Salmon and Their Habitat

A Stormwater Education Unit -
With Salmon Tank

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INTRODUCTION

Introduction

Summary

The lessons in this unit are designed to be used before, during and after salmon have been raised in the classroom with the Clear Creek Salmon in the Classroom Program or a similar program. **However**, these lessons may also be used to teach students about salmon if it is not possible to raise salmon in a tank in the classroom.

Through their investigations with these NGSS-aligned lessons, students develop an understanding of salmon life cycles; internal and external structures that function to support survival, growth, behavior, and reproduction; different inherited traits; and that the environment can also affect the traits that these fish develop. In addition, evidence is studied around how variations in characteristics among individuals in the same species may provide advantages in surviving. Students will consider ideas that when the environment changes, some salmon survive and reproduce, some move to new locations, some move into the transformed environment, and some die. Impacts of the uses of energy and fuels derived from natural resources on the environment are also addressed. When experiencing these lessons in conjunction with raising salmon in the classroom, students are provided in-class reference for the subject material whose focus is on the connection between salmon and their habitat. In addition, students generate a high level of interest in the investigations and develop a sense of place because they connect locally to environmental stewardship, community involvement, and interaction with salmon, an icon species in the Northwest and a policy-relevant topic.

Depending on whether you will be raising salmon or not, throughout the course of your salmon unit students may be working with and listening to guest speakers; working indoors and outdoors; working in groups; using scientific tools; gathering data; recording evidence accurately; using science, reading, writing and math skills; and sharing information with each other, the class and others in their school and at home. Share your expectations with them for the work ahead.

Standards

Next Generation Science Standards

3-LS1-1 From Molecules to Organisms: Structures and Processes

Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

3-LS3-1 Heredity: Inheritance and Variation of Traits

Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

3-LS3-2 Heredity: Inheritance and Variation of Traits

Use evidence to support the explanation that traits can be influenced by the environment.

3-LS4-2 Biological Evolution: Unity and Diversity

Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

3-LS4-3 Biological Evolution: Unity and Diversity

Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

4-LS1-1 From Molecules to Organisms: Structures and Processes

Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

4-LS1-2 From Molecules to Organisms: Structures and Processes

Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

4-ESS3-1 Earth and Human Activity

Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.

Common Core State Standard (CCSS) Connections

Refer to each NGSS Standard above for a complete list of connections to Common Core State Standards for ELA and math that support the work in the standard. For example, in this unit there are opportunities to utilize the mathematical skills found in "M.P.2: Reason abstractly and quantitatively." Additionally, opportunities are present to use the writing skills such as those found in "W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly."

How to Use this Curriculum

This curriculum is designed to be used while raising salmon in a tank in the classroom. However, if that is not possible, many of the lessons can still be used in the classroom. Each scenario is summarized in the following paragraphs. Please be sure to review the *Overview* and the *Suggested Timeline* for your situation.

The program begins with a formative assessment probe, allowing teachers to gauge student knowledge about what makes a healthy salmon stream. The units and lessons are designed to be sequential, building on student knowledge. Blackline Masters for copying are provided for each lesson.

Resources, including vocabulary, books, video links, and links to the locally developed *Salmon Field Guide, Kitsap Edition,* are provided in the Resources section.

Curriculum Overview – No Salmon Tank

Although this curriculum is designed to be used while raising salmon in a tank in the classroom, many of the lessons can still be used if you do not have a tank. The *Suggested Timeline, No Salmon Tank* provides an overall view of the curriculum.

Unit 1 provides an opportunity to assess what students know, introduces the phenomenon, and allows students to develop some investigative questions. Units 2 and 3 offer students an opportunity to learn all about salmon and their habitat needs. Students design their own salmon stream, sharing their designs through a gallery walk, then complete the virtual scavenger hunt to see some habitat features "in real life". In Unit 4, they revise their stream designs based on what they have learned about habitat. As a Summative Assessment, they develop a Wanted Poster summarizing what they have learned throughout all the units. Opportunities may be available to have some of these Wanted Posters displayed in kiosks near streams around Kitsap County.

Curriculum Overview – With a Salmon Tank

The *Suggested Timeline, With a Salmon Tank* includes lessons as well as various tasks associated with raising salmon, organized in chronological order. Any lessons or tasks associated with raising salmon are coded with RS; those associated with a field trip are coded RS-FT. These lessons and tasks are interspersed throughout the *Suggested Timeline* based on when they should be introduced or completed. The other units are the same for those raising salmon and those that are not raising salmon.

PLEASE NOTE: Students raising salmon should be given the Formative Assessment Probe, Lesson 1-1, before they even see the tank.

The first section of the *Suggested Timeline, With a Salmon Tank,* includes Getting Ready and Tank Monitoring lessons. Tank temperature and several other parameters need to be monitored regularly and by involving students, you will provide them with opportunities for independent work as well as incorporating math and graphing, if desired.

Unit 1 provides an opportunity to assess what students know, introduces the phenomenon, and allows students to develop some investigative questions. Units 2 and 3 offer students an opportunity to learn all about salmon and their habitat needs. Students design their own salmon stream, sharing their designs through a gallery walk, then either attend a field trip or complete the virtual scavenger hunt to see some habitat features "in real life". In Unit 4, they revise their stream designs based on what they have learned about habitat. As a Summative Assessment, they develop a Wanted Poster summarizing what they have learned throughout all the units. Opportunities may be available to have some of these Wanted Posters displayed in kiosks near streams around Kitsap County.

Kitsap County Public Works (KCPW) and the Clear Creek Task Force (CCTF) are partners along with several other community agencies in the Clear Creek Salmon in the Classroom Program. KCPW protects people, property, and the environment in many ways. They offer education programs that help us understand what happens to the water where we live. CCTF's mission is to create and maintain a community wide network to mobilize support, educate and focus actions to preserve, protect and restore the Clear Creek ecosystem. Share with students that representatives from these groups will be working with you to share and help you investigate real-life, local experiences with one of our valuable local resources, salmon. You will be working together to gain an understanding of salmon and the connections to their habitat.

Blackline Masters

The Blackline Masters referred to in the Materials sections are located at the end of the curriculum. Because some Blackline Masters are used in multiple lessons, they are listed in alphabetical order.

Suggested Timeline

Choose the *Suggested Timeline* that best fits your situation—whether you have a tank and are raising salmon or you do not have a tank and are not raising salmon. While all the lessons are not required to be taught, students will have the best learning experience if all the lessons are taught in sequence.

