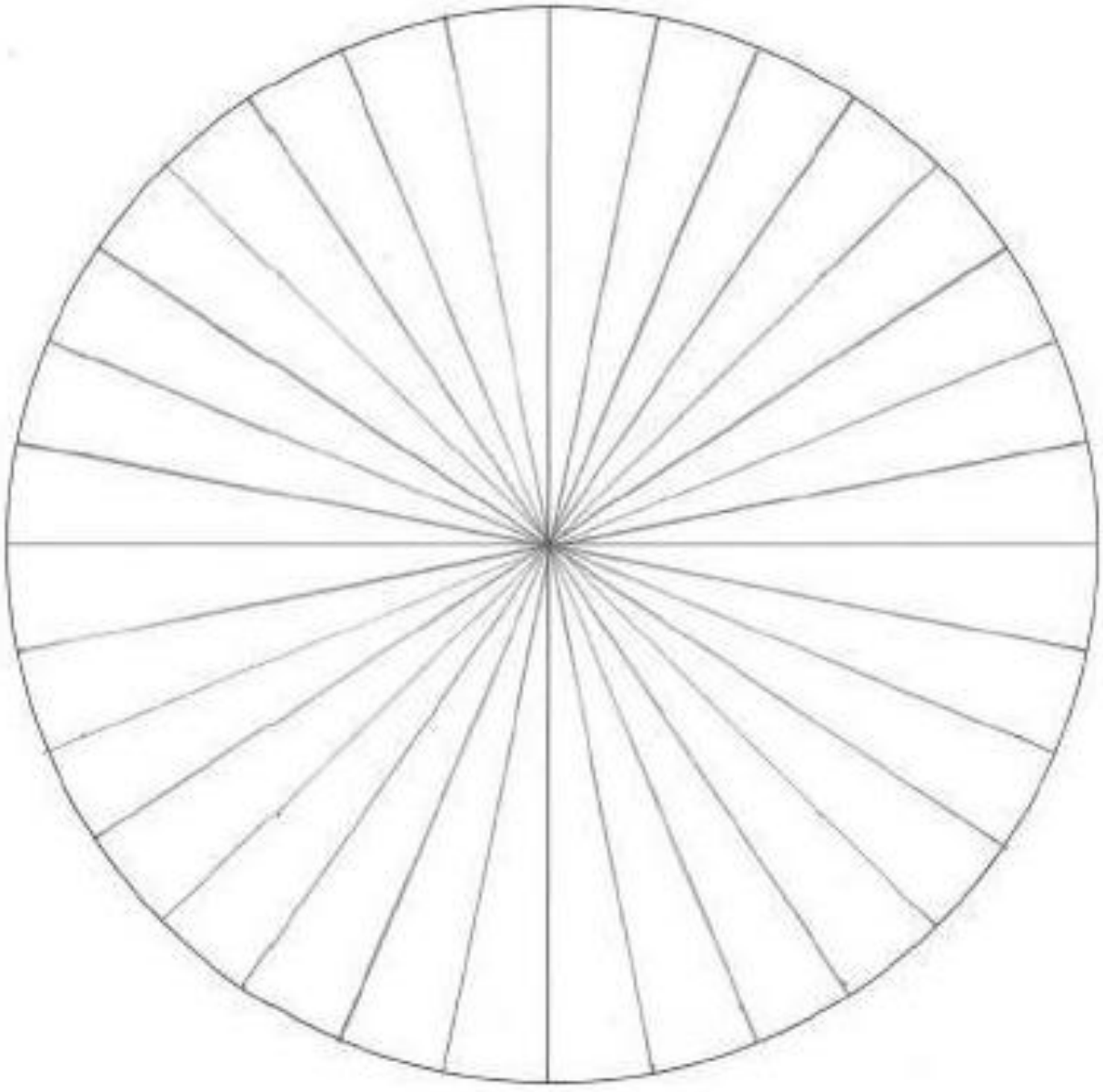
Name_____

Water Pie

Freshwater in the World

What to do:

1. Colour in two of the pie slices (2%) green to represent glaciers and ice.
2. Colour in one slice of the pie (1%) red to represent the amount of freshwater.
3. Colour in the remaining slices blue to represent the ocean (97%).
4. After colouring in the slices, label the water pie with the headings: *Glaciers and ice* (green)*; Freshwater* (red); and *Ocean* (blue).



Grade 6 Classroom Hatchery Activities

#6 Community Habitats

As adapted from: Shrinking Habitat: Project Wild

Time Frame: 45 minutes

Class size: 25-30 students

Setting: Large classroom with open area (desks and chairs set to the side) **OR** gym **OR** outdoor space

Objectives:
Students simulate a process of land development in a physically involving activity and will be able to describe some effects of human development of land areas on plants and animals that previously lived in the area. Following the interactive activity, students will be able to recognize that loss of habitat is the most critical problem facing wildlife today.

Materials:
-Green (x3) and blue (x2) construction paper
-Hula hoops (4-6)
-five of six larger bedsheets or blankets for 1 student group of developers

Curriculum Links
Overall Expectations
Science & Technology: Understanding Life Systems- Biodiversity
-Biodiversity includes diversity of individuals, species, and ecosystems
-Because all living things are connected, maintain diversity is critical to the health of the planet
-Humans make choices that can have an impact on biodiversity
***Note: Health & Physical Education expectations originate from 2010 Interim Edition: Re-issued 2018 ***
Health & Physical Education: Living Skills
-Demonstrate personal and interpersonal skills and the use of critical and creative thinking process 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

Specific Expectations
Science & Technology: Understanding Life Systems- Biodiversity
1.1 analyse a local issue related to biodiversity, taking different points of view into consideration, propose actions that can be taken to preserve biodiversity, and act on the proposal
1.2 Assess the benefits that human societies derive from biodiversity and the problems that occur when biodiversity is diminished.
2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics,* and *organisms* in oral

and written communication

3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plants and animals in communities, and among communities and the physical landscapes that support them.

3.5 describe interrelationships within species between species, and between species and their environment, and explain how these interrelationships sustain biodiversity.

***Note: Health & Physical Education expectations originate from 2010 Interim Edition: Re-issued 2018 ***

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 other students when being active;* ***Movement Competence:*** *communicate clearly when working together in small groups to create a movement sequence)*

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:*** *promote fair play, share equipment, take turns and follow rules when playing lead-up games;* ***Movement Competence****: contribute ideas when working in a group to accomplish a collaborative task*

Health & Physical Education: Active Living

A 1.1 actively participate in a wide variety of program activities (*e.g., lead-up games, recreational activities, fitness activities, dance),* according to their capabilities, while applying behaviours that enhance their readiness and ability to take part (*e.g., being engaged and moving throughout the activity, using time effectively, being open to new activities, displaying fair play by taking turns and sharing, listening to others, not blaming or taking advantage of others)*

A 1.2 demonstrate an understanding of factors that contribute to their personal enjoyment of being active (*e.g., having the opportunity to participate in activities in various sizes in groups and using various types of equipment, having a choice of activities, being able to take part in activities that are modified to suit their individual needs, being able to participate actively in a game or activity rather than having to sit it out, having a chance to take part in both team games and individual activities, experiencing pleasure in both the physical experiences and the aesthetic aspects of movement)*, as they participate in a wide variety of individual and small-group activities and lead-up games

Background

All around us, and all over the planet, wildlife habitat is being lost. Whenever an area of land is paved for a shopping centre, divided and excavated for homes for people, and when it is ploughed to grow a crop, small animals lose their homes and frequently their sources of food and water. As these small animals disappear, so too do the larger animals that previously depended upon the smaller animals as a source of food. This process is happening all over the earth. For example, many wetlands on the planet have been filled in and drained to make land for farming and homes. When they are filled in, many kinds of birds, reptiles, amphibians, crustaceans, and other species - including a wide variety of vegetation - are lost. Sometimes the animals can move somewhere else; most often they cannot. Lake Ontario Atlantic Salmon is an example of a population that was not able to continue surviving in the changing habitat during industrial and community growth.
The major purpose of this activity is for students to simulate some of the potential impacts of land development on wildlife and its habitat, to recognize that this process is one that is taking place in areas all over the planet and to understand that loss of habitat is the most critical problem facing wildlife today.

Procedure

1. Review with the students the elements necessary for a habitat (food, water, shelter and space). After some discussion to make sure that that elements of habitat are clearly in mind, tell the students that in this activity they will be simulating wildlife in its habitat.
2. Divide the students into four groups: **herbivores, carnivores, vegetation (**trees, shrubs, grasses, etc.) and people who will be **land developers**. If the students are not familiar with the terms "herbivore" and "carnivore", provide them with working definitions of these terms (herbivore - a plant-eating animal; carnivore - a meat-eating animal; and although not needed for this activity, omnivore - an animal that eats both plants and animals). Plan for three times as many herbivores as carnivores, with a small number of developers in proportion to the other two groups. The number (amount) of vegetation may vary. For example, two developers, three carnivores, nine herbivores, and six trees or bushes (vegetation).
3. Establish a large area - either in the classroom, with tables, chairs and desks moved to the sides of the room, or outside - that can be used to simulate the wildlife habitat area before development. The "land developers" are to stay on the sidelines at this time, simply observing the undeveloped land and its wildlife inhabitants, or meeting on their own, nearby, to make plans for development. They can make their entrance rather suddenly once the wildlife habitat has been established, simulating the arrival of heavy construction equipment.
4. Provide each "herbivore" with:
    - Two hula hoops to uses as "shelter"
    - Three pieces of green construction paper to represent food
    - One piece of blue construction paper to represent water
    - Some of the vegetation portrayed by students

Provide each "carnivore" with:

- One hula hoop to use as a "lair"
- Space equivalent to that used by three herbivores
- Three herbivores as a potential food source
- One piece of blue construction paper to represent water
- Some of the vegetation portrayed by students

5. Ask the "herbivores" to arrange the food, water, and shelte r- including the students who are "vegetation" - in a space to represent their habitat. Once the herbivores have arranged their habitat, ask the "carnivores" to move into the area to establish their lairs and water sources, keeping an eye on the herbivores as possible food sources. For added interest, suggest that the students identify what particular kind of animal they are, and role-play its characteristics. (This phase takes about ten minutes, with the developers planning while the herbivores and carnivores arrange the habitat).
6. Once the animals are established in their habitats, it is time for the developers to enter the picture. These developers have been given the opportunity to create a housing and shopping area. (They may use three to seven minutes to construct their development, explaining their actions as they take them.) They are restricted in how much space they can use. They may use the space equivalent to that used by three herbivores. The developers may use the sheets and blankets to build their development. They may remove trees, represented by students (without physically hurting the students), shelter (represented by hula hoops), food and water.
7. Once the students have constructed their development, engage all of the students in a discussion of what happened.
    - *What action took place? What were some of the consequences with the community development?*
    - *Would or did any animals die? From what causes?*
    - *Could the developers have done anything differently to change the consequences? Could they have developed several scattered small areas instead of one large area, or vice versa, with what effects?*
    - *Would it have reduced negative consequences for wildlife if they put the development in a different area of the habitat? Rather than negative consequences, were there positive consequences? If so, what were they? How were they achieved?*

Grade 6 Classroom Hatchery Activities

#7 Match that smell scent experiment

<u> Be sure to check for any allergies to spices and vinegar prior to completing this activity **</u>**

Time Frame: 40-60 minutes

Class size: 20-30 students

Setting: Classroom

Objectives:
The purpose of this activity is for the students to assess the sense of smell as a means of determining levels of water pollution. Following a memory matching game of scents, students will see four jars of liquid, all looking the same. Students are to use smell to properly label the jars.

Materials:
-24: 3 x 5 index cards or pieces of cardstock with herbs or spices glued on (1 set per 2 or 3 students)
-4 large jars that are large enough to hold a litre of water
-100 ml, 10 ml and 1 ml white vinegar (separated to be placed into each water jar)
-Labels: 100 ml, 10 ml and 1ml (attached) (1 set of labels per group of 3 or 4 students)
-Plastic bottles or small containers marked A, B, C or D (enough for groups of 3 or 4 students)

<u>Curriculum Links</u>
Overall Expectations
Science Expectations- Understanding Life Systems: Biodiversity
-Biodiversity includes diversity of individuals, species and ecosystems
-Humans make choices that can have an impact on biodiversity

Specific Expectations
Science Expectations- Understanding Life Systems: Biodiversity
1.1 analyse a local issue related to biodiversity, taking different points of view into consideration, propose actions that can be taken to preserve biodiversity, and act on the proposal
1.2 assess the benefits that human societies derive from biodiversity and the problems that occur when biodiversity is diminished
2.3 use scientific inquiry/ research skills to compare the characteristics of organisms within the plant or animal kingdoms
2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics* and *organism* in oral and written communication
3.1 identify and describe the distinguishing characteristics of different groups of plants and animals and use these characteristics to further classify various kinds of plants and animals
3.5 describe interrelationships within species between species, and between species and their environment, and explain how these interrelationships sustain biodiversity

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 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

Match that smell:

Make a memory-style card game that relies on student's sense of smell. On 24: 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 spice is to appear on two cards, with at least twenty-four cards total. Use the attached labels to attach to each index card.

Scent Experiment:

Collect four jars that are large enough to hold a litre of liquid. In one jar, put a litre of water. In the remaining jars, pour 100 ml, 10 ml, and 1 ml. respectively of a clear strong smelling liquid and add water to total a litre. In no particular order, mark these jars A, B, C, or D. Be sure to make a note to keep to the side stating which jar is which as you will need it later. Have large labels that read 100 ml, 10 ml and 1 ml on the table beside the jars.

Vinegar is recommended as it is colourless, has a strong odour, dissolves easily in water and is readily available. Do not use oily substances as they do not dissolve into the water. It's important that the solutions in each jar differ only in the strength of the odour. You should experiment with the amounts of "pollutant" (vinegar) to ensure there is a variation in the 'smelliness' of each sample. Adjust the labels if necessary. It should be very difficult to distinguish between the plain water and the jar with 1 mL of vinegar.

Procedure

Match that smell:

1. Divide the class into groups of 2 or 3. Provide each pair or group of 3 with a set of 24 index cards.
2. Students will shuffle the cards and lay the cards face side down on the playing area. Ask students to take turns one at a time to find the matches by flipping two cards over to reveal the card and scent. If a match is made, students take those cards and place them to the side and play continues with next player, if a match is not made the cards are returned face down and play is moved onto the next person. Depending on the class, you can have students keep score of points of matches made. Although appearance can offer a clue, encourage students to make sure to smell the card as some scents may look similar to other scents.
3. Provide students 10-15 minutes for finding matching sets in the cards. During clean-up and gathering of materials prior to moving onto the next task, you can ask students about some observations they found when trying to match the scents.

Scent Experiment:

1. Divide the class into groups of 3 or 4. Using plastic bottles or other small containers, marked A, B, C or D, have a student from each group collect a small sample from the corresponding jar of premixed water and "pollutant" solution. The challenge is for the class to come to a consensus on how to label the jars.

2. Using the labels, each group will place the labels as to what they feel suits the correct label. Smelling the samples, students will label each jar, sharing with their group members their decision and supporting it with verbal reasoning.
3. Provide students 10 minutes to discuss and share with their group prior to providing the class with the correct labels of the jars. Prior to the reveal, enquire with students to share why they labelled certain jars and how they can support their decision.
4. Asking one member from each group to return the samples to you in a central gathering spot (large table, etc.) share a whole class discussion enquiring about their observations. The following discussion questions to be shared are as follows:

What are the advantages of this method of labelling the jars and determining the amount of pollutant present and what are the disadvantages?

The advantage of using smell is that no special equipment or tools are needed, just a nose. It's easy and anyone can do it. One disadvantage of this method is that people's ability to smell varies. What is considered a weak smell by one person may be interpreted as very strong by another. Also a person's sense of smell can be influenced by environmental factors such as other smells.

Is smelling a reliable method of determining if a freshwater habitat is polluted?

Smelling is not a reliable method of determining the level of water pollution. In the case of sever pollution, the odour may be obvious, but some pollutants may be odourless. In addition, low levels of pollution cannot be detected by smell and can still harmful to freshwater organisms.

Atlantic Salmon have a very strong sense of smell that they use for migrating back to their home stream when returning to spawn. Do you think that it is helpful for them to use their sense of smell to be able to find appropriate spawning areas? What are some of the issues that Atlantic Salmon may have with certain pollutants in the water?

The fact that Atlantic Salmon are able to use their sense of smell is a positive and useful tool as it will help guide them to where they had hatched. If they survived there, then their offspring should also survive. One of the issues that could occur is that some pollutants could affect a salmon's ability to recognize their natal stream. Pollutants may also make the salmon ill or cause death if it is harmful enough.

Match that smell:

On 24: 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 spice is to appear on two cards, with at least twenty-four cards total. Use the labels below to attach to the card below the glued on spice on one side of the card.

Cayenne Pepper	**Cayenne Pepper**	**Garlic Powder**
Cinnamon	**Cinnamon**	**Garlic Powder**
Cloves	**Cloves**	**Ginger**
Pepper	**Pepper**	**Ginger**
Cumin	**Cumin**	**Oregano**

Scent Experiment:

Labels: 100 mL, 10 mL and 1mL (attached) (1 set of labels per group of 3 or 4 students)

100 mL of pollutant	10 mL of pollutant
1 mL of pollutant	Water only

100 mL of pollutant	10 mL of pollutant
1 mL of pollutant	Water only

BRING BACK THE SALMON
LAKE ONTARIO
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Grade 6 Classroom Hatchery Activities

#8 Engineering Stream Shores

As adapted from: "Save Our Shore!" eGFI

Time Frame: 50 minutes

Class size: 20-30 students

Setting: Classroom

Objectives:
In this activity in groups of 4 or 5, students learn about stream erosion and the role of engineers in protecting shorelines by applying engineering design to devise ways to mitigate erosion that help foster healthy streams that can support healthy Atlantic Salmon habitats. Students will be able to understand stream erosion and apply the engineering design process while evaluating the strength and weaknesses of different designs.

Materials:
-14.45" x 12.55" x 5.67" plastic dish bin (1 per group of 4 or 5 students)
-Water
-Wind generating source (e.g. fan) or paddle or other object to displace water
-Sand
-Toothpicks
-Assortment of small rock
-Small building blocks or other waterproof objects to represent houses, plasticine
-Rosemary sprigs or other objects to represent vegetation
-Ruler
-Towels
-Protractor (optional)
-Camera (optional)
-Metronome (optional)
-Stream Stakeholder concern and activity steps (attached) 1 copy per group
-Marking rubric (can be provided to students for review; can be used for marking during group share to class)

Curriculum Links
Overall Expectations
Science & Technology: Understanding Life Systems- Biodiversity
-Biodiversity includes diversity of individuals, species and ecosystems
-Because all living things are connected, maintaining diversity is critical to the health of the planet
-Humans make choices that can have an impact on biodiversity

Specific Expectations
Science & Technology: Understanding Life Systems- Biodiversity
1.1 analyse a local issue related to biodiversity, taking different points of view into consideration, propose actions that can be taken to preserve biodiversity, and act on the proposal
1.2 assess the benefits that human societies derive from biodiversity and the problems that occur when biodiversity is diminished
2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics,* and *organism* in oral and

written communication
3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plants and animals in communities, and among communities and the physical landscapes that support them

Procedure

The Scenario:
Each group is a stream restoration engineering team. They are competing with the other groups in the class for healthy streams that can support Atlantic Salmon returning to spawn. Over the past few years, the stream's shorelines have been eroding. Teams must develop a plan to help manage its erosion problem. The plan must include modifying the shores of the stream in some way to address immediate erosion concerns. The plan must also include two strategies that do not physically alter the shoreline, but instead regulate human behaviour.

Each of the major stakeholders (groups of people with an interest in the issue of shoreline erosion) will vote on a team's idea. In order to win the most successful strategy, the team must balance competing interests and concerns. The teacher may also give additional criteria to consider, such as a specific budget or other feasibility constraints.

Stream stakeholder concerns
Business Owners
Streams are a prime spot for fishing as anglers try to catch resident and migratory fish. When anglers are fishing in the stream, it also brings money into the community. Business owners are concerned that erosion is keeping tourists away as muddy waters will not support healthy waters for the fish. The business owners want a management plan that will solve the erosion problem as soon as possible and cost as little as possible.
Recreation Users
Anglers and swimmers in the community are concerned about the muddy water and whether it will get worse as a result of erosion. They want a management plan that is aesthetically pleasing (looks nice, but does not have to be all natural) and does not alter the water dynamics too much (so they can still keep doing their normal activities like fishing and swimming).
Environmentalists
An environmental group wants to protect the habitat of the endangered Redside Dace minnow that lives in the stream. They would prefer that no development and hard structures be built on or near the stream. They want to have the area continue to be protected so that the minnow's habitat that can be preserved, natural features of the stream maintained and also priority placed on the long-term health of the stream.
Property Owners
There are some houses near the stream. As the stream shoreline is eroding, these houses are at risk. The owners who live in these houses want to build a living shoreline or hard structures to save their properties. Property owners have agreed to pay for half of the cost themselves and they want a management plan that will solve the erosion problem immediately.

Have a class discussion to come up with the criteria for determining the effectiveness of the engineering plan on controlling stream erosion which is a concern of all of the stakeholders. The following are some erosion criteria to consider. Come to a class consensus on which of these criteria you will measure and how you will measure it. You may come up with criteria that are not on this list.

1. The height of the stream shoreline.
2. The width of the stream.
3. The overall shape of the stream.
4. The amount of sand pulled into the stream.

Set up the stream bins:

You will use dish bins to create a replica stream to develop and refine stream management strategies.

1. (Optional) Wash the sand and rocks before the activity to remove fine particles that will make the water in the binds muddy.
2. Fill the dish bins with water to about one-third full. The height of the water should be the same among all the groups.
3. Practice generating waves with a wind source or by displacing water using a paddle or other object. All groups should generate waves using the same method, they should have similar amplitudes and frequencies. Consider using a metronome to standardize wave frequency.
4. Create a shoreline by carefully pouring sand into one end of the bin, so that a portion of the sand extends above the waterline. Standardize as many variables as possible, you may think of more than the following factors:
    - The total amount of sand
    - The height of the beach
    - The width of the beach
    - The location of the Redside Dace (mark with toothpicks)
    - The number and location of the houses

Develop the management plan - shoreline modifications

1. Groups will choose a name for their shoreline engineering team.
2. As a group, they will share and discuss ideas for managing the shoreline erosion problems. Teams might consider multiple approaches in their plan to alter the shoreline. The following are some things that could be considered:
    - Building hard structures.
    - Stabilizing the shore with "soft" non-structural techniques, for example, importing or shifting sand or planting vegetation.
3. After making changes to their stream bin, students test their structural ideas by generating waves to reflect stream current.
4. After groups have created their stream bin changes, they will select one team member to share the ideas with the stakeholders (fellow classmates), sharing their ideas, solutions and what problems they may have faced in the creation of their solutions.
5. When cleaning up, dry out the sand before storing it by spreading it out in a pan or on plastic tarps in the sun.
6. Once clean-up has been completed, as a whole class foster a following observation conversation. Questions that can be considered are:
    - How did the shoreline change after they had placed their changes in the stream bin? How much did it change?
    - Thinking of how the stream was before problem solving, how did your plan compare to "doing nothing?"
    - Based on your stream bin and the changes you suggested, and what you know about human behaviour, what are two things that the community can suggest or input so that erosion does not continue in the stream? *(Some suggestions could include: relocating structures to areas further away from the stream; buying back houses that are too close to the shoreline, destroying the houses and relocating the owners; setting construction set-back limits; placing signs on the shoreline to stop people from walking, fishing and/or swimming from the edges.)*
    - How were different group ideas similar? How were they unique?
    - Which solutions do you think met each of the four stakeholder's needs best? Why?
    - What were the limitations when you were creating your proposal and changes of action? Were there things you could have changed to improve your design?
    - What are five reasons why it is important for people to protect streams from excess erosion?

Stream stakeholder concerns
Business Owners Streams are a prime spot for fishing as anglers try to catch resident and migratory species. When anglers are fishing in the stream, it also brings money into the community. Business owners are concerned that erosion is keeping tourists away as muddy waters will not support healthy waters for the fish. The business owners want a management plan that will solve the erosion problem as soon as possible and cost as little as possible.
Recreation Users Anglers and swimmers in the community are concerned about the muddy water and whether it will get worse as a result of erosion. They want a management plan that is aesthetically pleasing (looks nice, but does not have to be all natural) and does not alter the water dynamics too much (so they can still keep doing their normal activities like fishing and swimming.)
Environmentalists An environmental group wants to protect the habitat of the endangered Redside Dace minnow that lives in the streams. They would prefer that development and hard structures not be built on or near the stream. They want to have the areas continue to be protected so that the minnows will have a habitat that can be preserved, natural features of the stream maintained and also priority placed on the long-term health of the stream.
Property Owners There are some houses near the stream. As the stream shoreline is eroding, these houses are at risk. The owners who live in these houses want to build a living shoreline or hard structures to save their properties. Property owners have agreed to pay for half of the cost themselves and they want a management plan that will solve the erosion problem immediately.

Develop the management plan - shoreline changes

1. Choose a name for your shoreline engineering team.

2. As a group, share and discuss ideas for managing the shoreline erosion problems. You might consider multiple approaches in you plan to alter the shoreline. The following are some things that could be considered:
- Building hard structures (like walls) .
- Stabilizing the shore with "soft" non-structural techniques, for example, importing or shifting sand or planting vegetation (shrubs or trees).

3. Test your stream before making any changes to see how waves and current affect your stream in the bin. Notice what shifts or moves and what problems could arise with the constant flow of waves and current on your stream.

4. Make the changes that you have discussed with your team, planting vegetation (trees), moving buildings or adding sand, etc.

5. After making changes to your stream bin, test your structural ideas by generating waves to reflect stream current.

6. After you have created your stream bin changes, select one team member to share the ideas with the stakeholders (fellow classmates), sharing your ideas, solutions and what problems you may have faced in the creation of your solutions.

Stream Bin Inquiry Experiment

Engineering Team:_____ Date:_____

Component	3	2	1	Score and comments
Knowledge and Understanding	Understands what shoreline erosion is and can be answered through experimentation	Is able to explain what erosion is and understanding is displayed through experimentation. Some examples are used in understanding	The demonstration does not represent understanding and cannot provide examples to support knowledge	
Conduct the experiment	Step-by-step procedures were followed. Understanding is evident and student is engaged to further learning on topic	Step-by-step procedures were followed. Understanding is present in demonstration	Step-by-step procedures were not followed. Confusion on topic of focus is present	
Conclude	Results and conclusions show a clear and accurate understanding of knowledge gained from conducting the experiment	Results and conclusions show somewhat of a clear and accurate understanding of knowledge gained from conducting the experiment	Results and conclusions are unclear are show an inaccurate understanding of knowledge gained from conducting the experiment	
Communicate the results	The demonstration is complete. Sharing of plan was well planned and organized. Spokesperson spoke clearly and kept audience engaged	The demonstration is completed. Presentation was well organized for the most part. Spokesperson spoke clearly	The demonstration is incomplete, messy and show little effort and creativity. Spokesperson was presented information in a disorganized manner	
Group Work	Group member were on task at all times working cooperatively on the project as a team	Group members were on task most of the time, working cooperatively on the project as a team	Group members were not on task at all times and did not work as a team	

Grade 6 Classroom Hatchery Activities

#9 Atlantic Salmon Life Cycle Puzzle and Mobile

As adapted from: Fish Friends curriculum

Time Frame: 40 minutes

Class size: 20-30 students

Setting: Classroom (with a large enough area for groups of 2 or 3 students to piece together Life Cycle puzzle); desks or work area to be able to create Life Cycle mobile

Objectives:
Through a hands-on activity, partners or groups of 3 will learn about the different stages of the life cycle of Atlantic Salmon and try to place the stages in the correct order through a puzzle activity. Following the ordering activity, students will create a visual representation of the life cycle that displays the life cycle of Atlantic Salmon as well as create a concrete example that can be displayed in the class demonstrating their learning and understanding.

Materials:
-Salmon Life Cycle puzzle pieces (attached)
-Ziploc bags or envelope (to place Life Cycle puzzle pieces in)
-Laminator (optional)
-Salmon Life Cycle puzzle and envelope (1 envelope per 2 or 3 students)
-Atlantic Salmon Life Cycle visual (a few copies per group of 2 or 3 students) (attached)
-Paper 8.5" x 14" long
-Atlantic Salmon life cycle illustrations (attached)
-Rulers
-String (2 pieces of 30 cm string)
-Glue or tape
-Hole Punch
-Scissors

Curriculum Links
Overall Expectations
Science Expectations- Understanding Life Systems: Biodiversity
-Biodiversity includes diversity of individuals, species and ecosystems
-Because all living things are connected, maintaining diversity is critical to the health of the planet
The Arts- Visual Arts
Creating and Presenting: apply the creative process to produce art works in a variety of traditional two-and three- dimensional forms, as well as multimedia art works, that communicate feelings, ideas, and understandings, using elements, principles, and techniques of visual arts as well as current media technologies

Specific Expectations

Science Expectations- Understanding Life Systems: Biodiversity

2.2 investigate the organisms found in a specific habitat and classify them according to a classification system

2.3 use scientific/inquiry/research skills to compare the characteristics of organisms within the plant or animal kingdoms

2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics, and organism* in oral and written communication

3.1 identify and describe the distinguishing characteristics of different groups of plants and animals and use these characteristics to further classify various kinds of plants and animals

3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plants and animals in communities, and among communities and physical landscapes that support them

The Arts- Visual Arts

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

Preparation:

1. Print 1 copy of the Salmon Life Cycle puzzle (attached) for each pair or group of 3 students. You can laminate each puzzle piece after cutting them out for future re-use.
2. Once all the puzzle pieces have been cut out (and laminated if you choose), place all the pieces into an envelope or Ziploc bag so that each pair or group of 3 students have their own Salmon Life Cycle puzzle

Procedure

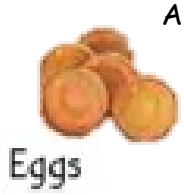
1. Provide each pair or group of 3 students with the Salmon Life Cycle puzzle pieces. Students are to find a place that will provide enough space for them to put the pieces of the Life Cycle puzzle in order. Students will read each description carefully and then put each stage in the life cycle in the correct order. Accommodations for this activity can include use of the images for visual cues for low or non-readers, students then can use the images to compare the size difference between each stage. Focusing on the key highlighted words can also provide ease of comprehension: for example "eggs" come before the fish becomes an "adult".
2. Allot approximately 15-20 minutes for students to solve the life cycle puzzle. Foster the discussion with the students enquiring about the proper life cycle order. You can provide partners or groups of 3 with the Atlantic Salmon Life Cycle illustration to allow them to confirm they have placed the puzzle pieces in the correct order.
3. Following the completion of the Salmon Life Cycle puzzle students will create a hanging mobile that outlines the stages of the Salmon Life Cycle. Folding the 8.5" x 14" page in half (lengthwise) and cutting them apart, to create two strips of paper, students will tape one end of the 8.5" x 14" strip to the other strips end in order to create one long strip of blank paper.
4. Using the information they have learned during the puzzle activity and referring to the illustrations, students will cut out their own copies of the Life Cycle illustrations and glue them onto the long strip of blank white paper.
5. Once all of the life cycle illustrations have been affixed to the white paper strips, students will tape the ends of the paper length together so it forms a circle to illustrate the never-ending circle of life.
6. Once all of the Life Cycle illustrations have been affixed to the paper, students will punch holes in the top of the picture and attach string so that it can be hung for display in the class.

Salmon Life Cycle

A salmon goes through many changes as it grows and becomes an adult. These changes are part of its life cycle. The stages are described but the order is mixed up. Reading each description carefully, place the pieces together in the right order.

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

The small fish, about two centimetres long, is called an **alevin**. It feeds on the yolk of the egg from which it has hatched while it is still in the gravel. The yolk is contained in a yolk sac attached to the belly of the fish.



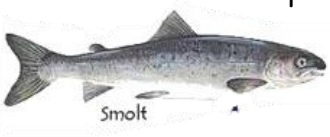
A female salmon lays approximately 1500-1600 **eggs** per kg of her weight. A fish of 5 kg would lay 7,500-8,000 eggs.

As the eggs develop, the eyes of the developing Atlantic Salmon can be seen through the semi-transparent membrane. This stage the eggs are called **eyed eggs**.