Vocabulary

See Teacher Resources at the end of this curriculum for a list of vocabulary words compiled from KCPW program goals and OSPI NGSS Vocabulary used in the Washington Comprehensive Assessment of Science (WCAS) in grade 5, in alignment with this unit.

SUGGESTION: write words on cards and tape them to where the word is found in the room or around the tank.

Getting Ready

- If raising salmon in a tank in your classroom:
    - Do not give students access to the salmon tank until after they have responded to the probe used in Lesson 1-1 so that no clues are given to guide their responses (ex. refrigeration = cold water is needed for salmon). This first response, based solely on prior experiences, will help guide your instruction in the following lessons.
    - Discuss with co-teacher(s) who is participating in raising salmon; who will be the lead; and how the lead will communicate program information to other teachers.
    - Register for the raising salmon program, if necessary, when information is received (for the Clear Creek Salmon in the Classroom Program, registration information is sent by October each year.)
    - Follow the Outline and Schedule and the steps in the Salmon in the Classroom Aquarium Maintenance Manual (or a similar one for your program) to clean, check and prepare your salmon tank.

- Coordinate with co-teachers to determine an estimated timeline for your salmon curriculum based on receiving eggs in January.
- If not raising salmon in your classroom, coordinate with co-teacher(s) to determine when this topic best fits your curriculum.

Acknowledgments

The lessons in this curriculum were developed or modified by Lori Reynolds, Instructional Design and Development, and Pat Kirschbaum, Kitsap County Public Works (KCPW). These lessons are designed to support Next Generation Science Standards (NGSS), Common Core State Standards (CCSS), and meet the goals of the Kitsap County Public Works Stormwater Program.

The Clear Creek Salmon in the Classroom Program was started by the Central Kitsap Kiwanis Club in 1988. It is now a partnership with the Clear Creek Task Force, Kitsap County Public Works, Suquamish Tribe, Silverdale Kiwanis Club, Kitsap Public Utility District, United Van Lines, Air Management Solutions, community volunteers, and over 30 local classrooms with the shared goal of enhancing the salmon population in Clear Creek and educating students on the importance of ecosystems. For more information on this program, visit *https://www.clearcreektrail.org/* and click on Salmon under the Stewardship tab.

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TIMELINE

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Suggested Timeline - with a Salmon Tank

Salmon and Their Habitat

Unit	Lesson/Task	Approximate Time Required	Schedule
Introduction	Standards and Overview	n/a	n/a
Unit RS: Raising Salmon - Getting Ready - Teacher Only	RS-1 Program Registration and Teacher Agreement	30 minutes	October
	RS-2 Aquarium prep: inventory, training, inspect, clean, operational check (Give Probe 1-1 BEFORE students see tank)	60 - 120 minutes (more if teacher workshop offered)	October
	RS-3 Aquarium Readiness to accept eggs (Give Probe, 1-1 BEFORE students see tank)	60-120 minutes	First day after Winter Break
	RS-4 Pick up salmon eggs (Give Probe 1-1 BEFORE students see tank)	60-120 minutes	First week in January
Unit 1: Setting the Stage for Investigation	1-1 - Formative Assessment Probe (Give this before students see tank)	45 minutes	Before students see the tank
	1-2 - Probe Review	30 minutes	
	1-3 - Phenomenon & Investigative Question	60 minutes	
Unit RS: Raising Salmon - Salmon Tank Monitoring - Students with adult supervision	RS-5 Tank Checklist	30 minutes	Weekly after tank set up
	RS-6 Monitoring Calendar COMING 2020-2021 SCHOOL YEAR	30 minutes	Weekly after tank set up
	RS-7 When Will They Hatch	30-60 minutes	Day eggs are received
Unit RS Field Trip (RS-FT): Prep	RS-FT-1 Submit Field Trip Request- Teacher Only	30 minutes	late January
Unit 2: Getting to Know Salmon	2-1 - Life Cycles	Multi-day. See lesson	Jan to Mar
	2-2 - Structure, Function, Information Processing	60-90 minutes	
	2-3 - Salmon Traits	120 minutes	
Unit 3: Habitat	3-1 - You Ain't Nothing but a Hound Dog	45-60 minutes	
	3-2 - Modified Hooks and Ladders COMING 2020-2021 SCHOOL YEAR	Setup: 15-30 minutes Game: 30-45 minutes Discussion: 30 minutes	
Unit RS-FT: Engineering Activity	RS-FT-2 - Engineering Activity - Salmon Release Tool (Optional for field trip)	Several days concurrent with other lessons	Begin in February
	3-3 - Performance Task: Saving Our Salmon: Clean Water	Part 1: 60-90 minutes Part 2: 70 minutes	

Suggested Timeline - with a Salmon Tank

Salmon and Their Habitat

Unit	Lesson/Task	Approximate Time Required	Schedule
	3-4 - Salmon Stream Design	150 minutes over multiple days	Jan to Mar
	3-5 Virtual Scavenger Hunt (in addition to or in lieu of a field trip)	60 minutes	
Unit RS-FT: Field Trip	RS-FT-3 Salmon Release Field Trip	3 hours. Need transportation	March
Unit RS Tank Clean Up	RS-8 Tank Cleanup and Storage	1-2 hours	After field trip
Unit 4: Summative Assessment	4-1 - Revisit and Revise: Salmon Stream Design	30-60 minutes	March to May or post Field Trip
	4-2 - Wanted Poster	Multi-day. See lesson	
	4-3 - Revisiting the Probe	30 minutes	
Resources	Field Trip Opportunities and Websites		
	Good Fit Books		
	Performance Task - Save Our Salmon-Water Flow		
	Salmon Field Guide: Kitsap Edition, links		
	Salmon in the Classroom Aquarium Maintenance Manual (for those raising salmon)		
	Videos		
	Vocabulary		
Blackline Masters	Clear Creek Salmon in the Classroom Aquarium Use Agreement		
	Helpful Hints to Remember our Pacific Salmon!		
	Pacific Salmon Species Chart		
	Pacific Salmon Species Fact Sheet		
	Phenomenon – Salmon and Their Habitat		
	Phenomenon – Salmon Release Site Photo		
	Probe: What Makes a Good Salmon Stream		
	Puppies and Their Parents		
	Salmon Body Parts		
	Salmon Head and Tail		
	Salmon ID Poster 11 x 17		
	Salmon Release Tool Challenge		
	Salmon Stream Design Gallery Walk Feedback		
	Salmon Tank Checklist Monitoring Weekly Summary		
	Salmon Trait Data Collection Sheet		
	Salmonid Life Cycle Diagram		
	Scaffold – Environmental Effects on Inherited Traits		

Suggested Timeline - with a Salmon Tank

Salmon and Their Habitat

Unit	Lesson/Task	Approximate Time Required	Schedule
	Tank Checklist		
	Task: Saving Our Salmon: Clean Water		
	Thermal Unit Chart		
	Virtual Scavenger Hunt		
	Wanted Poster Guide		
	When Will They Hatch Calendar		
	When Will They Hatch Worksheet		
	You Ain't Nothing But a Hound Dog		
Feedback	Please use the link on the website to provide feedback on lessons.		