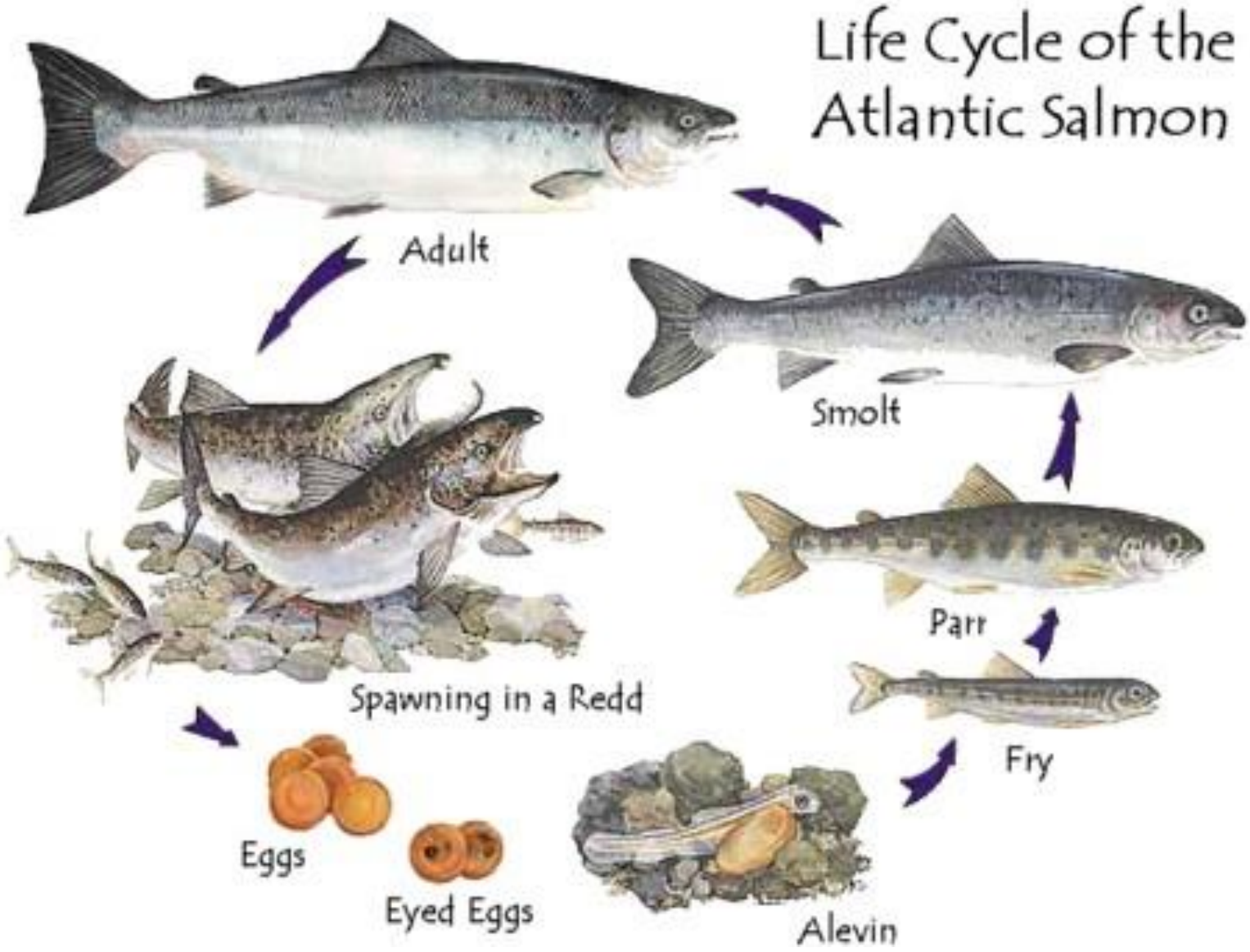
When the yolk sac is nearly gone, the tiny salmon wriggles its way up through the gravel out into the stream. Now it will feed on microscopic plankton in the water. It is finally on its own. Until the young fish is five to eight centimetres long, it is called a **fry**.

Our Atlantic Salmon spend two or three years in the lake. They may weigh from 4 to 20 kg. They return as **adults** to the river where they were born. They then spawn, completing another generation and continuing the life cycle.

An amazing change takes place.



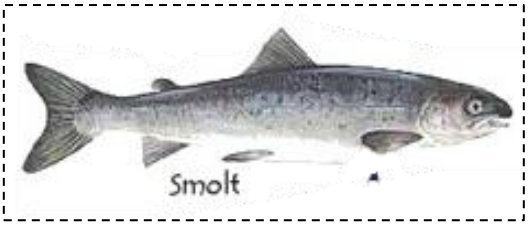
The parr marks and spots disappear and the fish becomes silver. It is now called a **smolt**. It swims swiftly down the river, heading to the lake where its silvery colour will hide it. It is dangerous for the fish to enter the lake with brightly coloured stripes and spots!

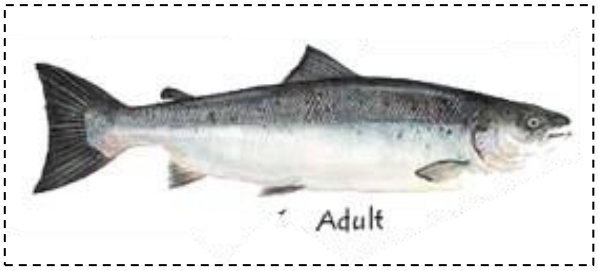

Life Cycle of the Atlantic Salmon
Adult
Smolt
Parr
Fry
Alevin
Eggs
Eyed Eggs
Spawning in a Redd

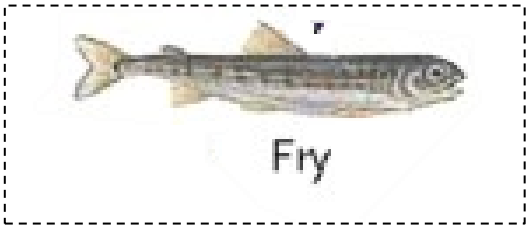
Atlantic Salmon life cycle illustrations

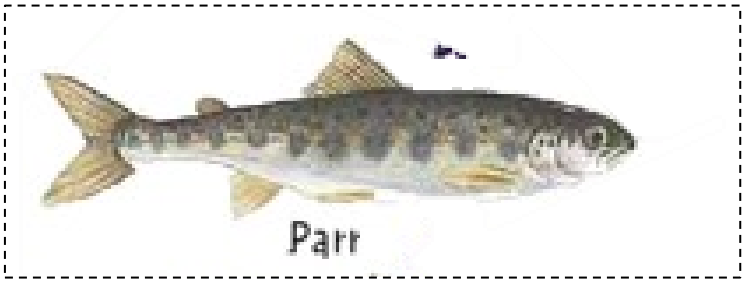
What to do:

1. Fold the 8.5” x 14” page in half (lengthwise/longest side to longest side) and cut them apart, to create two strips of paper.
2. Tape one end of the 8.5” x 14” strip to the other strips end in order to create one long strip of blank paper.
3. Using the information you have learned during the puzzle activity and using the illustrations, cut out your own copies of the Life Cycle illustrations and glue them onto the long strip of blank white paper in the correct order of the Atlantic Salmon Life Cycle. Be sure to leave space in between each illustration. In the blank space between each picture write down key information about each stage of the life cycle using the information from the puzzle.
4. Once all of the life cycle pictures have been glued to the white paper strips, tape the ends of the paper length together so it forms a circle to illustrate the never-ending circle of life.
5. Once you have created a circle out of the strip of paper with the life cycle pictures attached, use a hole punch to make four holes spread equally apart at the top of the circle on opposite sides of the circle. Attach the two strings to each hole and tie the end of the loose string together so that it can be hung for display in the class.









Grade 6 Classroom Hatchery Activities

#10 Salmon Migration

As adapted from: Project Wild: Migration Headache

Time Frame: 30 minutes

Class size: 20-30 students

Setting: Gymnasium or outdoor playing field

Objectives:
Students role-play migrating Atlantic Salmon travelling between lake and stream habitat and are subject to hazards at either end of the migration path as well as along the way. At the end of this active activity, students will be able to list limiting factors affecting populations of migrating Atlantic Salmon, predict the effect of such limiting factors and describe the effects of habitat loss and degradation on populations of migrating Atlantic Salmon.

Materials:
-Large playing field or gymnasium
-two paper plates for every three students (clearly mark the plates to differentiate top from bottom: for example - top is green, bottom is red)
-whistle (optional)

Curriculum Links
Overall Expectations
Science & Technology expectations-Understanding Life Systems: Biodiversity
-Biodiversity includes diversity of individuals, species, and ecosystems
-Because all living things are connected, maintaining diversity is critical to the health of the planet
-Humans make choices that can have an impact on biodiversity
***Note: Health & Physical Education expectations originate from 2010 Interim Edition: Re-issued 2018 ***
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

Specific Expectations
Science & Technology expectations-Understanding Life Systems: Biodiversity
1.1. analyse a local issue related to biodiversity, taking different points of view into consideration, propose actions that can be taken to preserve biodiversity, and act on the proposal
1.2 assess the benefits that human societies derive from biodiversity and the problems that occur when biodiversity is diminished
2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural*

community, interrelationships, vertebrate, invertebrate, stability, characteristics, and *organism* in oral and written communication

3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plants and animals in communities, and among communities and the physical landscapes that support them

***Note: Health & Physical Education expectations originate from 2010 Interim Edition: Re-issued 2018 ***

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 other students when being active*

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:** promote fair play, share equipment, take turns, and follow rules when playing lead-up games; show respect for the decisions and calls of teammates when refereeing their own activities)*

Health & Physical Education- Active Living

A 1.1. actively participate in a wide variety of program activities (*e.g., lead-up games, recreational activities, fitness activities, dance)*, according to their capabilities, while applying behaviours that enhance their readiness and ability to take part (*e.g., being engaged and moving throughout the activity, using time effectively, being open to new activities, displaying fair play by taking turns and sharing, listening to others, not blaming or taking advantage of others)*

A 1.2 demonstrate an understanding of factors that contribute to their personal enjoyment of being active (*e.g., having the opportunity to participate in activities in various sizes of groups and using various types of equipment, having a choice of activities, being able to take part in activities that are modified to suit their individual needs, being able to participate actively in a game or activity rather than having to sit it out, having a chance to take part in both team games and individual activities, experiencing pleasure in both the physical experiences and the aesthetic aspects of movement)*, as they participate in a wide variety of individual and small-group activities and lead-up games

A 3.1 demonstrate behaviours and apply procedures that maximize their safety and that of other during physical activity (*e.g., demonstrating personal responsibility; checking that equipment is in good working order; wearing an appropriate and properly fitting helmet when taking part in activities such as bike riding, tobogganing, snowboarding, downhill skiing, or skateboarding; helping someone adjust the straps on his or her wheelchair)*

Background

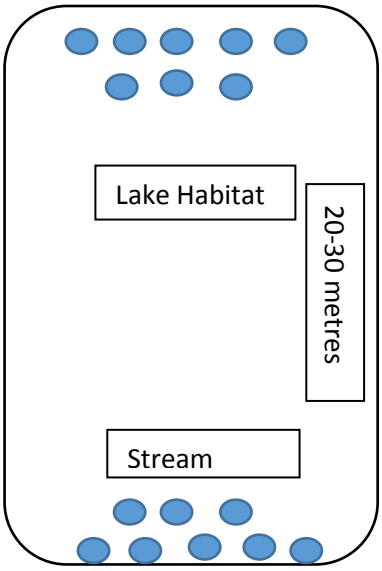
Migration is a mysterious topic. How do birds, fish, mammals and insects travel the immense distances they do with such exactness? Some travel at night, some during the day, some in the skies, and others deep within the sea. Yet they locate habitats necessary for the continuation of their species. Scientists have proposed that they use the stars, the sun and even the earth`s magnetic field for guidance. Some animals, such as salmon, seem to use smell to guide them back to their streams.

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.

Procedure

1. Select a large playing area about 20 metres in length. Place the paper plates in two patches on the playing field as shown below:



   Choose the number of plates so that you have one plate for each three students at **each** end of the field. Designate one of these areas the "Lake Habitat" and the other "Stream Habitat". This means you have two sets of plates, one set at the Lake Habitat and one set at the Stream Habitat.
2. Explain to students that they are Atlantic Salmon and will migrate between these two areas at your signal. Tell them that the paper plates represent rocks and gravel and sources of food. Spawning salmon require rocks and gravel in order to create the redd for the eggs, while young Atlantic alevin use the rocks and gravel for protection before migrating downstream. The plates represent suitable habitat for Atlantic Salmon. At the end of each journey, the students will have to have one foot on a paper plate in order to be allowed to continue. If they cannot get their foot on a plate, that means they have not found any suitable habitat. They "die" and have to move - at least temporarily - to the sidelines and watch. During migration, Atlantic Salmon use their sense of smell to return to their home streams to spawn.
3. Explain to the students that many factors will limit the survival of migrating Atlantic Salmon. Some involve changes in the lake and stream habitats. There will be times of abundant food, water, shelter and space suitably arranged to meet the habitat requirements of the salmon. There will be other times when the habitat is stressed, with many factors limiting the potential for survival. Sometimes the area of available habitat is reduced. Tell the students that for purposes of this activity, only three Atlantic Salmon can occupy a "habitat haven" (paper plate) at any one time.
4. Begin the activity with all the students at the stream habitat. Announce the start of the first migration. Have the students migrate in slow motion to the lake habitat until they become familiar with the process. Then they can speed up. On the first try, all the salmon will successfully migrate to the lake habitat.
5. Explain that there has been no loss in the area of available habitat. Thus, a successful migration season is at hand.
6. Before the students migrate toward the stream habitat, turn over one plate from the stream habitat. Explain that urban expansion has occurred and the stream now neighbours a large area that has been turned into a residential area. Repeat the instruction to migrate and send the salmon to the stream habitat. Have the three students that will be displaced stand on the sideline. Tell the students that these three salmon died as a result of loss of habitat. Remind any "dead" Atlantic Salmon that they will have a

chance to get back into the activity. They can come back as surviving eggs when favourable conditions prevail and there is habitat available in the stream habitat.

7. Before the next migration to the lake habitat, turn over four plates in the lake habitat. This represents a catastrophic loss. Tell the students that this is a result of pollution and contamination of water and overfishing of salmon in the lake. Instruct the students to migrate to the lake habitat.
   NOTE: This results in a large number of students waiting on the sidelines to re-enter in the stream habitat. Before many cycles are repeated, provide them with the opportunity for re-entry. Each time give the students examples of changes in the habitat conditions that could have taken place making it possible for them to survive. Two students can be made permanent monitors to turn the paper over as you instruct them.
8. Repeat the process for eight or ten migration cycles to illustrate changes in habitat conditions with resulting effects on the salmon. Give examples of factors that might influence the salmon`s survival. (See the table below for suggestions.)

   Some limiting factors are a natural and dynamic part of any environment. This is true of factors favouring survival as well. However, in the case of migratory fish such as Atlantic Salmon, the loss or degradation of huge areas of suitable spawning habitat as a result of human activities, e.g., draining wetlands for conversion to farmland or residential buildings, pollution of water, and blocking migration, is one of the main limiting factors.

   Be sure to create one or more "disaster" years to illustrate catastrophic loss of large areas of available habitat. Remember that, overall, the availability of suitable habitats for migrating Atlantic Salmon is diminishing - the activity should end with fewer areas of available habitat than can accommodate all the salmon. The greatest long-term threats to the survival of populations of migratory fish like Atlantic Salmon is the loss and degradation of habitat.

9. In discussion, ask the students to identify the apparent causes of the salmon`s decline from year to year. Ask them to try to imagine what seem to be the major factors contributing to habitat loss and degradation. Ask them to make predictions about the effects of these factors. Distinguish between short-term and long-term effects. Distinguish between catastrophic effects and gradual changes. Ask the students to support their hypotheses with evidence, seeking additional information through research if necessary.

Factors Limiting Survival of Populations of Atlantic Salmon	**Factors Favouring Survival of Populations of Atlantic Salmon**
• Stream drainage • Drought • Pollution and contamination of water • Urban expansion • Conversion of wetlands to farmland • Conversion of natural waterways to canals • Overfishing • Starvation • Shoreline degradation • Predation (invasive species, etc.) • Disease • Storms	• Preservation of streams • High rainfall • Restoration of habitat • Dynamic balance with predators, control of invasive species • Human action aimed at protecting and restoring of streams, including through education • Regulation of fishing

Grade 6 Classroom Hatchery Activities

#11 Hooks and Ladders

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 the hazards faced by Atlantic Salmon in an activity portraying their life cycle and migration.

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 (7é5 cm x 12.5 cm cards; poker chips, etc.)

Curriculum Links
Overall Expectations
Science & Technology expectations- Understanding Life systems: Biodiversity
-Biodiversity includes diversity of individuals, species and ecosystems
-Because all living things are connected, maintaining diversity is critical to the health of the planet
-Human make choices that can have an impact on biodiversity
***Note: Health & Physical Education expectations originate from 2010 Interim Edition: Re-issued 2018 ***
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

Specific Expectations
Science & Technology expectations- Understanding Life systems: Biodiversity
1.1 analyse a local issue related to biodiversity, taking different points of view into consideration, propose actions that can be taken to preserve biodiversity, and act on the proposal
1.2 assess the benefits that human societies derive from biodiversity and the problems that occur when biodiversity is diminished
2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics,* and *organism* in oral and written communication

3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plants and animals in communities, and among communities and the physical landscapes that support them

3.5 describe interrelationships within species between species, and between species and their environment, and explain how these interrelationships sustain biodiversity

***Note: Health & Physical Education expectations originate from 2010 Interim Edition: Re-issued 2018 ***

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

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 the 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 games, recreational activities, fitness activities, dance),* according to their capabilities, while applying behaviours that enhance their readiness and ability to take part (*e.g., being engaged and moving throughout the activity, using time effectively, being open to new activities, displaying fair play by taking turns and sharing, listening to others, not blaming or taking advantage of others)*

A 1.2 demonstrate an understanding of factors that contribute to their personal enjoyment of being active *(e.g., having the opportunity to participate in activities in various sizes of groups and using various types of equipment, being able to participate actively in a game or activity rather than having to sit it out, having a chance to take part in both team games and individual activities, experiencing pleasure in both the physical experiences and the aesthetic aspects of movement)* as they participate in a wide variety of individual and small-group activities and lead-up games

A 3.1 demonstrate behaviours and apply procedures that maximize their safety and that of others during physical activity (*e.g., demonstrating personal responsibility; checking that equipment is in good working order)*

Background

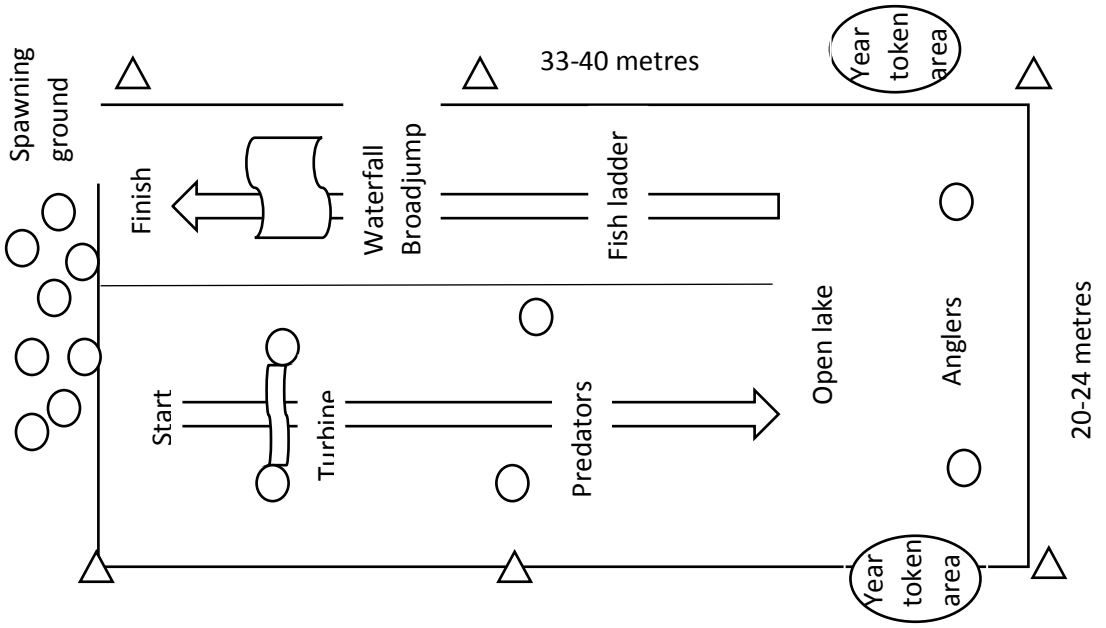
Many fish live part of their lives in one habitat and then migrate to another habitat. Some make their migratory journeys to mature and reproduce. Atlantic Salmon are an example of one of the most spectacular of the migrating species. Within the genetics of Atlantic Salmon is an instinct that drives them from the time of hatching along a monumental journey from their freshwater spawning beds downstream into the lake. Once in the lake 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 manipulation of natural systems. A 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 female 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. Lower water levels can isolate salmon offspring in streamside depressions. After hatching, the small fish, called alevin, spend their first few weeks hiding in the gravel. Gradually they absorb their yolk sac and become fry. When they become

smolts and migrate downstream, they are confronted by other hazards. 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, Lake Ontario 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 lake is also a series of hazards. For example, dams hinder their journey and block it completely where fish ladders are not installed. Fish ladders are water-filled staircases that allow the migrating fish to swim upstream, around the dam. Humans who fish, eagles, and other predatory mammals and birds 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 animals 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 are no longer a fish, but becomes 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 year's 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 6 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 smolts swim downstream to reach the lake, 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 high; however, they cannot clear all objects that lie in their path, and most Atlantic Salmon can only jump 10 feet.

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
Overall Expectations
Science & Technology - Understanding Life Systems: Biodiversity
- Biodiversity includes diversity of individuals, species and ecosystems
- Because all living things are connected, maintaining diversity is critical to the health of the planet
- Humans make choices that can have an impact on biodiversity

Mathematics
-Problem Solving: develop, select and apply problem-solving strategies as they pose and solve problems and conduct investigations to help deepen their mathematical understanding
-Connecting: Make connections among mathematical concepts and procedures, and relate mathematical ideas to situations or phenomena drawn from other contexts (e.g., other curriculum areas, daily life, sports)
-Representing: Create a variety of representations of mathematical ideas (e.g., by using physical models, pictures, numbers, variables, diagrams, graphs, onscreen dynamic representations), make connections among them, and apply them to solve problems
-Communicating: communicate mathematical thinking orally, visually, and in writing, using everyday language, as basic mathematical vocabulary, and a variety or representations, and observing basic mathematical conventions

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 Skills

-Participate actively and regularly in a wide variety of physical activities, and demonstrate an understanding of factors that encourage lifelong participation in physical activity

-Demonstrate responsibility for their own safety and the safety of others as they participate in physical activities

Note: Health & Physical Education expectations originate from 2010 Interim Edition: Re-issued 2018 *

Specific Expectations

Science & Technology - Understanding Life Systems: Biodiversity

1.2 assess the benefits that human societies derive from biodiversity and the problems that occur when biodiversity is diminished

2.3 use scientific inquiry/ research skills to compare the characteristics of organisms within the plant or animal kingdoms

2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics,* and *organism* in oral and written communication

3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plants and animals in communities, and among communities and the physical landscapes that support them

3.5 describe interrelationships within species between species, and between species and their environment, and explain how these interrelationships sustain biodiversity

Mathematics

Number Sense & Numeration

Operational sense:

-Use a variety of mental strategies to solve addition, subtraction, multiplication, and division problems involving whole numbers

-Solve problems involving the multiplication and division of whole numbers (four-digit by two-digit), using a variety of tools (e.g., concrete materials, drawings, calculators) and strategies (e.g., estimation, algorithms)

Data Management & Probability

-Collect and organize discrete or continuous primary data and secondary data and display the data in charts, tables, and graphs (including continuous line graphs) that have appropriate titles, labels (e.g. appropriate units marked on the axes), and scales (e.g., with appropriate increments) that suit the range and distribution of the data, using a variety of tools (e.g., graph paper, spreadsheets, dynamic statistical software)

-Select an appropriate type of graph to represent a set of data, graph the data using technology, and justify the choice of graph (i.e., from types of graphs already studied, such as pictographs, horizontal or vertical bar graphs, stem-and-leaf plots, double bar graph, broken-line graphs, and continuous line graphs)

-explain how different scales used on graphs can influence conclusions drawn from the data

Note: Health & Physical Education expectations originate from 2010 Interim Edition: Re-issued 2018 *

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 other students when being active)*

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: promote fair play, share equipment, take turns, and follow rules when playing lead-up games; Movement*

competence: contribute ideas when working in a group to accomplish a collaborative task)

Health & Physical Education – Active Living Skills

A 1.1. actively participate in a wide variety of program activities (*e.g., lead-up games, recreational activities, fitness activities, dance),* according to their capabilities, while applying behaviours that enhance their readiness and ability to take part (*e.g., being engaged and moving throughout the activity, using time effectively, being open to new activities, displaying fair play by taking turns and sharing, listening to others, not blaming or taking advantage of others)*

A 3.1 demonstrate behaviours and apply procedures that maximize their safety and that of others during \ physical activity (*e.g., demonstrating personal responsibility)*

Procedure

1. Divide students into partners. Each pair of students will have one 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 the 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 will begin jumping the rope while the other 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 two 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 ocean 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 two 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 6 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 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 and Technology- Understanding Lift Systems: Biodiversity
-Biodiversity includes diversity of individuals, species and ecosystems
-Because all living things are connected, maintaining diversity is critical to the health of the planet
-Humans make choices that can have an impact on biodiversity
Language: Writing
3. Use editing, proofreading, and publishing skills and strategies, and knowledge of language conventions, to correct errors, refine expression, and present their work effectively
***Note: Health & Physical Education expectations originate from 2010 Interim Edition: Re-issued 2018 ***
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

Specific Expectations
Science and Technology- Understanding Lift Systems: Biodiversity
2.3 use scientific inquiry/ research skills to compare the characteristics of organisms within the plant or animal kingdoms
2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics,* and *organism* in oral and written communication
3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each

species of plants and animals in communities, and among communities and the physical landscapes that support them

3.5 describe interrelationships within species between species, and between species and their environment, and explain how these interrelationships sustain biodiversity

Language: Writing

3.1 spell familiar words correctly (*from their oral vocabulary, anchor charts, and shared-guided- and independent reading texts; words used regularly in instructions 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 a variety of resources appropriate for the purpose

***Note: Health & Physical Education expectations originate from 2010 Interim Edition: Re-issued 2018 ***

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 (*Active living: use encouraging words to support other students when being active*

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 (*Active living: promote fair play, share equipment, take turns, and follow rules when playing lead-up games*

Health & Physical Education –Active Living

A 1.1. actively participate in a wide variety of program activities (*e.g., lead-up games, recreational activities, fitness activities, dance)* according to their capabilities, while applying behaviours that enhance their readiness and ability to take part (*e.g., being engaged and moving throughout the activity, using time effectively, being open to new activities, displaying fair play by taking turns and sharing, listening to others, not blaming or taking advantage of others)*

A 3.1 Demonstrate behaviours and apply procedures that maximize their safety and that of others during physical activity (*e.g., demonstrating personal responsibility)*

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.

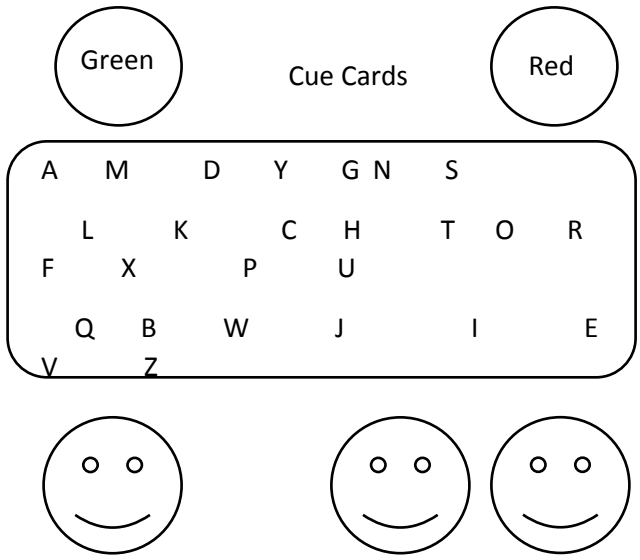
Students start at level 1. Once all cards are on the green polyspot, then they may proceed to level 2. Once all cards are on the green polyspot again, then they can proceed to level 3.

Variations:

Students work at their own pace by using levels.

Two students use one 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
Classification	Biodiversity
Natural Community	Interrelationship
Vertebrate	Invertebrate
Stability	Characteristics
Organism	Life cycle
Atlantic Salmon	Lake Ontario

Grade 6 Classroom Hatchery Activities

#14 Salmon Food Chains

As adapted from: Trout tag: Trout in The Classroom

Time Frame: 30 minutes

Class size: 20-30 students

Setting: Gymnasium or outdoor play area

Objectives:
In this active tag game, students act as various aquatic predators and prey reinforcing the role of predators and prey and how they can affect Atlantic Salmon populations.

Materials:
-Predator and prey visual signs with the following labels and images of: Atlantic Salmon, fry, otter, mayfly, humans, bacteria, osprey, stonefly, midge, great blue heron and smallmouth bass. Predator cards are marked with an O on the right corner and attached to red paper, while prey are marked with an X and attached to orange paper. Those species (Atlantic Salmon) that are not marked and are left on white paper and can act as either a prey OR a predator
-4 pylons to distinguish boundaries
-additional pylons to mark the middle of the field where teams face each other at the beginning of each round

Curriculum Links
Overall Expectations
Science & Technology expectations- Understanding Life Systems: Biodiversity
-Biodiversity includes diversity of individuals, species, and ecosystems
-Because all living things are connected, maintaining diversity is critical to the health of the planet
-Humans make choices that can have an impact on biodiversity
***Note: Health & Physical Education expectations originate from 2010 Interim Edition: Re-issued 2018 ***
Health and 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 Active Living, Movement Competence, and Healthy Living strands for this grade
Health and 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 and Physical Education- Movement competence
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 expectations- Understanding Life Systems: Biodiversity
1.2 assess the benefits that human societies derive from biodiversity and the problems that occur when

biodiversity is diminished

2.3 use scientific/inquiry research skills to compare the characteristics of organisms within the plant or animal kingdoms

2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics,* and *organism* in oral and written communication

3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within species of plants and animals in communities, and among communities and the physical landscapes that support them

3.5 describe interrelationships within species between species, and between species and their environment , and explain how these interrelationships sustain biodiversity

***Note: Health & Physical Education expectations originate from 2010 Interim Edition: Re-issued 2018 ***

Health and Physical Education

1.1 use self-awareness and self-monitoring skills to help them understand their strengths and needs, take responsibility for their actions, recognize sources of stress, and monitor their own progress, as they participate in physical activities, develop movement competence, and acquire knowledge and skills related to healthy living

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 other students when being active)*

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: promote fair play, share equipment, take turns, and follow rules when playing lead-up games)*

Health and Physical Education- Active Living

A 1.1 actively participate in a wide variety of program activities (*e.g., lead-up games, recreational activities, fitness activities, dance),* according to their capabilities, while applying behaviours that enhance their readiness and ability to take part (*e.g., being engaged and moving throughout the activity, using time effectively, being open to new activities, displaying fair play by taking turns and sharing, listening to others, not blaming or taking advantage of others)*

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

Health and Physical Education- Movement competence

B 2.1 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 four-on-four rubber-chicken keep away, basketball shooting games, and two-base softball; recreational activities such as mini-triathlons, hiking, skipping rope, and cooperative games; fitness activities such as t'ai chi, activities with exercise balls, and personal fitness challenges; dance activities such as cultural dance, jazz, and creative movement)*

B 2.3 apply a variety of tactical solutions to increase their chances of success as they participate in physical activities (*territory activities: defend territory by anticipating an opponent`s actions)*

Background:

Atlantic Salmon live in a complex food web while in Ontario waters. In streams, most animals spend a large portion of their time chasing prey or avoiding predators. Atlantic Salmon in the fry to parr stage prey on mayflies, stoneflies, caddisflies, blackflies, riffle beetles and occasionally small crustaceans and fish. Juvenile Atlantic Salmon are eaten by animals that live in and around their stream including Smallmouth Bass,

Northern Pike, Slimy Sculpin, kingfishers, ospreys, Great Blue Herons, otters, and mink. When Atlantic Salmon are post-smolt and adults they forage on Alewife, Rainbow Smelt, Round Gobies, and sculpins when they are in the lake. For the purpose of this game, bacteria are "predators" of everything because they decompose all living matter when they die. Also for the purposes of this game, humans are predators of Atlantic Salmon.

Points to keep in mind during play:

- Review with students the predator relationships before the game so it is fresh to apply to the game.
- You can choose to always show "Atlantic Salmon" or "fry" as one of the species OR randomly select images for further food web connections.
- "Humans" and "bacteria" eat everything.
- Make sure the signs are visible to both teams when you reveal them at the beginning of each round.
- Remind students of proper tagging etiquette: proper gentle tagging above the waist aiming for the arms, shoulder or back of the player, not on people's heads, not pulling on clothing or hair, etc. in order to avoid injuries during game play.
- If one team is significantly smaller than the other, make them the predators for a couple of rounds to extend the game indefinitely.

Procedure

1. Place the 4 pylons around the perimeter of the play area and explain to the students that the pylons indicate the boundary area as well as the area past the boundaries is a "safe area" that students can use when tired or fatigued but not use as a "free area" to stay out of the game. Timing students may be an option for a 30 second break in the "safe area" before returning to the game if students are using the area outside the pylons to avoid participation in the tag game.
2. The 2 remaining pylons are placed on the boundary lines to mark the middle of the playing area to indicate and act as a visual cue of the middle area that teams will meet in the middle facing each other at the beginning of each round.
3. Teams meet at the center of the playing field facing each other in two rough lines about five feet apart.
4. On the count of three, hold up two signs showing each team's species for that round. Based on the signs, members of the "predator" team try to chase and catch members of the "prey" team. Meanwhile, members of the "prey" team have to run back to their own safe zone (past the pylons on their side at the end of the playing field).
5. Members of the "prey" team that were caught become members of the "predator" team.
6. Continue playing until students are fatigued.