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LESSON PLANS

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Table of Contents - Lesson Plans with a Tank

3-5	Virtual Scavenger Hunt
RS-FT-3	Salmon Release Trip
RS-8	Tank Cleanup and Storage
4-1	Revisit and Revise: Salmon Stream Design
4-2	Wanted Poster
4-3	Revisiting the Probe

RS-1 Program Registration and Aquarium Use Agreement

Method
Teacher Only

Time Required
30 minutes

Objective
- For the Clear Creek Salmon in the Classroom Program, complete necessary steps to participate in the program.

Materials
- Program Registration Information email
- Aquarium Use Agreement

Procedures
To participate in the Clear Creek Salmon in the Classroom Program:

1. Review the Program registration information sent by email in late September/early October.
2. Consult with co-teachers to confirm participation in the Program.
3. Respond to the email to register for the Program and provide all required information.
4. Sign and submit (by mail or email) the Aquarium Use Agreement sent with the email.
5. If you are new to the program and have not received the program registration email, contact Kitsap1, *help@kitsap1.com*, 360-337-5777.

If you participate in another program to raise salmon in your classroom, follow the registration procedure for that program.

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RS-2 Aquarium Prep

Method
Teacher only

Time Required
60 – 120 minutes (more if a teacher workshop is offered)

Objective
- Ensure the salmon aquarium is in working order.
- Request service, if needed.
- Attend trainings when scheduled to learn more about raising salmon and additional curriculum or support available.

Materials
- Aquarium Maintenance Manual found in the Resources section
- Equipment and Supplies listed in the Aquarium Maintenance Manual

Procedures
1. Follow the steps in the Aquarium Maintenance Manual, pages 2 – 4, to take inventory, inspect and set up your aquarium, and complete an operational check.
2. Follow procedures to request service, if needed, as indicated in the Operational Check section of the Aquarium Maintenance Manual.
3. Attend trainings when offered.

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RS-3 Aquarium Readiness to Accept Eggs

Method
Teacher only

Time Required
60-120 minutes

Objective
Ensure the salmon aquarium is ready to accept salmon eggs

Materials
- Aquarium Maintenance Manual found in the Resources section
- All equipment and supplies listed in the Salmon Aquarium Maintenance Manual

Background Information
The aquarium must be **at temperature** and ready to accept eggs in early January, usually the first week back from Winter Break. Be sure to **have the tank full and operating at least 2 days before eggs arrive** to ensure proper temperature.

Procedures
1. Follow the steps in the Aquarium Readiness section of the Aquarium Maintenance Manual to ensure the aquarium is ready for salmon eggs when they are delivered.

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RS-4 Pick Up Salmon Eggs

Method
Teacher Only

Time Required
60-120 minutes

Objective
- Transfer salmon eggs from Grovers Creek Hatchery to classroom tank within 1 hour.

Materials
- Aquarium Maintenance Manual found in the Resources section
- Depending on the school, a teacher or parent volunteer may need to drive to the hatchery or another location to pick up salmon eggs.
- All materials for transporting salmon eggs will be provided—cups and covers, damp paper towels, eggs. You may want to have a small box or cup holder to hold the cup.

Background Information
Salmon eggs for the Clear Creek Salmon in the Classroom Program, and many other Salmon in the Classroom Programs in Kitsap County, are donated by the Suquamish Tribe's Grovers Creek Fish Hatchery in Indianola. Each tank receives approximately 100 salmon eggs along with fish food to feed the salmon once they are free-swimming. Pickup dates are usually in early January. Eggs are to be picked up by the teacher or a parent volunteer at the hatchery unless other arrangements have been made. Eggs need to be transferred to the classroom aquarium within one hour of leaving the hatchery water.

Central Kitsap School District teachers **MAY** have the option of picking up their eggs at the CKSD Science Kit Center at the Operations and Maintenance Service Center or at the TLC.

Procedures
1. Determine who will pick up salmon eggs. Provide them the hatchery address: Grovers Creek Fish Hatchery, 23175 Indianola Road, NE, Poulsbo, WA.
2. Contact the school office staff to ensure whoever is delivering the salmon eggs has access to the classroom and tank as soon as they arrive at the school.
3. Follow the procedures in the Egg Pickup and Placement section of the Aquarium Maintenance Manual.
4. Determine how students will know the eggs are coming and if you will have a special welcoming ceremony or celebration.

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1-1 Formative Assessment Probe

Method

Teacher led in class
If raising salmon, complete before students see the salmon tank

Time Required

Approximately 45 minutes

Objective

- Define and explain the parameters of a good salmon stream based on evidence and reasoning from prior knowledge

Materials

Provided by classroom teacher

- Copies from provided blackline masters of:
  - Probe, What Makes a Good Salmon Stream?, 1 per student

Procedures

- Administer the probe, What Makes a Good Salmon Stream? Read the probe to students as they follow along before they respond independently.
- Collect the probes, review them, and save them for Lesson 1-2.

*NOTE: The KCPW Educator will want copies of these probes at the **end** of your salmon unit. Please copy and mail or scan and email copies of the **post** assessment to Stormwater Educator, Kitsap County Public Works, 614 Division Street, MS-26A, Port Orchard, WA 98366 or* help@kitsap1.com.

If students are not sure what a word in a response means and don't know if they should mark it as part of their claim about what makes a good salmon stream, have them mark that choice with a question mark and circle the word in question. This will give you additional valuable formative information about which words and concepts will need particular focus as you move forward with instruction. What connections are students making between salmon needs and their stream habitat in their responses? Assure students that they will work with and "own" these concepts and words as you work through the investigations together.