Atlantic Salmon

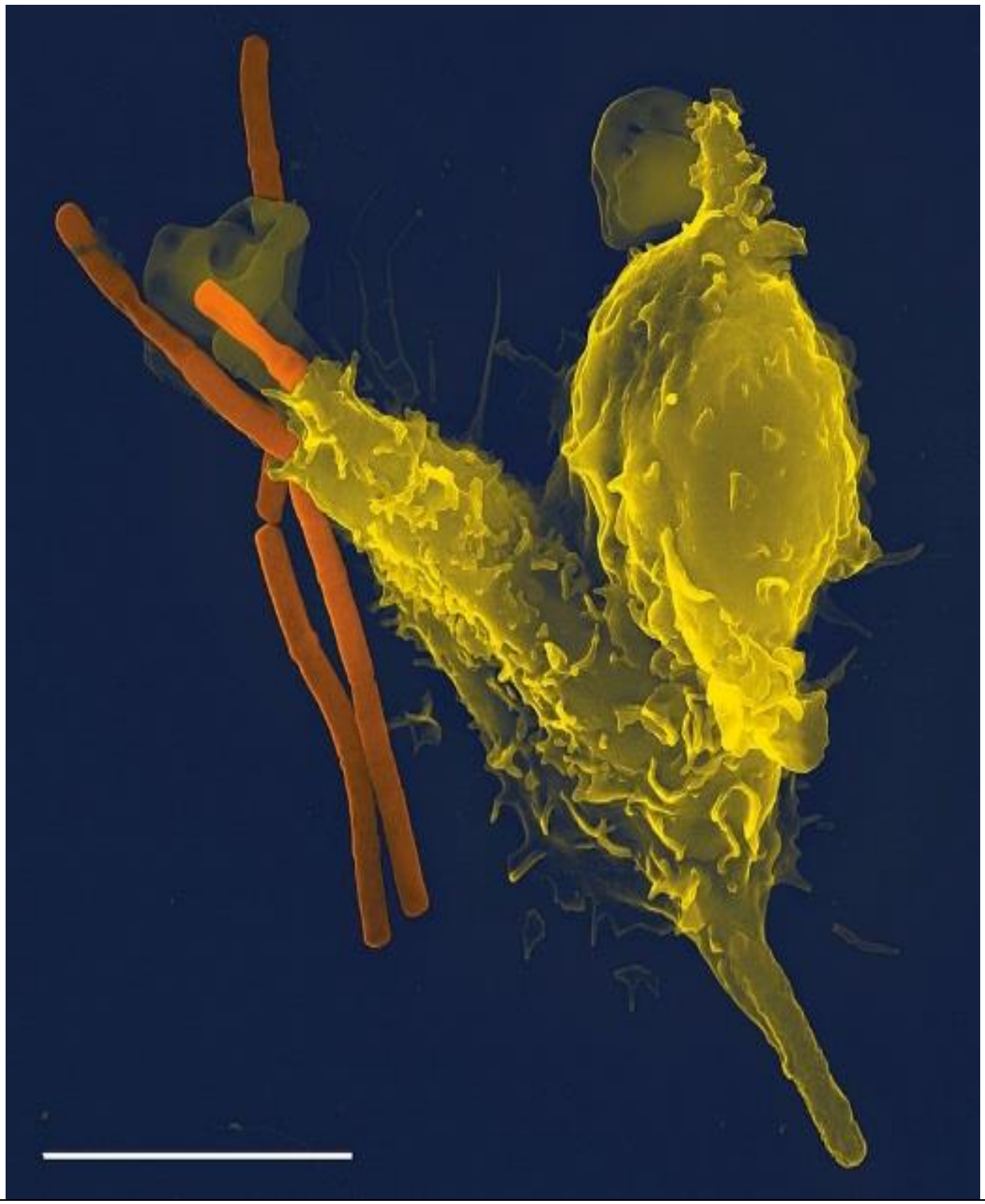
Fry

Otter

Mayfly

Humans

Bacteria



Osprey

Stonefly

Midge

Great Blue Heron

Smallmouth Bass

Grade 6 Classroom Hatchery Activities

#15 Aquarium Set-Up

As adapted from: Fish in the Classroom

This activity is intended to be used in classrooms that have received an incubation unit and eggs from the Lake Ontario Atlantic Salmon Restoration Program.

This activity focuses on common terms used when setting up the aquarium and the key parts included in an aquarium when incubating the eggs. Following these activities, set up of the aquarium can be completed as a whole-class activity (assigning specific jobs to certain students to contribute and add to the aquarium until it is fully set-up) or as a demonstration led by the teacher.

Time Frame: 40-50 minutes

Class size: 20-30 students

Setting: Classroom: an area for group creation of a concept poster and ample area for students to circulate around with their peers

Objectives:
In groups of 4, students will create a concept poster as a group to answer five questions or prompts about healthy aquatic habits as provided to each group, and as a team will record their answers on the large presentation paper. Following the group concept poster, students will participate in an interactive vocabulary activity that familiarizes students with terms and concepts that they will recognize during the setup and maintenance of the classroom hatchery unit.

Materials:
-Large presentation paper (20 in x 23 in.)
-Markers
-Questions and prompt questions: 1 copy per group of 4 or 5 students. ***Healthy Atlantic salmon aquarium habitats!*** (attached)
-Pencils
-***Kick Me Vocabulary*** worksheet (attached) (2 sided)
-Tape to affix labels to student's backs

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Biodiversity
-Biodiversity includes diversity of individuals, species and ecosystems
-Because all living things are connected, maintaining diversity is critical to the health of the planet
-Humans make choices that can have an impact on biodiversity
Language- Oral Communication
Listen in order to understand and respond appropriately in a variety of situations for a variety of purposes
Language- Writing
1. Generate, gather, and organize ideas and information to write for an intended purpose and audience
2. 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: Biodiversity

1.1 analyse a local issue related to biodiversity, taking different points of view into consideration, propose actions that can be taken to preserve biodiversity, and act on the proposal

1.2 assess the benefits that human societies derive from biodiversity and the problems that occur when biodiversity is diminished

2.1 follow established safety procedures for outdoor activities and field work (e.g., stay with a partner when exploring a habitat; wash hands after exploring a habitat)

2.2 investigate organisms found in a specific habitat and classify them according to a classification system

2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics,* and *organisms* in oral and written communication

3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plants and animals in communities, and among communities and the physical landscapes that support them

3.5 describe interrelationships within species between species, and between species and their environment, and explain how these interrelationships sustain biodiversity

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.

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

1.8 identify the point of view presented in oral texts, determine whether they agree with the point of view, and suggest other possible perspectives (*e.g., ask questions about the values that are stated and implied by the perspective taken and those that are ignored)*

2.6 identify a variety of non-verbal cues, including facial expression, gestures, and eye contact, and use them in oral communications, appropriately and with sensitivity towards cultural differences, to help convey their meaning (*e.g., count off on their fingers as they present each point in an argument)*

2.7 use a variety of appropriate visual aids, (*e.g., video images, maps, posters, charts, costumes)* to support or enhance oral presentations

Language- Writing

1.2 generate ideas about a potential topic and identify those most appropriate for the purpose

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

3.4 use punctuation appropriately to communicate their intended meaning in longer and more complex sentences with a focus on the use of: commas to separate words in a list or after an introductory word or phrase; quotation marks in dialogue; and some uses of the colon, semi-colon, and brackets

Background:

All living things have needs that have to be met in order to survive. Fish, as well as other living things, get these needs in a variety of ways from their living environment. Fish like Atlantic Salmon have a life cycle, beginning as eggs, and if healthy environmental conditions exist, they will develop through various stages over time. The Atlantic Salmon's basic life needs must be met at all stages of their life cycle. Understanding how an aquarium functions is the first step in keeping the fish alive and well. The key parts of an aquarium include the tank, filter, gravel, chiller, and water.

Tank
Without the tank there couldn't be an aquarium as it holds the water and fish. The walls and seams are rigid and sturdy. Tanks are also designed to support lighting and filtration, though for our classroom hatchery fish, insulation takes the place of a lid and keeps the tank dark.

Filters
Filters are used to improve water quality and make long-term fish care possible. There are three basic methods of filtration.

Mechanical Filtration
Filter floss or pads trap small debris and keep them from floating around in the water. This prevents the debris from decaying and polluting the aquarium and clouding the water.

Chemical Filtration
Using chemicals or chemical compounds to remove small dissolved organic particles from the water that causes discoloration, odour and other more serious problems. Activated carbon is the most common form of chemical filtration as the carbon binds to some organic compounds, and like a sponge, absorbs them and removes them from the water.

Biological filtration
Biological filters grow beneficial bacteria which remove ammonia and nitrite from the water through a process called the *nitrogen cycle*. For the bacteria to stay alive it must stay in constant water conditions and be fed a steady diet of ammonia and nitrite.

Gravel
In a healthy aquarium, each tiny piece of gravel is home to thousands of beneficial bacteria that work as a biological filter to keep the water clean. Porous gravel provides the greatest amount of surface area for the bacteria to colonize. Marbles and other smooth glass or plastic stones should be avoided. For our fish, gravel also provides places for the alevin to hide.

Water
The eggs used in the program come from freshwater, as all salmon spawn in freshwater streams. Freshwater fish can be found all over the world in rivers, streams, lakes, ponds, swamps, and practically anywhere there is a constant source of water. Therefore, different fish prefer different water chemistries depending on their origin. Atlantic Salmon require neutral water conditions. It is important to maintain the water at a pH between 6.5 and 7.5 and a temperature of about 4 ºC. For fish to survive, the dissolved ammonia and nitrite levels in the tank must remain very close to 0. This may seem like a challenge, but with the help of the filter and gravel, it is quite easy.

Water also contains dissolved chlorine or, in some areas, chloramine. This keeps the water clean and safe for people to consume, however it can be fatal for sensitive aquarium animals. Chlorine will dissipate in air, and so any water added to the tank must sit in a bucket for at least 3 days prior to being added to the tank..

Salt can reduce the levels of harmful bacteria and fungus. We add a little salt to our classroom hatchery tank (much lower than saltwater concentrations) to help prevent fungus and bacteria from growing.

Procedure
Collaborative posters.
1. In groups of 4, students will create a poster as a group to answer five questions or prompts as provided to each group as a team and will record their answers on the large presentation paper.
2. Each group with have 10 minutes to complete their group poster. Students answer questions relating to aquarium set up and what is included in providing fish like Atlantic Salmon with a healthy habitat. Students will also be able to connect their responses and thoughts to their own real-world experiences.

3. After the 10 minutes, each group is going to display the posters in a central location in the classroom and make observations as a whole class from the poster wall.
4. Prompts for reflection questions that the students will be asked include:
    - *By raising your hand, share what patterns of answers you see between all of the posters on display.*
    - *By raising your hand, share what things that are similar or interesting.*

Vocabulary:
The vocabulary activity is known as *Kick Me* and it originated from the idea of *Kick me,* signs that are affixed to others backs. Students will instead have bold vocabulary words or key phrases in order to familiarize themselves with terms that they will use during raising Atlantic Salmon in the classroom.

1. The goal for students is to find answers on each other's backs using the attached worksheet. When students have found the correct answer they will fill in the blank.
2. Set a time limit for the activity (10-15 minutes). Provide a 5 minute warning prior to activity completion. Students will circulate around the class trying to find the correct blank for their worksheet. They can brainstorm with partners and record their answers on their own sheets.
3. Number one rule is: *There is absolutely no kicking.*
4. Following the activity ask students to share their answers.

Answer key:

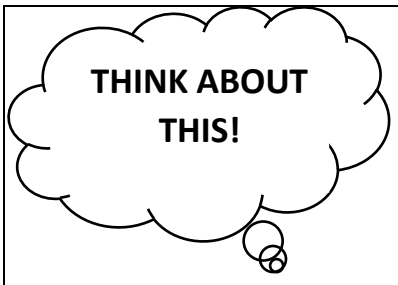
Tank	The ____ holds the water so that the Atlantic Salmon can have a habitat while in the class. _____s also support filters to help keep the aquarium healthy.
Insulation	_____ is used to keep the tank dark.
Filters	_____ are used to improve water quality and make long-term fish care possible.
Gravel	_____ provides area for healthy bacteria to grow. The _____ also provides a safe hiding spot for the alevin as they grow into fry.
Water	The eggs come from a fresh_____ environment, which contains almost no salt. Different fish prefer different _____ chemistry depending on where they are from and Atlantic Salmon need neutral _____ conditions. It is important to maintain the _____ at a pH between 6.5 and 7.5.
Water temperature	_____ at 4 ºC for the duration of egg and alevin development ensures they grow at the correct rate.
Colouring	Atlantic Salmon smolts are blue green with silvery sides and a white belly.
Spawning colouring	During spawning, male Atlantic Salmon loses their silver colour and takes on a greenish or reddish hue.
Eggs	Pea-sized orange _____ have been deposited in riverbed gravel.
Eyed eggs	As the eggs develop, the eyes of the developing Atlantic Salmon can be seen through the semi-transparent membrane, and they are called _____.
Alevin	Partially transparent _____ hatch and hide in the gravel. They feed from their attached yolk sacs and are about 2 cm or less than 1 inch in length.
Fry	____ begin feeding on microscopic life in the stream and eventually reach a length of 5 to 8 cm.
Parr	Vertical marks are on the side of the fish with a single red dot between to help camouflage. _____ stay in the river for 1 to 3 years, depending on the water temperature and food availability.
Smolts	At 12-24 cm, parr transform into _____in the spring. A silvery sheen replaces the park marks. _____ journey down the river and into the lake.

Adult	Silvery hunters, _____ Atlantic Salmon live one to two years in Lake Ontario. _____ salmon return to home rivers when they are ready to spawn.
Spawning adults	The female digs a 10-30 cm deep nest that is called a redd in the gravel bottom of the stream. Her eggs and the milt from an adult male are released to fertilize the eggs and then she moves gravel to cover the eggs.
1,500 eggs	Female Atlantic Salmon can lay _____ or more for each kg or 2.2 lbs of their body weight.
8,000 eggs	A 12-pound female Atlantic Salmon will lay about _____ completing the life cycle.
3,200 km	Spawning adults in the Atlantic Ocean have been known to swim over _____ km to reach their spawning ground.
10 feet	An Atlantic Salmon can jump up to _____ feet (about 3 metres).
Salmo salar	_____ is the Latin name for Atlantic Salmon
"leaper"	The Atlantic salmon is also known as the _____ as it can jump about 3 metres high.

Healthy Atlantic salmon aquarium habitats!

In your group of 4 you have 10 minutes to complete your group poster on the presentation paper. You will answer questions relating to aquarium set up and what is included in providing your Atlantic Salmon with a healthy habitat. You can connect your responses and thoughts to your own real world experiences. Remember to record **BOTH** the question and your answer onto the presentation paper. You will have only one of your peers as the group reporter that will record all the information on your group poster.

What are all the things a fish needs to survive in its environment?
Do fish in an aquarium need anything different? Why or why not?
Suppose the aquarium contained only adult fish, not eggs. Would you make any changes in the design of your aquarium? What would you change or leave the same?
In nature, Atlantic Salmon eggs need to be between 1°C and 5 °C to hatch. How would you keep the water in your aquarium at this temperature? Suggest two or three possible solutions.
Design an aquarium that would be an ideal environment for a fish. As a group, members can contribute to the illustration of your aquarium.



Look again at your list of what a fish needs.

-Are each of these needs being met in your aquarium?

-Do you need to add anything?

Name:_____

Kick Me Vocabulary

What to do:

1. Each of you will have one word or key words attached to your back. You need to find the correct answers on each other's backs and record the answer in the blanks below.
2. There will be a timer set so be sure to use your time wisely. You can brainstorm with a partner but you need to record your answers on your own sheets.

Number one rule is: *There is absolutely no kicking.*

	The _____ holds the water so that the Atlantic Salmon can have a habitat while in the class. _____s also support filters to help keep the aquarium healthy.
	_____ is used to keep the tank dark.
	_____ are used to improve water quality and make long-term fish care possible.
	_____ provides area for healthy bacteria to grow. The _____ also provides a safe hiding spot for the alevin as they grow into fry.
	The eggs come from a fresh____ environment, which contains almost no salt. Different fish prefer different _____ chemistry depending on where they are from and Atlantic Salmon need neutral _____ conditions. It is important to maintain the _____ at a pH between 6.5 and 7.5.
	_____ at 4 °C for the duration of egg and alevin development ensures they grow at the correct rate.
	Atlantic salmon smolts are blue green with silvery sides and a white belly.
	During spawning, male Atlantic Salmon loses their silver colour and takes on a greenish or reddish hue.
	Pea-sized orange _____ have been deposited in riverbed gravel.
	As the eggs develop, the eyes of the developing Atlantic salmon can be seen through the semi-transparent membrane, and they are called _____.
	Partly transparent _____ hatch and hide in the gravel. They feed from their attached yolk sacs and are about 2 cm or less than 1 inch in length.
	_____ begin feeding on microscopic life in the stream and eventually reach a length of 5 to 8 cm.
	Vertical marks are on the side of the fish with a single red dot between to help camouflage. _____ stay in the river for 1 to 3 years, depending on the water temperature and food availability.

	At 12-24 cm, parr transform into _____ in the spring. A silvery sheen replaces the park marks. _____ journey down the river and into the lake.
	Silvery hunters, ____ Atlantic Salmon live one to two years in Lake Ontario. ____ salmon return to home rivers when they are ready to spawn.
	The female digs a 10-30 cm deep nest that is called a redd in the gravel bottom of the stream. Her eggs and the milt from an adult male are released to fertilize the eggs and then she moves gravel to cover the eggs.
	Female Atlantic salmon can lay _____ or more for each kg or 2.2 lbs of their body weight.
	A 12-pound female Atlantic Salmon will lay about _____ eggs completing the life cycle
	Spawning adults in the Atlantic Ocean have been known to swim over _____km to reach their spawning ground.
	An Atlantic Salmon can jump up to ____ feet (about 3 metres).
	_____ _____ is the Latin name for Atlantic Salmon.
	The Atlantic salmon is also known as the _____ as it can jump about 3 metres high.

Labels to be affixed to backs of students.

Attach the following labels to student's backs for the *Kick Me Vocabulary* activity. You can laminate the labels for continued use over years. There are a total of 22 labels. If there are extra labels, some students can volunteer to have more than one label or you can place those labels on certain areas around the class, etc. If there are not enough labels, you can partner students that would work well together or you can provide a modification for students that may need some peer assistance with one student acting as the label wearer and the other student as the recorder, etc.

Tank	**Insulation**	**Filters**	**Gravel**
Water	**Water temperature**	**Colouring**	**Spawning colouring**
Eggs	**Eyed eggs**	**Alevin**	**Fry**
Parr	**Smolts**	**Adult**	**Spawning adults**
1,500 eggs	**8,000 eggs**	**3,200 km**	**10 feet**
Salmo salar	**"leaper"**		

Grade 6 Classroom Hatchery Activities

#16 Water temperature

It is getting hot in here! Board Game

As adapted from: Ocean Home - Swimming Fishes

Time Frame: 60 minutes

Class size: 20-30 students

Setting: Classroom with a large enough area for groups of 6-12 students to play the board game and an area to complete the *Temperature Observation Sheet*

Objectives:
Through group interaction and participating in a board game, students will learn and demonstrate how fish's physiological constraints (cold-blooded) affect their response to changes in water temperature. Following the board game, students will observe and record the classroom tanks water temperatures over the course of one school week and hypothesize and make conclusions about how high or low water temperatures can affect the salmon eggs they are raising in the class.

Materials:
-Game board and player's move cards (1 copy per group of 6-12 students) (cut out and laminate for repeat play)
-Playing cards (cut out and laminate for repeat play)
-12 playing chips; Counters can be used or Swedish gummy fish or goldfish crackers (to be used as chips and can be eaten after game is finished)
-Playing instructions (double sided- cut out and laminated)- 1 copy per group of 6-12 students
-Large Ziploc bag to place all game pieces, game board, instructions, cards and players move cards in for safe keeping
-*Temperature Observation Sheet* 1 copy per student (double-sided)

Curriculum Links
Overall Expectations
Science & Technology: Understanding Life Systems- Biodiversity
-Biodiversity includes diversity of individuals, species, and ecosystems
-Because all living things are connected, maintaining diversity is critical to the health of the planet
-Humans make choices that can have an impact on biodiversity
Mathematics- Measurement
-Estimate, measure, and record quantities, using the metric measurement systems
Mathematics-Data Management and Probability
-Collect and organize discrete or continuous primary data and secondary data and display the data using charts and graphs, including continuous line graphs
-Read, describe, and interpret data, and explain relationships between sets of data

Specific Expectations
Science & Technology: Understanding Life Systems- Biodiversity
1.1 Analyse a local issue related to biodiversity (*e.g., the effects of human activities on urban biodiversity, flooding of traditional Aboriginal hunting and gathering areas as a result of dam construction),* taking

different points of view into consideration (*e.g., the points of view of members of the local community, business owners, people concerned about the environment, mine owners, local First Nations, Métis, Inuit)*

1.2 Assess the benefits that human societies derive from biodiversity (*e.g., thousands of products such as food, clothing, medicine, and building materials come from plants and animals)* and the problems that occur when biodiversity is diminished (*e.g., monocultures are more vulnerable to pests and diseases)*

2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics,* and *organism,* in oral and written communication

3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plant and animal, among species and plants and animals in communities, and among communities and the physical landscapes that support them

3.3 describe ways in which biodiversity within species is important for maintaining the resilience of those species

3.4 describe ways in which biodiversity within and among communities is important for maintaining the resilience of these communities

3.5 describe interrelationships within species between species, and between species and their environment, and explain how these interrelationships sustain biodiversity

Mathematics- Measurement

-Demonstrate an understanding of the relationship between estimated and precise measurements, and determine and justify when each kind is appropriate

Mathematics-Data Management and Probability

-Collect data by conducting a survey or an experiment to do with themselves, their environment, issues in their school or community, or content from another subject, and record observations or measurements.

-Collect and organize discrete or continuous primary data and secondary data and display the data in charts, tables and graphs (including continuous line graphs) that have appropriate titles, labels, and scales, that suit the range and distribution of the data, using a variety of tools (e.g., graph paper)

-Read, interpret, and draw conclusions from primary data (e.g., survey results, measurements, observations) and from secondary data, presenting in charts, tables, and graphs

Background

The Earth's climate has changed numerous times throughout the planet's history. However, beginning in the late 1800s, human activities have drastically impacted the normal fluctuations in Earth's climate. The combustion of fossil fuels and changes in how we use the landscape, such as cutting down trees (deforestation), has led to enhanced warming of the planet. One of the main reasons for this is the increase flux in greenhouse gases, especially carbon dioxide (CO_2), into the atmosphere.

The effects of climate change will be felt at both the local and global level. These effects include alterations in temperature and precipitation patterns and negative impacts on species such as acidification in the water, species displacement, and an increase of diseases and other health issues.

This activity focuses on how climate change and changes in water temperature plays a role in the change in distribution and abundance of aquatic species in a region. The surrounding environment influences an organism's lifestyle and behaviour. With an increase or decrease in water temperature, aquatic species such as Atlantic Salmon are at risk of dying or having to move to alternate locations to maintain healthy living in more favourable water temperatures.

Preparation

Print out enough game boards and laminate for repeat use for groups of 6-12 students. The game board is a 9 x 4 grid (with an additional row identifying each row). The nine numbered rows represent different

temperature regimes and represent "southern" (lower numbers) and "northern" (higher numbers) waters. The lettered columns denote the paths that players must move in during their turns. There can be a total of 12 players and a minimum of six players.

Print out copies of the playing cards so that each player gets one card. Laminate cards for repeat use.

Place the game board, playing cards, temperature key, playing instructions and player's move cards into a large Ziploc bag. Laminate all pieces for repeat play. Each group of 6-12 students receive a Ziploc bag with all the printed and laminated game parts inside with 12 counters to be used as playing chips. (Counters can be used as playing chips, or goldfish crackers or Swedish gummy fish can be used as playing pieces that students can consume at the end of game play.)

Procedure

Introduction

1. Ask the class to describe how they respond to cold weather and to hot weather.

People dress more warmly or lightly to maintain a consistent body temperature.

Ask the students if they have ever taken their body temperature with a thermometer? Do they remember what their temperature was? Would that change depending on whether they were outside or inside?

Ask them to suggest ways in which animals respond to warm or cold weather.

Warm-blooded animals, like people, can adjust their body temperature. Cold-blooded animals, like fish and reptiles, cannot, so their breathing and other bodily functions become slower in cold temperatures.

2. Explain that today they are going to learn about fish and their body temperatures. Share some or all of the following information with the students:

- *Humans and other mammals are warm-blooded, meaning they can keep the inside of their bodies at a constant temperature. They do this by generating their own heat when they are in a cooler environment, and by cooling themselves when they are in a hotter environment. To generate heat, warm-blooded animals convert the food that they eat into energy.*
- *Fish are cold-blooded and take on the temperature of their surroundings. They are hot when their environment is hot and cold when their environment is cold. In hot environments, cold blooded animals can have blood that is much warmer than warm-blooded animals.*

3. Ask the students to describe the different temperature environments that fish might live in (cold water, warm water, tropical) and if they can think of any fish species that may live in each temperature. Also, ask what they think would happen if water temperatures were too warm. Would the fish move northward (colder) or southwards (warmer) or stay in the same area?

4. Provide each group of 6-12 students with the game bags. You can assign each group of students or you can have students select their own groups that they will be able to responsibly play the game together and remain on-task and get along with.

5. Familiarize students with the temperature key. Explain that row 9, 8 and 7 are the northern water temperatures that indicate cooler temperatures while row 1, 2, and 3 are southern water temperatures that are warmer water temperatures.

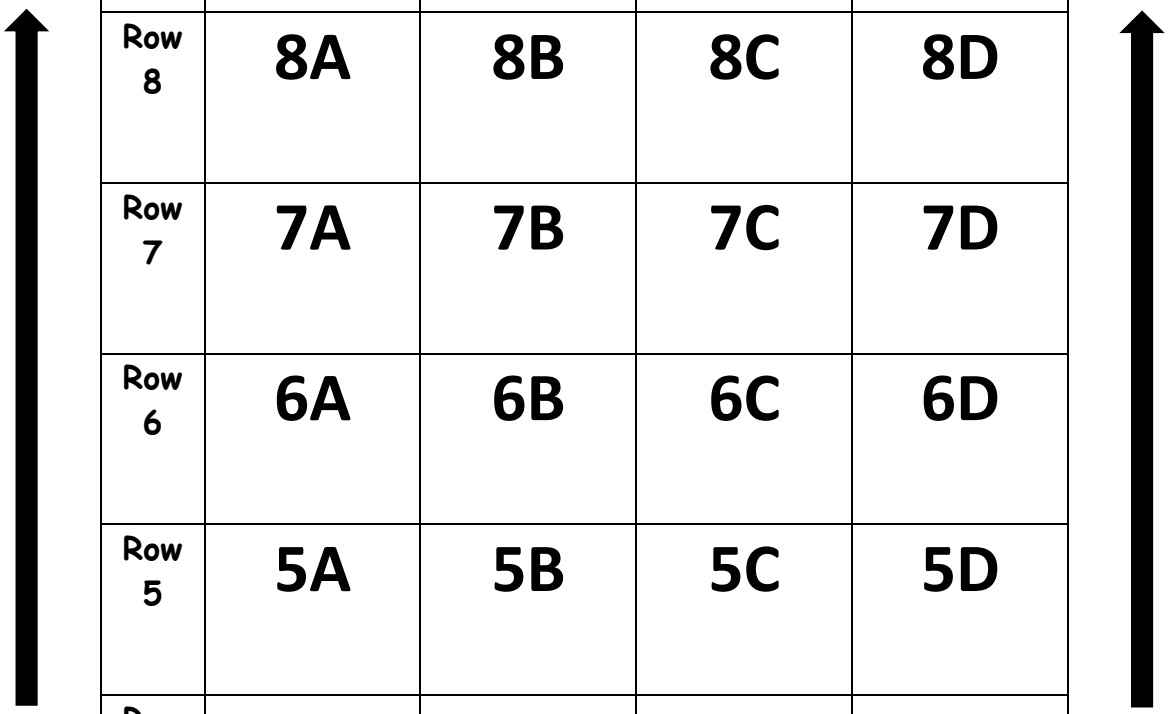
6. You can as a whole class play one round of the game with you demonstrating a turn and then following the demonstration, students can lead into independent group play **OR** groups of students can follow along through the game instructions as outlined. Before the game officially starts, each player must randomly select a card that will assign him or her to be a certain type of species. On each card for each species, there will be colours representing at least two temperatures that the species can live in, an illustration of their fish species, the common and scientific name, and the starting position on the board. Each player should hold his or her card throughout the game for reference.

7. The player moves cards that indicate each round and represent 10 year's time. Each card includes a temperature change which is laid out on the visual colour diagram. The first decade represented will be 2000-2010 and the activity will continue to 2090.

8. The initial "Start …..Year 2000" map represents water temperatures where all fish species can survive.

Row 9		Purple
Row 8		Blue
Row 7		Blue
Row 6		Green
Row 5		Yellow
Row 4		Orange
Row 3		Red
Row 2		Red
Row 1		Brown

9. During each round, the players must decide whether to move forward one cell, move back one cell, or remain in the same location. A player can only stay in a cell for two consecutive rounds. There can only be one person in a cell at a time.
10. During a change in temperature, if a player is found within a row with a colour that is not on their playing card, they are eliminated.
11. At the end of ten rounds, the players still remaining will win the game.
12. Ask students to clean up their game areas and place all of the pieces back into the large Ziploc bag. During group cleanup of the game, ask students the following reflection questions.
    - *Ask the students which direction were the fish moving and why? What would happen to your species if the waters became warmer? How would this change where you would go fishing?*
13. Once the board game has been cleaned up, provide each student with their own copy the *Temperature Observation Sheet.* Go over with the class, what the water temperature is in the classroom tank and ask students to record the information on their observation sheet. Ask for one student to volunteer to read the thermometer and then one additional student to confirm the information. Once you have had both students agree on the temperature of the water for that day, students will record their observations Monday-Friday. Students can answer their prediction questions at any time during their observation from Monday-Friday and can use their own connections from playing the board game as a group, class discussion or personal knowledge based connections.



Row 9	9A	9B	9C	9D
Row 8	8A	8B	8C	8D
Row 7	7A	7B	7C	7D
Row 6	6A	6B	6C	6D
Row 5	5A	5B	5C	5D
Row 4	4A	4B	4C	4D
Row 3	3A	3B	3C	3D
Row 2	2A	2B	2C	2D
Row 1	1A	1B	1C	1D

Game Board

Temperature key

Do you live in warmer water or colder water?

There will be 10 rounds to equal the passage of 100 years!

Row 9		**Purple**
Row 8		**Blue**
Row 7		**Blue**
Row 6		**Green**
Row 5		**Yellow**
Row 4		**Orange**
Row 3		**Red**
Row 2		**Red**
Row 1		**Brown**

An individual fish doesn't usually live to be 100 years old, so each person is representing many generations of that species of fish rather than an individual fish.

Playing Cards

The playing cards are below. When you print them, cut them out, then laminate - you can reuse them every year.

Ocean Pout
Macrozoarces americanus
Start: 8A

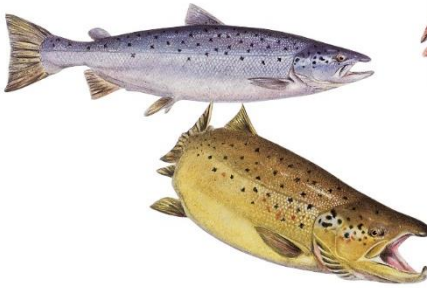
Image from: noaa.gov

Atlantic Cod
Gadus morhua
Start: 8B

Image from: noaa.gov

Atlantic Herring
Clupea harengus
Start: 8C

Atlantic Salmon
Salmo salar
Start: 8D



Striped Bass

Morone sacatilis

Start: 5A

Image from: *noaa.gov*

Weakfish

Cynscion regalis

Start: 5B

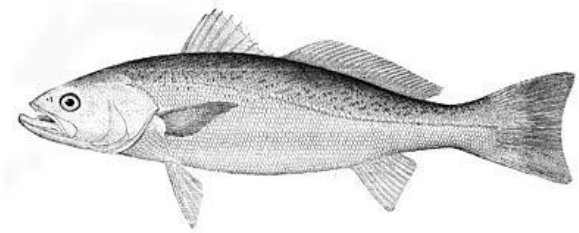


Image from: Wikimedia commons

Summer Flounder

Paralichthys dentatus

Start: 5C

Image from: noaa.gov

Atlantic Menhaden

Brevoortia tyrannus

Start: 5D

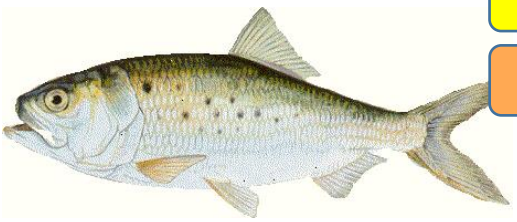


Image from: noaa.gov

Southern Stingray

Dasyatis americana

Start: 2A

Image from: noaa.gov

Gray Triggerfish

Balistes capriscus

Start: 2B

Image from: noaa.gov

Red Drum

Sciaenops ocellatus

Start: 2 C

Image from: noaa.gov

Lemon shark

Negaprion breviorstris

Start: 2D

Image from: noaa.gov

Player's Move Cards.

Using the player's move cards, you will read the steps and decide if your marker will move up or down on the game board. The player's move cards are in order from the year 2000-2090. The game begins in the Year 2000 and shows the water temperature chart that all fish species can survive in.

During each round, you must decide whether to move forward one square, move back one square, or remain in the same square.

- A player can only stay in the same square for two rounds and there can only be one person in the square at a time.
- During a change in water temperature, if a player is found within a square that is a colour NOT on their playing card, they are eliminated.

At the end of ten rounds, the players still remaining on the game board win the game!

Player's Move Card 1.

Year 2000

Do you think the water temperature becomes warmer or cooler in the next 10 years?

Row 9		Purple
Row 8		Blue
Row 7		Blue
Row 6		Green
Row 5		Yellow
Row 4		Orange
Row 3		Red
Row 2		Red
Row 1		Brown

Now, a decision.

Move forward one square on the game board (higher in number)

OR

Move back one square on the game board (lower in number)

OR

Stay where you are.

Player's Move Card 3.

Year 2020

Can you survive where you are? If not, please remove your playing marker off the board.

Row 9		Blue
Row 8		Green
Row 7		Green
Row 6		Yellow
Row 5		Yellow
Row 4		Orange
Row 3		Orange
Row 2		Red
Row 1		Brown

Decision time again….

Move forward

OR

Move backward

OR

Stay

If you haven't moved at all yet, you MUST move this time!

Player's Move Card 2.

Year 2010

The water temperature has changed… can you survive where you are?

Row 9		Purple
Row 8		Blue
Row 7		Green
Row 6		Yellow
Row 5		Yellow
Row 4		Orange
Row 3		Orange
Row 2		Red
Row 1		Brown

Does you're playing marker on the game board have the temperature colour on your fish card?

If not, then remove your piece from the game board.

Decision:

Move forward one square on the game board (higher in number)

OR

Move back one square on the game board (lower in number)

OR

Stay where you are.

Player's Move Card 4.

Year 2030

Do you have any observations about the last 30 years?