The correct responses:

- *shade* - keeps water cool
- *deep pools and ponds* – places for salmon to hide and rest

- *loose gravel* (about 1" diameter) – provides a place for salmon to spawn
- *beaver dams* – slows water and creates good rearing habitat for juvenile salmon
- *cold water* – necessary for salmon survival
- *places to hide* – protection from predators
- *clean water* – many salmon can't survive in polluted water
- *clear water* – silty water can clog gills
- *meandering stream* – helps slow the flow of water and moves nutrients through the stream system
- *rocks* – can slow water, create pools to hide and rest and gravel is needed for spawning
- *consistent water* – water levels are consistent throughout the year
- *riffles* – movement of water over rocks adds oxygen to the water
- *air (oxygen)* – salmon filter oxygen from the water through their gills
- *free-flowing rivers* – man-made dams can block salmon's migration
- *fallen trees* – provide places to hide, resting areas and trap gravel for spawning
- *boulders* – provide hiding places and stabilize banks, preventing erosion.
- *wood & vegetation along streambank* – provide cover, temperature regulation, and food for invertebrates
- *food* – juvenile salmon need food while living in the stream

Items on the probe that DO NOT make a good salmon stream

- *culverts* – pipes, open on both sides. Direct streams or drainages under roads and driveways. Culverts force the stream flow into a small area (the pipe), increasing the flow. The increased flow makes it hard for salmon to swim through the culvert. The focused flow can also create a hole and eventually a waterfall on the downstream side of the culvert, making it difficult for salmon to swim upstream.
- *Human-made dams* – Usually built for irrigation or power generation, they can block juvenile and adult salmon migration and cover spawning habitat. Some have fish ladders, but even these are sometimes challenging for salmon.
- *Excess mud, sand, and/or silt from erosion* – while some natural erosion in streams is good because it moves nutrients through the system, excess erosion from human activity creates silt—small particles of dirt that can settle between rocks, making it difficult for salmon to dig their redd. This silt can also settle on the redd itself, suffocating the eggs that have been laid, or can clog gills.

There will be opportunities for future reference and use, including summative assessment, in later lessons, so be sure to retain your students' probes.

1-2 Formative Assessment Probe Review

Method
Teacher Led

Time Required
30 minutes

Objective
- Discuss probe responses

Materials
Provided by the classroom teacher

- Be sure students have their completed copy of the Probe from Lesson 1-1, What Makes a Good Salmon Stream?
- Poster paper

Procedures
- On a piece of poster paper, with students referencing their responses to the probe from Lesson 1-1, call on students and capture student ideas about which elements they think make a good salmon stream and any questions they have.
- Collect and save the probes and poster for future reference.

NOTE: From here on in this unit, this probe can be revisited multiple times as students' conceptual understanding evolves. This revisiting can give you and your students valuable information about their conceptual development—do students understand the connections between salmon and their habitat? Are they including information they have learned throughout their investigations? This probe will be revisited in Lesson 4-3 and can be used as a summative assessment of student understanding.

For productive discourse here and in following discussions, give time to think and then ask questions such as: Can you give an example?, Who can repeat what was just said or put it in their own words?, Why do you think that?, What's your evidence?, Does anyone want to respond to that idea?

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1-3 Phenomenon and Investigative Question

Method
Teacher Led and Student Discussion

Time Required
30 minutes

Objective
- Make predictions about the impact of a salmon's habitat on its survival
- Develop an investigative question

Materials
The phenomenon can be introduced as a photo or video, whichever works best for your students.

Provided by the classroom teacher

- Copies from provided blackline masters of:
    - Phenomenon for Salmon and Their Habitat (the image of salmon spawning) 1 per student or team, or projected to whole class

      OR
- You Tube video of Chinook salmon spawning, https://www.youtube.com/watch?time_continue=434&v=vBME9YT3N2M&feature=emb_logo or Google search the text Chinook Salmon Spawning Act3 2016. The female begins digging the redd at about minute 5:40 with actual spawning happening about minutes 6:40 – 8:26. The video provides an opportunity for students to gather auditory as well as visual evidence to develop their sense making.

Procedures
- Show students the image of salmon spawning or the video segment.
- Explain to them that this is an image of two adult Chinook salmon spawning. The female releases eggs into the gravel in a river bottom and the male fertilizes those eggs with what's called milt. Their gaping mouths indicate spawning; milt from the male can be seen as a cloud in the water. In the video, you can watch as the female digs the redd; the male crosses over to indicate he is ready; the gaping mouths and releasing milt can be seen and, as the female uses her tail to cover the eggs with gravel, some are kicked up from the gravel and can be seen floating in the water behind her tail. These eggs may settle back into the gravel and get covered with

subsequent movements by the female, or they may lay in the gravel to become food for other aquatic life.

- Ask students to think back to their response to the probe, any tank observations they may have made, and images in this photo or video and share what things in a salmon's habitat they think a salmon would interact with that could impact their survival for good or bad.
- Explain that before digging into investigations to help us understand connections between salmon and their habitat, we need to develop an investigative question. Salmon need certain things in their habitat in order for them to survive. Brainstorm questions with students. Some examples include,
    - What are the connections between salmon and their habitat?
    - What do salmon need to survive?
    - When _____ happens to a salmon's habitat, what is the impact on the salmon? (Let your students fill in what they think could have an impact.)
    - What makes a good salmon stream?
- Capture your class' question by either posting it in the classroom or, if your students use science notebooks, have them record it in there. As you work through the lessons in this unit, refer back to this question and talk with students about what they're thinking.

RS-5 Tank Checklist

Method

Student groups with adult supervision (teacher or parent volunteer)

NOTE: If students are not actively participating in all tank monitoring, all the steps in this lesson must still be completed by the teacher or a parent volunteer to ensure salmon survival.

Time Required

20-30 minutes for Checklist monitoring; longer when changing tank water

Objective

- Engage students to ensure tank is operating properly (can also be used by teacher)
- Collect and use data as evidence of proper tank operation or potential issues
- Monitor feeding of salmon fry

Materials

- Salmon in the Classroom Tank Checklist (Form 7079) laminated and posted on your tank (this may already be on your tank)
- Salmon Tank Checklist Weekly Monitoring Summary (optional), 1 copy at the tank weekly
- Salmon Tank with all supplies
- Dry erase marker
- Aquarium Maintenance Manual available in the Resources section
- Ruler (Optional. Be sure nothing on the ruler could contaminate the tank water)
- For feeding salmon:
    - Salmon food
    - 1/8 tsp measuring spoon
    - small container
    - popsicle stick
    - 1-minute timer
- For changing tank water:
    - one (1) 5-gallon bucket with water sitting for 24 hours in a cool place
    - one (1) 5-gallon bucket empty
    - siphon tube or small container

Background Information

Proper aquarium function is critical to the survival of salmon that are raised in the classroom. Students can participate in monitoring the function of the aquarium to ensure the tank is functioning properly and the salmon are being taken care of. Regular monitoring helps to identify any problems quickly so they can be addressed and resolved before there are any major impacts to salmon. If students will not be involved in this, the steps in this lesson must be completed by a teacher or a parent volunteer to ensure salmon survival.