Row 9		Blue
Row 8		Green
Row 7		Yellow
Row 6		Yellow
Row 5		Yellow
Row 4		Orange
Row 3		Orange
Row 2		Red
Row 1		Brown

Can you survive where you are?

If not, please remove your playing marker off the board.

Decision:

Move forward one square on the game board (higher in number)

OR

Move back one square on the game board (lower in number)

OR

Stay where you are.

Player's Move Card 5.

Year 2040

There was a volcanic eruption in Alaska! What overall effect did the volcanic eruption have on the water temperatures?

Row 9		Blue
Row 8		Blue
Row 7		Green
Row 6		Green
Row 5		Yellow
Row 4		Yellow
Row 3		Yellow
Row 2		Orange
Row 1		Red

Can you survive where you are?

If not, remove your piece from the playing board.

Decision:

Move forward one square on the game board (higher in number)

OR

Move back one square on the game board (lower in number)

OR

Stay where you are.

Player's Move Card 6.

Year 2050

Row 9		Blue
Row 8		Green
Row 7		Yellow
Row 6		Yellow
Row 5		Yellow
Row 4		Orange
Row 3		Orange
Row 2		Orange
Row 1		Red

Can you survive where you are?

If not, please remove your playing piece off the board.

Decision time:

Move forward one square on the game board (higher in number)

OR

Move back one square on the game board (lower in number)

OR

Stay where you are.

Player's Move Card 7.

Year 2060

Can you survive where you are?
If not, remove your playing piece off the board.
We're a little more than half-way through our 100 years… how are the fish doing?

Row 9		Blue
Row 8		Green
Row 7		Yellow
Row 6		Yellow
Row 5		Orange
Row 4		Orange
Row 3		Orange
Row 2		Red
Row 1		Red

Decision:
Move forward one square on the game board (higher in number)
OR
Move back one square on the game board (lower in number)
OR
Stay where you are.

Player's Move Card 8.

Year 2070

Can you survive where you are?
If not, remove your playing piece off the board.

Only 3 rounds left!

Row 9		Blue
Row 8		Green
Row 7		Yellow
Row 6		Orange
Row 5		Orange
Row 4		Orange
Row 3		Orange
Row 2		Red
Row 1		Brown

Decision:
Move forward one square on the game board (higher in number)
OR
Move back one square on the game board (lower in number)
OR
Stay where you are.

Player's Move Card 9.

Year 2080

Can you survive where you are?
If not, remove your piece from the game board.

Row 9		Blue
Row 8		Green
Row 7		Yellow
Row 6		Orange
Row 5		Orange
Row 4		Orange
Row 3		Red
Row 2		Red
Row 1		Brown

Decision:
Move forward one square on the game board (higher in number)
OR
Move back one square on the game board (lower in number)
OR
Stay where you are.

Player's Move Card 10.

Year 2090

Can you survive where you are?
If not, remove your piece from the game board.

Row 9		Green
Row 8		Green
Row 7		Yellow
Row 6		Orange
Row 5		Orange
Row 4		Orange
Row 3		Red
Row 2		Red
Row 1		Brown

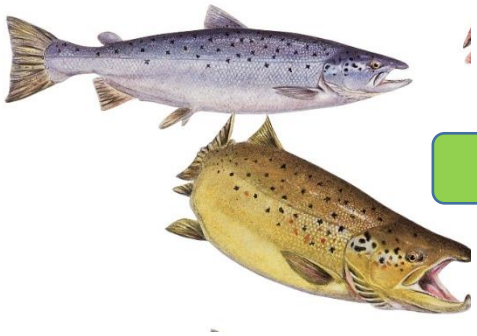
Decision- for the last time…
Move forward one square on the game board (higher in number)
OR
Move back one square on the game board (lower in number)
OR
Stay where you are.

How many fish have been left on the game board?

Playing Instructions.

Atlantic Herring
Clupea harengus
Start: 8C

Atlantic Salmon
Salmo salar
Start: 8D



How to Start Playing:

1. Each player will randomly select a playing card that assigns you the fish you will be while playing the game.
2. Hold onto your card during play for reference.
3. Each card has at least two colours representing the temperature of water your fish can survive in, your fish's scientific and common name, where you should place your playing marker on the game board and an illustration of your fish.

What to do:

1. Find the start block on your card and place your playing marker on that spot. For example: if you are an *Atlantic Salmon* you would start on space 8D.
2. The coloured squares on the right side of the card is the temperature of water your fish can survive in.

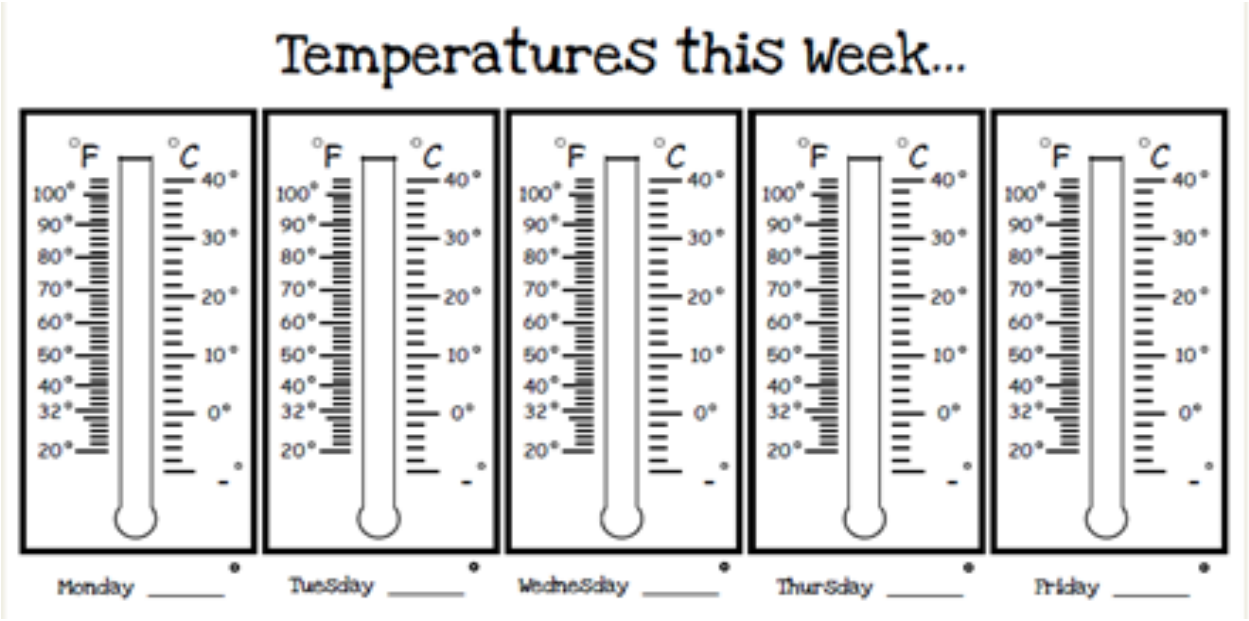
Name:_____

Temperature Observation Sheet

Fish and other cold-blooded animals cannot control their body temperature. Fish have the same temperature as the water in which they live. Many body functions work properly only at a specific temperature. Because of this, fish are very sensitive to water temperature. As eggs in the winter, Atlantic Salmon need a temperature between 1 °C and 9 °C. As alevin, they need a temperature between 5°C and 14°C. At later stages, salmon can live in warmer water, but they prefer water below 14°C.

Water temperature affects fish respiration, or breathing. Fish breathe by opening their mouth to take a mouthful of water. They close their throat and force the water out their gills. The gills extract oxygen from the air that is dissolved in the water. You can tell how fast fish are breathing by counting the number of times they open and close their operculum (which covers their gills). Water temperature is important to keep the salmon eggs healthy so they can grow into alevin. Record the temperature of the water for one week. Colour in the thermometer and record the degrees Celsius that the classroom tank is at each day. Complete the prediction questions during the week. You can support your learning in your answer by using what you learned while playing the board game as a class or your own personal knowledge connections.

Colour in the water temperature from Monday to Friday on the thermometers below using a RED pencil crayon.

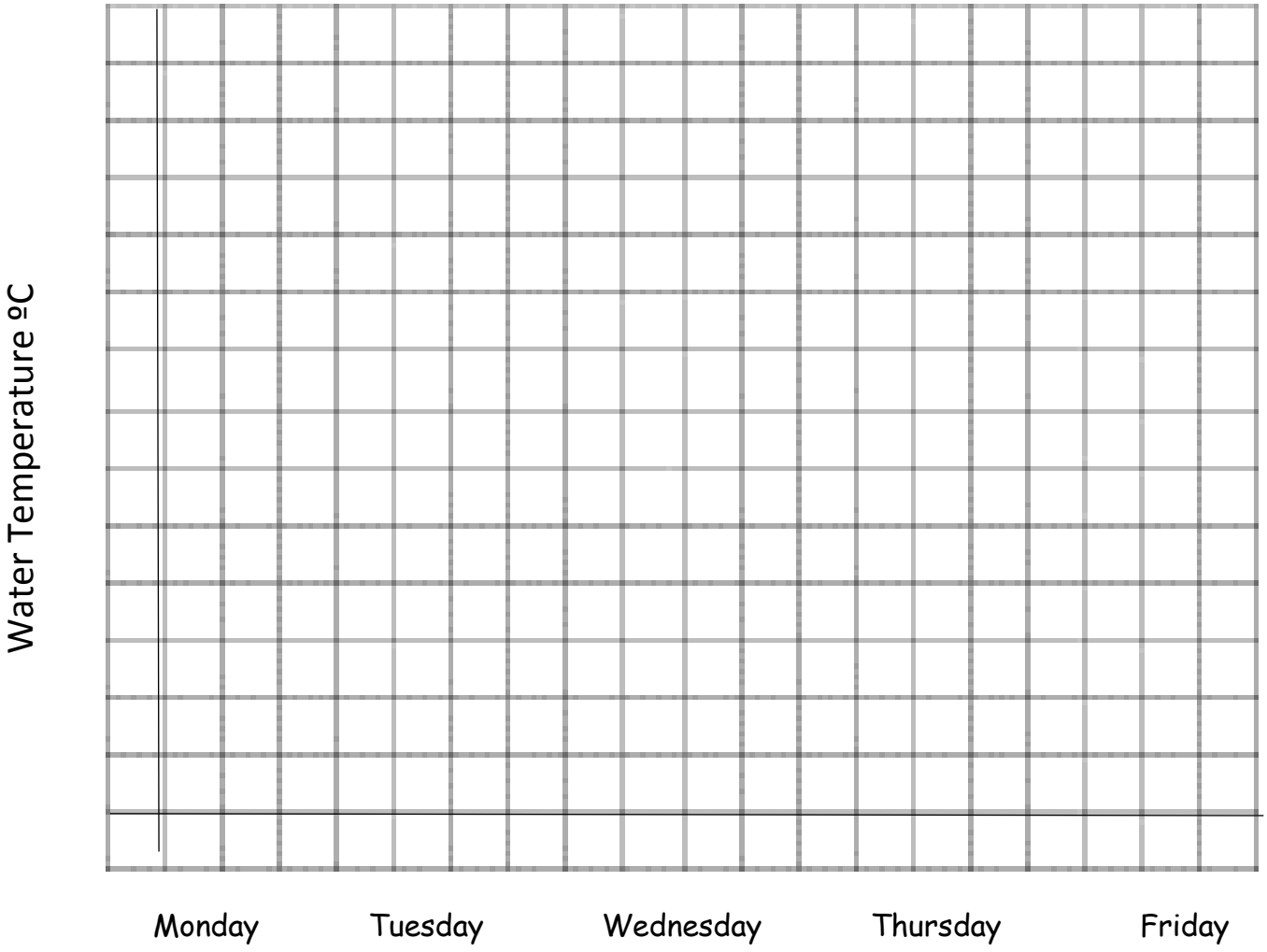


Record the water temperature in °C for each day of the week in the chart below.

	Monday	Tuesday	Wednesday	Thursday	Friday
Water temperature in °C					

Create a line graph that shows your observations of the water temperature in the classroom tank from Monday to Friday.

Water Temperature Line Graph



Predictions

I predict that when the temperature is too cold in the classroom tank, the salmon eggs will _____

_____

_____

I predict that when the temperature is too warm in classroom tank, the salmon eggs will_____

_____

Conclusions

What conclusions can you make from your observation of the water temperature in the classroom tank from Monday to Friday?

_____

_____

_____

Grade 6 Classroom Hatchery Activities

#17 Egg Observation

As adapted from: Salmon in The Classroom

Time Frame: 60 minutes

Class size: 20-30 students

Setting: Classroom

Objectives:
Students learn about the factors that can impact the healthy development of Atlantic Salmon eggs. Through a simulation activity, students will learn about accumulated thermal units (ATUs) and how the amount of heat over a course of time develop the eggs and why salmon biologists record water temperature. Through this interactive math simulation, students will practice calculating ATUs and establish if their eggs will be able to successfully hatch.

Materials:
-*Salmon Eggs* and *ATU* reading handout (double sided) (1 copy per student or 1 copy per pair of students)
-*Daily temperature data* handout (double sided) (1 copy per student) (** Answer key included **) (double sided)
-Math counters and/or manipulatives (beans, buttons, coins, etc.)

Curriculum Links
Overall Expectations
Science & Technology- Understanding Life Systems: Biodiversity
-Biodiversity includes diversity of individuals, species and ecosystems
-Because all living things are connected, maintaining diversity is critical to the health of the planet
-Humans make choices that can have an impact on biodiversity
Mathematics- Number Sense and Numeration
-**Problem Solving:** Develop, select and apply problem-solving strategies as they pose and solve problems and conduct investigations to help deepen their mathematical understanding
Mathematics- Data Management & Probability
-Collect and organize discrete or continuous primary data and secondary data and display the data using charts and graphs
-Read, describe and interpret data, and explain relationships between sets of data

Specific Expectations
Science & Technology- Understanding Life Systems: Biodiversity
1.1 assess the benefits that human societies derive from biodiversity (*e.g., thousands of products such as food, clothing, medicine, and building materials come from plants and animals)* and the problems that occur when biodiversity is diminished
2.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics* and *organism* in oral and written communication
3.3 describe ways in which biodiversity within species is important for maintaining the resilience of those species
3.4 describe ways in which biodiversity within and among communities is important for maintaining the

resilience of those communities

3.5 describe interrelationships within species between species and between species and their environment and explain how these interrelationships sustain biodiversity

Mathematics- Number Sense and Numeration

-Use a variety of mental strategies to solve addition, subtraction, multiplication, and division problems involving whole numbers

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

Mathematics- Data Management & Probability

-Collect and organize discrete or continuous primary data and secondary data and display the data in charts, tables, and graphs that have appropriate titles, labels and scales that suit the range and distribution of the data, using a variety of tools

-Read, interpret, and draw conclusions from primary data (*e.g., survey results, measurements, observations)* and secondary data *(e.g., sports data in the newspaper, data from the Internet about movies)* presented in charts, tables, and graphs

Background

When adult salmon return upstream to spawn, each female lays from 2,000 to 8,000 spherical, pinkish-orange eggs, which are about 6 to 9 mm (1/4 in) in diameter. Instead of a hard shell like a chicken, each egg has a soft, transparent membrane as its outside surface. This surface offers little protection against predators or other disturbances, so the female covers the eggs with gravel in a rocky stream called a redd. The redd is a shallow depression in the gravel. The female chooses a site in a stream with a high flow of fresh water. Salmon eggs are very sensitive - only one in 10 survives to hatch. In the first days, even a slight disturbance of the stream can be fatal.

Procedure

1. Provide each student or pair of students with their own copy of the *Salmon Eggs* handout. Ask for student volunteers to read the article aloud or read the handout aloud to the whole class. To cut down on printing of the handout, displaying a digital version of the handout could be an option as a whole class read along.
2. Ask students to suggest reasons for birds sitting on their eggs before they hatch. Explain that a bird's body provides heat, which eggs need to develop. In many species, including birds and fish, the amount of heat that eggs receive is the most important factor in determining when the eggs will hatch. The amount of heat is measured in units called accumulated thermal units (ATUs). Each species needs a different number of ATUSs (about 450 ATUs for salmon; about 777 for chicken eggs at 70% relative humidity). While birds get most of the ATUS they need from their mother's body, salmon get the ATUs they need from the water that flows past them.
3. Explain that, in the simulation that they will be doing as a class, each student represents a redd with 2,500 salmon eggs in a stream. The eggs must receive 450 ATUs to hatch, but if they receive more than 18 or less than 2 ATUs in a day, they will die. Events taking place around them in their environment may also cause the eggs to die. Using the table (attached) as a whole class, guide them in calculating the ATUs received by their salmon eggs.
   Note: be sure to calculate a few examples with the class prior to leading to independent math solving. Use math counters to represent the ATUs the eggs in the redd receive.
4. Ask the class to predict when eyes will appear in the egg if they normally appear at 220 ATUs. (***Prediction: day 30)***
5. Randomly add some events that affect the survival of the redds. Ensure that about 10% of redds survive to hatch.