Getting Ready

- Attach the Tank Checklist to the tank and find a place near the tank for the dry erase marker or attach it to the tank as well.
- If using the Weekly Monitoring Summary, find a location for that near the tank.
- Identify a cool, protected area to store the bucket of water while it off-gases for 24 hours

***NOTE**: It may be easier to show students the parts of the aquarium before winter break when it will be empty, then show them again just before or just after the eggs have arrived. Be sure to administer the Probe from Lesson 1-1 before students see the tank.*

Procedures

- Assign 1-2 students to complete the Tank Checklist each day. One option is to add this job to your classroom Weekly Jobs rotation.
- The Tank Number should already be filled out for your tank.
- Project the Tank Checklist so it can be seen by all students.
- Complete all the steps on the checklist with the class and explain to students how they will evaluate each item when it is their turn to monitor. You may want to only introduce a few of these at a time while you or a parent volunteer complete the others. Once students are comfortable monitoring the items you've introduced, you can add additional items.
- Date: students should enter the current date each time they monitor, erasing the old one when needed.
- Water is at least one inch above the top of the cooling tube.
    - Explain to students they will be learning that salmon need cold water to survive. This cooling tube keeps the water in the tank at the proper temperature. For the cooling tube to function properly, the water level needs to be at least 1" above the tube.
    - Show students where the cooling tube is in the tank.
    - Provide a way for students to estimate that the water is at least 1" above the cooling tube (ruler, mark on tank, etc.). Make sure nothing that goes into the water is contaminated with anything.

  - Determine what students should do if the water level is below the mark.
  - Show students where to check this off on the Tank Checklist.
- The temperature is between 45˚F and 48˚F (7˚C and 9˚C)
  - Remind students they will be learning that salmon need cold water to survive. Monitoring the water temperature in the tank to ensure it is between this temperature range will help ensure the salmon have the right habitat to survive.
  - Show students where the thermometer is located on the tank.
  - Note the scale of your class's thermometer—F or C.
  - Explain to students how to read the thermometer on your tank.
  - Determine what students should do if the temperature is not within this range.
  - Show students where to check this off on the Tank Checklist.

  NOTE: The temperature can then be recorded on the Monitoring Calendar if using. (see Lesson RS-6)
- There is not excessive icing on the cooling tube
  - When too much ice forms on the cooling tube, it can interfere with the function of the tube. Checking the tube regularly allows you to identify potential problems before they become deadly to your salmon.
  - Show students where the cooling tube is located.
  - Discuss what excessive icing may look like—see your Aquarium Maintenance Manual, P. 12, Issue: Ice forming on cooling tube, for a photo.
  - Determine what students should do if there is excessive icing on the tube.
  - Show students where to check this off on the Tank Checklist.
- The airstone is bubbling
  - Explain to students they will be learning that salmon need oxygen to survive, just like people. However, salmon do not get their oxygen from air; they filter oxygen that's dissolved in the water. The bubbles from the airstone help to move water around in the tank and add dissolved oxygen to the water. The bubbles also help to keep ice from forming on the cooling tube.
  - Show students where the airstone is located.
  - Show them where the bubbles are coming out of the airstone.
  - Explain that the airstone should bubble continuously across the entire length.
  - Determine what students should do if there are not enough bubbles coming out of the airstone.
  - Show students where to check this off on the Tank Checklist.
- The cooling compressor is cycling on and off throughout the day
  - Whenever possible throughout the day, when you hear the cooling compressor come on, point that out to students so they know what it sounds like. When it turns off, point that out as well.
  - The compressor may not turn on/off while the students are completing this check, so it may be something to monitor throughout the day.

  - Determine what students should do if they think the compressor has not been turning on/off during the day.
  - Show students where to check this off on the Tank Checklist.
- When fry begin swimming, if students are feeding the fish:
  - Show them how to measure the food and feed the fish. (See P. 8 in your Aquarium Maintenance Manual). Alternatively, the teacher could do the measuring and feed the fish while students observe for 1 minute.
  - As the food is sprinkled into the tank, have students start a 1-minute timer and observe how much food settles to the bottom of the tank. If it is a lot, feed less. If no food settles to the bottom, consider feeding a little more next time, but be sure to monitor so you are not overfeeding.
  - Show students where to enter the time of each feeding during the day on the Tank Checklist. If the fish are not being fed yet, have the students put "n/a" on each line so they are in the habit of marking that section.

  NOTE: overfeeding can lead to water quality issues that could cause fish to die.

- Water is changed daily to every three days
  - Explain to students that these tanks do not have filters, so it is important to change the water regularly to remove egg casings and any toxins from excess food or fish waste. In a healthy stream, the natural water flow does this.
  - Have students check the date of the last water change. Determine at what point you want to be reminded that water needs to be changed—daily; every 2 days; or every 3 days.
  - If the water is being changed, erase the previous date and enter the current date. If the water is not being changed, leave the date from the last change.
  - Share with students that a lot of our tap water has chlorine, which can be toxic to fish. However, chlorine will evaporate from water, so you need to always have a 5-gallon bucket of water "off-gassing" in a cool, protected area.
  - You can demonstrate for students how water will be changed, even if you or a parent will be the ones doing it. See your Aquarium Maintenance Manual, P. 7 for instructions. Students can help before or after school when possible.

  ***NOTE**: If students are monitoring pH and using the Monitoring Calendar in Lesson RS-6, have them measure the pH after changing the water.*

  - Be sure to monitor the water temperature and pH after changing the water. If it is too warm, see the Troubleshooting Section of the Aquarium Maintenance Manual beginning on Page 12.

- Optional: You can use the Salmon Tank Checklist Weekly Monitoring Sheet to keep track of your daily monitoring data each week to compare over time. You can also graph results with your students.

Example Salmon Tank Checklist Monitoring Summary (half sheet masters are available in the blackline masters)

Salmon Tank Checklist Monitoring						
Item	**Date and Result**					
Water 1" above tube (Yes/no)						
Water Temperature (actual temp)						
Excessive icing on cooling tube (yes/no)						
Airstone bubbling (yes/no)						
Compressor cycling on and off (yes/no)						
Feeding (times or amount/day)						
Water Changed (yes/no)						

NOTE: Your classroom salmon tank is a system. You can use this as an example when teaching this concept to your students. What happens if the airstone stops working (the cooling tube ices); if the compressor stops working (the temperature gets too high), etc.