Events could include:

- Brown trout discover redds and eat some eggs. One of every 10 redds is lost.
- Disease hits some redds and kills some eggs. Two of every 10 redds are lost.
- Off-road vehicles drive through the stream, crushing some eggs. One of every 20 redds is lost.
- Construction or logging upstream releases silt into the stream, preventing oxygen from reaching the eggs. Two of every 10 redds are lost.
- Small streams have ice reaching the gravel, which destroys eggs. One of every 10 redd is lost.
- High rainfall floods the stream and washes away the gravel and some eggs. One of the every 10 redds is lost.
- Car oil seeps into the stream and poisons the water. One of every 20 redds is lost.
- People remove stream-side vegetation, raising the temperature to 20 ºC and killing juvenile salmon in the stream. Three of every 10 redds are lost.
- Dogs playing in the stream dig up redds. One of every 20 redds is lost.

6. Once students have been able to complete the ATUs chart, discuss with the class the observations they drew from the data. If necessary, prompt them with questions, such as:
   - *How consistent was the temperature?*

   It varied from 4 ºC to 14 ºC, changing 0 ºC to 3 ºC per day.
   - *What events had the most impact on salmon survival?*

   Logging, construction and disease.

Salmon Eggs

When adult Atlantic Salmon swim upstream to spawn in the fall, the female chooses a site in a stream with a gravel bed and plenty of flowing, fresh water. With her body and tail she create a current which moves rocks and creates a shallow depression called a redd, like a nest in the gravel. Each female lays from 2,000 to 8,000 pinky-orange eggs, about 6 to 9 mm (1/4 inch) in diameter. Instead of a hard shell like a chicken egg, each salmon egg has a soft, transparent wall. This wall, or membrane, offers little protection against predators or other disturbances, so after the male fertilizes them the female covers the eggs with gravel. Birds, fish, and mammals eat the eggs if they can find them, and flooding, pollution, and disease also destroy eggs.

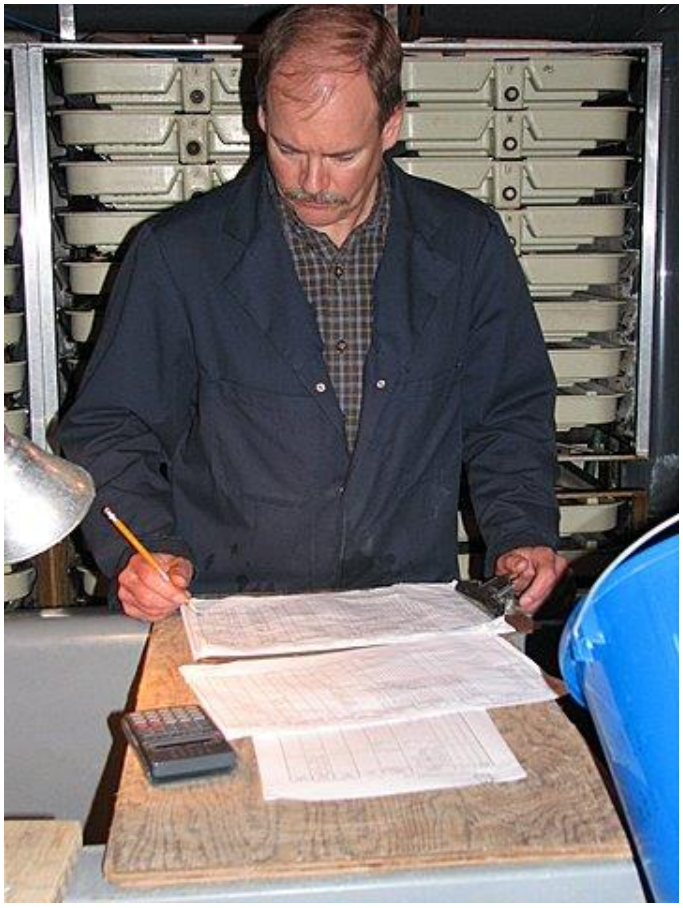
Salmon eggs need cold water to live. If the water is too cold or too hot, the eggs will die. The developing salmon uses its yolk for nutrients. The salmon gets air through the egg wall from the stream water. If the water stops running, the growing salmon inside the egg will die. Dirt in the water can bury the egg and smother the developing salmon.

Salmon eggs are very sensitive - only one in 10 survives to hatch. In the first days, even a slight disturabance to the stream bed can be fatal. Changes in water level or temperature can kill many eggs; they are also very sensitive to pollution in the water. The eggs need pure, clean water, with plenty of dissolved oxygen and little silt in the water.

Because salmon are cold-blooded, the water temperature controls the rate of which they develop. The ideal water temperature for salmon eggs is from 1 to 9 °C. The eggs will die about 20°C or below freezing. Eggs develop more slowly at lower temperatures.

Salmon develop all their body parts inside the egg. You can see a salmon's dark eyes through the egg wall. After spending the winter in the gravel, salmon hatch from the eggs.

The Science Behind Salmon Eggs



Salmon biologists use accumulated thermal units (ATUs) to measure the heat an egg receives. ATU is the total heat an egg receives over a period of time. To calculate ATUs, you add the water temperature each day to the total for the previous days. For example, if the water temperature is 8°C on the first day, the ATUs are 8. If the temperature is 8°C again on the second day, the ATUs are 16. If the temperature falls to 6°C on the third day, the ATUs are 22.

The ATUs control the time a salmon takes to develop. Inside the egg, the developing salmon feeds from a yolk sac. However, the embryo still needs to get oxygen from the water that flows through the gravel. Oxygen can pass through the wall of the egg. However, if silt covers the gravel or the egg is buried, oxygen cannot transfer through the egg membrane and the embryo will suffocate. The embryo can also die if the water flows too slowly and enough oxygen cannot reach the egg. As development progresses, the embryo begins to move and wiggle around. At a certain point, it releases a chemical that weakens the wall. The embryo breaks through and wiggles out. It will live the next stage of its life in the gravel as an alevin.

Name:_____

Can You Calculate The ATUs Needed For Your Egg To Develop?

Using the formula below and after practice as a class, complete the blanks in the table below to find out how many ATUs your eggs would receive by the time they hatch.

Day	Temp °C	Do the math: water temp (°C) + previous day total ATUs = new total ATUs
Day 1	8 °C	8 ATUs
Day 2	8 °C	8 C° + 8 ATUs = 16 ATUs
Day 3	8 °C	8 C° + 16 ATUs = 24 ATUs
Day 4	9 °C	9 C° + 24 ATUs = 33 ATUs
Day 5	9 °C	9 C° + 33 ATUs = 42 ATUs
Day 6	10 °C	10 C° + 42 ATUs = 52 ATUs
Day 7	9 °C	
Day 8	8 °C	
Day 9	8 °C	
Day 10	9 °C	
Day 11	8 °C	
Day 12	7 °C	
Day 13	6 °C	
Day 14	5 °C	
Day 15	6 °C	
Day 16	5 °C	
Day 17	4 °C	
Day 18	4 °C	
Day 19	5 °C	
Day 20	5 °C	
Day 21	6 °C	
Day 22	7 °C	

Day 23	8 °C	
Day 24	8 °C	
Day 25	9 °C	
Day 26	9 °C	
Day 27	9 °C	
Day 28	9 °C	
Day 29	10 °C	
Day 30	10 °C	
Day 31	11 °C	
Day 32	11 °C	
Day 33	12 °C	
Day 34	12 °C	
Day 35	13 °C	
Day 36	13 °C	
Day 37	14 °C	
Day 38	13 °C	
Day 39	14 °C	
Day 40	13 °C	
Day 41	12 °C	
Day 42	12 °C	
Day 43	11 °C	
Day 44	10 °C	
Day 45	11 °C	
Day 46	10 °C	
Day 47	8 °C	
Day 48	7 °C	
Day 49	7 °C	
Day 50	10 °C	

**** ANSWER KEY ****

Can You Calculate The ATUs Needed For Your Egg To Develop?

Using the formula below and after practice with the class, complete the blanks in the following below to find out how many ATUs your eggs would receive by the time they hatch.

Day	Temp °C	Do the math: water temp (C°) + previous day total ATUs = new total ATUs
Day 1	8 °C	8 ATUs
Day 2	8 °C	8 C° + 8 ATUs = 16 ATUs
Day 3	8 °C	8 C° + 16 ATUs = 24 ATUs
Day 4	9 °C	9 C° + 24 ATUs = 33 ATUs
Day 5	9 °C	9 C° + 33 ATUs = 42 ATUs
Day 6	10 °C	10 C° + 42 ATUs = 52 ATUs
Day 7	9 °C	61 ATUs
Day 8	8 °C	69 ATUs
Day 9	8 °C	77 ATUs
Day 10	9 °C	86 ATUs
Day 11	8 °C	94 ATUs
Day 12	7 °C	101 ATUs
Day 13	6 °C	107 ATUs
Day 14	5 °C	112 ATUs
Day 15	6 °C	118 ATUs
Day 16	5 °C	123 ATUs
Day 17	4 °C	127 ATUs
Day 18	4 °C	131 ATUs
Day 19	5 °C	136 ATUs
Day 20	5 °C	141 ATUs
Day 21	6 °C	147 ATUs
Day 22	7 °C	154 ATUs
Day 23	8 °C	162 ATUs
Day 24	8 °C	170 ATUs

Day 25	9 °C	179 ATUs
Day 26	9 °C	188 ATUs
Day 27	9 °C	197 ATUs
Day 28	9 °C	206 ATUs
Day 29	10 °C	216 ATUs
Day 30	10 °C	226 ATUs
Day 31	11 °C	237 ATUs
Day 32	11 °C	248 ATUs
Day 33	12 °C	260 ATUs
Day 34	12 °C	272 ATUs
Day 35	13 °C	285 ATUs
Day 36	13 °C	298 ATUs
Day 37	14 °C	312 ATUs
Day 38	13 °C	325 ATUs
Day 39	14 °C	339 ATUs
Day 40	13 °C	352 ATUs
Day 41	12 °C	364 ATUs
Day 42	12 °C	376 ATUs
Day 43	11 °C	387 ATUs
Day 44	10 °C	397 ATUs
Day 45	11 °C	408 ATUs
Day 46	10 °C	418 ATUs
Day 47	8 °C	426 ATUs
Day 48	7 °C	433 ATUs
Day 49	7 °C	440 ATUs
Day 50	10 °C	450 ATUs

BRING BACK THE SALMON
LAKE ONTARIO
supported by ONTARIO POWER GENERATION

Grade 6 Classroom Hatchery Activities

#18 Alevin to Fry Rush Hour

Time Frame: 20-25 minutes

Class size: 20-30 students

Setting: Large open space (large classroom or gymnasium)

Objectives:
Through this active physical education activity, students will play the role of alevin after the eggs have hatched and search for protection and aim for survival as Atlantic salmon fry while swimming and searching in their stream for aquatic organisms.

Materials:
-Chairs (1 per student)
-Whistle (optional); can be used as indicator for beginning of each round of game play

Curriculum Links
Overall Expectations
Science & Technology: Understanding Life Systems- Biodiversity
-Demonstrate an understanding of biodiversity, its contributions to the stability of natural systems and its benefits to humans
-Assess human impacts on biodiversity, and identify ways of preserving biodiversity
Health & Physical Education- Living Skills
1. Demonstrate personal and interpersonal skills and 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

Specific Expectations
Science & Technology: Understanding Life Systems- Biodiversity
2.2 Investigate the organism found in a specific habitat and classify them according to a classification system
1.4 use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics,* and *organism* in oral and written communication
3.1 identify and describe the distinguishing characteristics of different groups of plants and animals (*e.g., invertebrates have no spinal column; insects have three basic body parts; flowing plants produce flowers and fruits)*, and use these characteristics to further classify various kinds of plants and animals *(e.g., invertebrates, arthropods-insects; vertebrates-mammals-primates; seed plants- flowering plants- grasses)*
3.2 demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plant and animal, among species of plants and animals in communities and among communities

and the physical landscapes that support them

Health & Physical Education- Living Skills

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: promote fair play, share equipment, and follow rules when playing lead-up games)*

Health & Physical Education- Active Living

A 1.1 actively participate in a wide variety of program activities (*e.g., lead-up games, recreational activities, fitness activities, dance)*, according to their capabilities, while applying behaviours that enhance their readiness and ability to take part (*e.g., being engaged and moving throughout the activity, using time effectively, being open to new activities, displaying fair play by taking turns and sharing, listening to others, not blaming or taking advantage of others)*

A 3.1 demonstrate behaviours and apply procedures that maximize their safety and that of others during physical activity (*e.g., demonstrating personal responsibility; checking that equipment is in good working order)*

Background

Wiggling energetically, the salmon embryo in an egg breaks through the egg lining and makes its way out of its egg and into the gravel. For the next 30 to 50 days, it lives as an alevin (a-le-vin: the 'a' is pronounced like *play* or like *cat*) in the dark spaces between the gravel of its home stream. As with the egg, the rate of an alevin's development depends mainly on the water temperature, which should range from 4 ºC to 14 ºC.

The yolk sac, which remains attached to the alevin's belly, provides the food it needs. The sac shrinks as the alevin develops, gradually allowing it to move about more easily.

The alevin's respiration, or breathing, system also develops, allowing it to breathe through its gills. Clear, flowing water is still important, but an alevin has some ability to move through spaces in the gravel away from areas that are too silty. Also, an alevin can clear small amounts of silt from its gills, so it can live in water that has more silt than salmon eggs can accept.

Alevins need cold running water that is rich in oxygen and they need clean gravel with spaces in which they can hide. Threats include predators in the water, siltation, pollution, floods and other activities that can disturb the gravel. People can protect the alevins by keeping dirt or other pollutants out of the water and by staying off of stream gravel.

Because alevins keep the orange colour of the salmon egg and their yolk sac slows their movements, they are an easy target for predators. Alevins avoid light and live as much as 30 cm down in the gravel. However, as they grow stronger and their yolk sac grows smaller, they begin to move up to the surface of the gravel. They develop dark markings on their skin that help them hide on the streambed.

When the yolk sac is completely absorbed, or "buttoned up", alevins are about 2.5 cm long. In spring, when the water begins to warm and algae, insects and plankton grow in lakes and rivers, alevins emerge as fry to begin the next stage of their life.

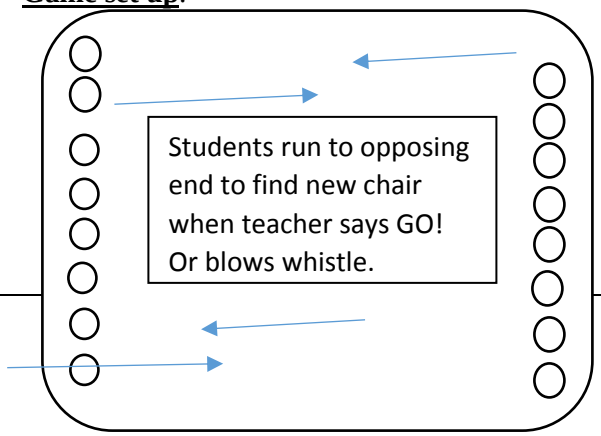
Procedure

1. Place chairs on two sides of the classroom or gymnasium in a straight line so that each side is even and each student has a chair. The middle of the playing area is the Atlantic Salmon's stream and the students are role playing as alevin and fry. (Note the diagram below)

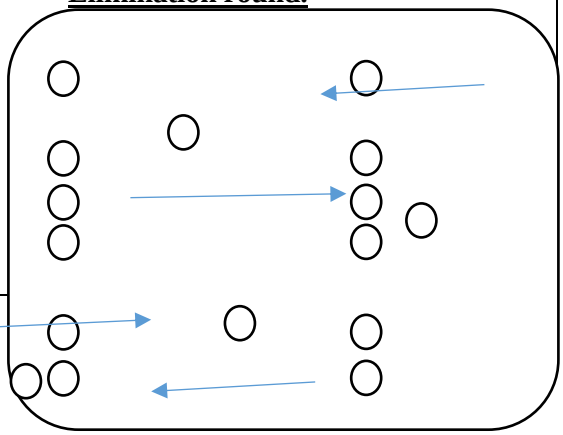
2. On the count of *1, 2, 3, go*! or blowing of the whistle, students will run from one side of the area to the other side finding a new chair. Students are beginning as alevin and at the beginning of the round become Atlantic Salmon fry that have to leave to find another chair while getting "food and nutrients" in the middle of the running area and then finding protection and safety in their new chair opposite their beginning spot. Complete this round a few times for students to master the concept of finding a new spot and running while avoiding crashing into their peers.
3. Once students have mastered running between both ends and finding their own chair, the elimination round will begin.

The teacher will remove chairs each round. Students that do not get a chair become an obstacle in the stream as a boulder or rock and have to remain stationary for the remaining rounds. The boulders and rocks are frozen in the spot and are not allowed to tag or hit their peers that are the surviving alevin and fry searching for food in the stream (middle of playing area) and protection and safety (on the chairs). Play continues until all players are eliminated or if there is a tie, you can determine a winner by a final showdown of best of 3 rock, paper, scissors.

Game set up.



Elimination round.



Middle of game play area is considered the middle of stream where fry get microscopic organisms to feed on while running from one end to the other end. All students are sitting in chairs (each student has their own chair).	Students sitting in chairs (chairs are removed each round). Students that do not have a chair are boulders or rocks in the middle of the streams acting as obstructions for remaining students still in game play.