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RS-7 When Will They Hatch

Method

Teacher led; group work

Time Required

30-60 minutes

Objective

- Calculate daily Thermal Units (TUs) accumulated by eggs
- Predict approximately when salmon eggs will hatch to alevin based on TUs accumulated daily

Materials

- Copies from provided blackline masters of either:
  - When Will They Hatch Worksheet, 1 per student
  - When Will They Hatch Calendar (optional), 1 per student
- Thermal Unit Chart, projected for class to see
- Thermometer
- Calendar
- Calculator

Background Information

Salmon and trout eggs develop at a rate that is partially determined by water temperature. Water at temperatures preferred by salmon may feel cold to us, but it still contributes thermal energy (energy generated and measured by heat) to the developing embryo. This energy is measured in Thermal Units (TUs). When the embryo has accumulated enough thermal units, it hatches. The number of thermal units it needs depends on the average water temperature. Eggs in very cold water will take considerably longer to develop because there is less heat energy available and because they must accumulate more heat energy (thermal units) overall to hatch. Note that the temperature range is limited. Optimal temperatures are about 40-55 degrees F. Eggs will survive temperatures close to freezing but develop very slowly. If the water is too warm, the eggs die.

1 Thermal Unit (TU) = 1˚F above freezing (32˚) for 24 hours

Example: At 52˚F 20 TUs will be accumulated in one day; 100 TUs over 5 days:

52˚ – 32˚ = 20 TUs
20 TUs will accumulate each day (24 hours)
Over a 5-day period, 5 x 20 = 100 TUs will accumulate.

NOTE: Temperature data from the hatchery is measured in degrees Fahrenheit. If the thermometer in your tank measures temperature in degrees Celsius, you'll need to convert to degrees Fahrenheit before performing any calculations.

The following data is needed to predict the approximate hatch date. See the blackline master When Will They Hatch worksheet.

- the total TU required for hatching (provided in the table below)
- the average hatchery water temperature (provided after egg pickup)
- the date the eggs were fertilized (provided after egg pickup)
- the date they arrived in your classroom (provided by you and your students)
- the total days spent at the hatchery (calculated by you and your students)
- The total TU accumulated per day at the hatchery (calculated by you and your students)
- The total amount of TU accumulated at the hatchery (calculated by you and your students)
- TUs still needed (calculated by you and your students)
- the average water temperature in your classroom tank (provided by you and your students)
- The number of TUs per day that will accumulate in your classroom tank (calculated by you and your students)
- Number of days until hatching (calculated by you and your students)

Thermal Unit (TU) Chart TUs needed by chum salmon from Grovers Creek Hatchery	
Stage	**Thermal Units (TUs) Needed**
Eye Up (stage when picked up)	750
Hatch	950 – 1100
Emergence (Swimming)	1600

Procedures

1. Ask students what factors might influence when the eggs will hatch. They will probably think of temperature. Students may be aware that birds sit on their eggs to make them hatch. Body heat is a form of energy and energy is needed for growth. Discuss how fish also get energy from their immediate surroundings - the water. Challenge students to think of how they could predict when their fish eggs will hatch.
2. Students will probably offer comments like "When they get warm enough (get enough heat) they will hatch". Discuss the temperature of your aquarium. You have probably been monitoring this daily during the week prior to getting the eggs. How could water temperature affect egg hatching?
3. Explain to students that salmon eggs need energy—heat or thermal energy—to develop and hatch. The more heat they get, the faster they develop. This heat is measured in Thermal Units or TUs. Show students the Thermal Unit Chart and distribute the When Will They Hatch worksheet. Work as a class or in small groups to determine what information is needed to predict exactly when hatching will occur.
4. Students should write down the information and the steps they will take to get their predictions. Help them do this by writing all the relevant information for the whole class to see - the date fish were spawned, the average water temperature at the hatchery, the average water temperature in your aquarium and the number of TU's required for hatching.
5. Ensure you have collected all the data needed for your calculations.
6. Complete the When Will They Hatch worksheet or have students devise their own way of presenting the information.
7. Each day record the water temperature. If it changes at all during the day, take two readings and find the average temperature. Make a chart to show the number of TU's that accumulate each day or use the When Will They Hatch Calendar provided.
8. After hatching, compare predictions to what actually happened. If the fish did not hatch on the predicted day, discuss what factors might have been involved—temperature variations throughout the day, using average temperature, miscalculations, etc.

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RS-FT-1 Submit Field Trip Request Form

Method
Teacher Only

Time Required
10 minutes plus coordination time with teaching partners

Objective
- For the Clear Creek Salmon in the Classroom Program, gather information from participating teachers to best schedule all classes for a field trip.

Materials
- Field Trip email sent to lead teacher

Background Information
Each year, 15-20 two-hour field trips are made available to teachers participating in the Salmon in the Classroom program at Clear Creek. Every attempt is made to provide your class with one of your preferred choices. However, the goal is to provide a field trip experience for all interested classes, so teachers may be contacted to see if alternate dates and times would work.

Procedures
- Review the Clear Creek Salmon in the Classroom Program field trip emails sent to the lead teacher in January.
- Coordinate with teaching partners to determine the 3 best dates/times for your school's field trip
- Submit the on-line field trip request form by the date indicated in the email
- Communicate field trip information to teaching partners

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2-1 Life Cycles

Method
Teacher led in class; individual or group work

Time Required
Approximately 45 minutes for reading and instruction; up to several days for illustrations and coloring

Objective
- Combine information from multiple sources to complete a salmon life cycle

Materials
Provided by the classroom teacher

- Copies from provided blackline masters of:
  - Pacific Salmon Species Fact Sheets (5 total), available for student reference*
  - Salmon Head and Tail for folding salmon life cycle display, 1 per student:
    - copy of salmon head
    - copy of salmon tail
  - Salmon ID Poster 11 x 17, available for student reference
  - Salmonid Life Cycle Diagram, 1 per student or team, or projected to whole class
- 18" x 6" piece of white construction paper, 1 per student
- Salmon Field Guide, Kitsap Edition available for student reference:
  - One copy is provided with salmon tank.
  - An online version is available, *https://extension.wsu.edu/kitsap/water-stewardship/kitsap-salmon-tours/*
  - A class set can be checked out by contacting Kitsap County Public Works, help@kitsap1.com *or 360-337-5777*
- Good Fit books available for student reference. Suggestions available in the Resources section.
- Scissors
- Glue
- Colored pencils, markers, or crayons

**Images included with permission from Students for Salmon, Nooksack Salmon Enhancement Association, 2016*

Background Information

There are five Pacific salmon species. They belong to the genus Oncorhynchus (pronounced äŋkōˈriŋkəs) and are part of a larger Salmonidae family that include other salmon and trout species. We will focus on the five Pacific salmon species: Chinook, chum, coho, pink and sockeye.

NOTE: Chinook is the only salmon name capitalized. It is a proper noun because the name came from the indigenous Chinook Tribe of the Columbia River (Washington and Oregon).

The salmon life cycle is similar for all salmonids, but the length of time spent in freshwater and saltwater does vary for each species. Salmon are anadromous. This means that they are born in freshwater, spend most of their life in the ocean, and return to freshwater to spawn.

Salmon return from the ocean and enter the stream in the summer or fall to spawn. When they are spawning, females lay their eggs in the streambed and the male fertilizes the eggs with milt (sperm). The eggs are laid in a gravel nest called a redd (from Old English "to make ready"). The redd hides them from predators and direct sunlight. A female deposits a total of about 3,000 eggs in the gravel. Males compete and fight against each other to be the one to fertilize the eggs, which must happen within milliseconds of the eggs hitting the water before the shells harden. The female then covers the eggs with gravel and moves to lay additional eggs. This process may take 1-2 days for all eggs to be laid and fertilized.

After spawning is complete, the male and female will guard their redd until they die. The eggs remain hidden in the streambed for about two to four months before they "hatch" into alevins. Alevins get their nutrients from the yolk sacs that are attached to their bodies. They grow rapidly in the gravel for one to three months. It is important during the egg and alevin stages of the salmonids' life cycle to have clean, clear, cold, flowing water and clean gravel. This gravel is small—about 1" in diameter—so salmon can move it with their tails. If there is too much suspended sediment in the stream, the eggs and alevins will suffocate. If the water flow is too heavy, they could become dislodged from the redd and die.

When the alevins have absorbed their yolk sacs, they surface from the gravel in spring and early summer as fry. They nourish themselves by feeding on plankton and small insects (macroinvertebrates) in the stream. During this stage of life, it is important for the fry to have adequate streamside cover for protection from predators and to keep water temperatures cool. Large boulders in the stream and alongside the banks can provide cover as can trees, bushes and shrubs along the bank. These features also help to stabilize stream banks and prevent erosion. Fry also need oxygen, which they filter from the water. As the water runs over rocks of varying sizes, riffles are created which add oxygen to the water. Different species spend differing amounts of time in freshwater streams. Chum salmon, the

most abundant species found in Kitsap County streams and most likely the species you are raising in your classroom, migrate to the ocean very soon after emerging from the gravel. Pink salmon also migrate to the ocean immediately after emerging from the gravel, although only a few pink salmon are found in Kitsap streams. Coho salmon, also found in Kitsap streams and possibly the species you are raising, remain in the stream for one to two years before migrating to the ocean. Sockeye salmon usually spend one to three years in lakes before migrating via tributaries to the ocean but are seen only occasionally in Kitsap streams. Chinook are in the stream for three to eighteen months as juveniles before migrating towards the ocean. Although many Chinook salmon use Kitsap's nearshore to forage, those found in Kitsap streams are most likely from fish hatcheries at Gorst, Grovers, and Dogfish Creeks.

The juvenile salmon, after spending time in fresh water, head downstream and undergo changes that allow them to live in saltwater—they lose their parr marks, become more silvery looking, and their kidneys change so they can excrete salt. The young salmon, called smolts, acclimate to the saltwater by staying in the estuary for one to three months. They feed on zooplankton, insects, shrimp and small fish in the estuary. Once they have adjusted from fresh water to saltwater, the smolts move into the open ocean. Ocean life for salmonids lasts one to seven years, depending on the species, and they can travel hundreds or even thousands of miles. During this stage, the sea-run adults grow large and feed on zooplankton, insects, and small fish such as herring.

When they are fully mature (2-5 years depending on species), Pacific salmon migrate from the ocean back to the stream where they were born using the Earth's magnetic field and their sense of smell. A salmon's sense of smell is thousands of times better than a dog's sense of smell! When they have returned to the freshwater streams they are called spawning adults. Their colors change to attract a mate and many times to better match the stream. Males develop hooked noses, or kypes, which help them fight other males to spawn. They swim upstream to reproduce, and the cycle begins again. Salmon usually spawn within 100 yards of the redd that they hatched from.

When the salmon have spawned, they die. Their bodies decompose and give nutrients to animals and plants along the stream. The nutrients they leave behind, many of which are only found in the ocean, are very important to the health of the riparian zone. Research completed by Washington Departments of Fish and Wildlife and Natural Resources in 2000 found that more than 137 species depend on salmon in some way for their survival.

Videos

During this lesson, there are several videos you can share with your students.

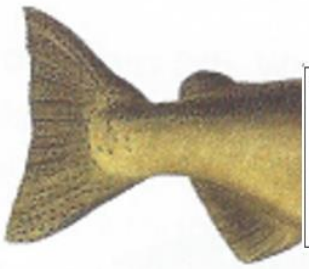
- This 30 second video from US Fish and Wildlife Service, taken at the Quilcene, WA, Fish Hatchery, shows salmon eggs hatching to alevin. *https://www.youtube.com/watch?v=dnX4ZKvYTHs*.
- These short videos from the Deep Look Series by KQED and PBS take a VERY close look at several things in nature that relate to salmon and streams. Additional videos are listed in the Resources section:
    - *There's Something Very Fishy About These Trees, 5 minutes,* *https://www.youtube.com/watch?v=rZWiWh5acbE&feature=youtu.be* Take a close look at how salmon impact the vegetation all around streams.
    - *Sticky. Stretchy. Waterproof. The Amazing Underwater Tape of the Caddisfly, 4 minutes,* https://www.youtube.com/watch?v=Z3BHrzDHoYo&list=PLdKlciEDdCQDxBs0SZgTMqhszst1jqZhp&index=82&t=0s. Take a REALLY close look at how these stream critters (macroinvertebrates) that salmon may eat build their homes.
    - *A Baby Dragonfly's Mouth Will Give You Nightmares, 4 minutes,* https://www.youtube.com/watch?v=EHo_9wnnUTE. Learn about the unique parts of a dragonfly nymph's mouth and watch it in action. (Another stream critter (macroinvertebrate) salmon may eat!)

Procedures

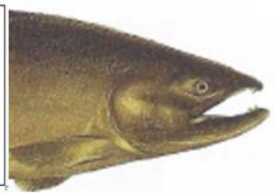
- Cut enough pieces of 18" x 24" white construction paper to make one 18" x 6" piece for each of your students.
- Project the Salmon Life Cycle Diagram so all students can see. Using the information about salmon life cycles in the background information above, demonstrate the salmon life cycle. Have your students take notes.
- If raising salmon, point out the name of the type of salmon you will be raising.
- For an additional, engaging way (especially for the musical learners in your room) to learn about the salmon life cycle you could also share the video of the salmon life cycle in this link, sung to the song "I Will Survive", *https://www.youtube.com/watch?v=qV30UZ9aF04* .
- Pass out one 18" x 6" piece of white construction paper to each student.
- Instruct students to fold the paper into six equal parts, accordion style, about 3" wide. See image below.
- Starting with the egg stage, have students label each life cycle stage on the bottom (egg, alevin, fry, smolt, sea-run adult, spawning adult/death). Be sure to leave plenty

of room above for illustrating. Next, starting again with the egg stage, have students list the habitat for each stage at the top of each section (egg, alevin, fry- freshwater stream, smolt-estuary, sea-run adult-Pacific Ocean, spawning adult/death-freshwater stream). Again, be sure to leave plenty of room for illustrating below. Students are then ready to illustrate each stage of the salmon life cycle. Leave extra room on the first and last rectangle for gluing on the head and tail.

- Have students use the references listed in the Materials section to guide them. Having books on hand from the Good Fit Books suggested in the Resources section or projecting the Salmon ID Poster 11 x 17 will also give students pictures to reference to help them with the accuracy of their illustrations. If you are raising salmon, first-hand observations can also be made of the salmon in their tank for one of the stages!
- Next, distribute copies of the salmon head and tail from the blackline masters. Have students color the head and tail of their salmon. The Pacific Salmon Species Fact Sheets and the Salmon ID 11 x 17 Poster can be great references for salmon colors. Once colored, students cut out the head and tail and glue them onto each end of the life cycle stages.
- These make a great wall or hallway display.
- Be sure to ask your students what they are thinking about their investigative question now that they have learned about a salmon's life cycle.



Fresh Water Stream	Fresh Water Stream	Fresh Water Stream	Estuary	Pacific Ocean	Fresh Water Stream
Egg	Alevin	Fry	Smolt	Sea-Run Adult	Spawning Adult/Death



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2-2 Structure Function and Information Processing

Method
Teacher Led, group work optional

Time Required
60 – 90 minutes

Objective
- Identify the five types of Pacific salmon
- Describe the name, weight, length, and interesting facts of the five types of Pacific Salmon
- Identify and label salmon body parts
- Describe salmon body parts in terms of their function as part of a system

Materials
Provided by the classroom teacher
- Copies from provided blackline masters of:
    - Helpful Hints to Remember our Pacific Salmon, 1 per student or team, or projected to whole class
    - Pacific Salmon Species Chart*, 1 per student
    - Pacific Salmon Species Fact Sheets*, 1 per student or team, or posted for whole class viewing
    - Salmon Body Parts, 1 per student

**Images included with permission from Students for Salmon, Nooksack Salmon Enhancement Association, 2016*

Background Information
After learning about the salmon's anadromous life cycle, students are ready to learn about the differences between the five local Pacific salmon species; their appearance, habitat requirements, and how the structure, function and information processing of internal and external body parts help them survive.

Procedures
- Use the Helpful Hints to Remember Pacific Salmon sheet to help students remember the five Pacific salmon.
- Next, to familiarize themselves with details about Pacific salmon, have students read the Pacific Salmon Species Fact Sheets and complete the Pacific Salmon Species Chart.
- These should be retained for reference throughout this unit.

- For a general introduction to the anatomy of fish (salmon) and how those parts work together as a system, read the following to your students and have them complete their own Outline of a Salmon on their Salmon Body Parts handout as you demonstrate on a projected image of the same. Use the diagram provided as a guide.
    - First, briefly discuss the vocabulary term *scientific diagram* and how scientists use this skill frequently in their studies to capture observations and information. Stress that accuracy is the focus not artistic embellishment. See the completed example provided here.
    - With students following along on their copy of Salmon Body Parts, point out the body outline shape and say, "Salmon are streamlined to move easily through water."
    - Fins: "Salmon have eight fins including the tail. The fins are embedded in their muscle and not linked to other bones. This gives salmon a lot of flexibility and ability to maneuver. Each fin has a different function."
        - *Caudal Fin*: Model drawing on the left side of the fish, a tail fin and label it Caudal Fin. "The caudal or tail fin, is the largest and most powerful. It pushes from side to side and moves the fish forward in a wavy path. This fin is also used for jumping."
        - *Adipose Fin*: On the top of the fish, toward the tail, draw and label the adipose fin. "The adipose fin has no known function. It is sometimes clipped off in hatchery fish to help identify fish when they return or are caught."
        - *Dorsal Fin*: Draw the dorsal fin. "The dorsal fin keeps the fish upright, and it also controls the direction the fish moves in."
        - *Anal Fin*: Draw and label the anal fin. "The anal fin helps keep the fish stable and upright."
        - *Pelvic and Pectoral Fins*: Draw and label the pelvic and pectoral fins. "The pelvic and pectoral fins come in pairs (one on each side of the fish) and are used for steering and balance. They can also move the fish up and down in the water."
    - On the "face", add a mouth, eyes, nostrils, gill cover and gills and label these parts.
        - *Mouth*: "A salmon's mouth contains needle-like teeth, which they use to grab their prey. Salmon do not chew their food. Salmon also use their mouth to breathe by gulping water through it and then closing their mouth and throat. The water is then forced through the opening in the back of their throat that is lined with gills. The water passes through the gills."
        - *Gills*: "These are thin pieces of skin that take oxygen from the water. The gill cover is tightly closed when it takes in the oxygen. To exhale, the fish closes its mouth and lets the water out of its gills."
        - *Eyes*: "Salmon eyes can see in all directions. To help them see in front and behind them, salmon can move each eye in different directions at

the same time. They do not have eyelids or tear glands because the water keeps their eyes clean."

- *Nostrils (nares)*: "Salmon have nostrils above their mouth, but no nose. They are called nares. They do not breathe through their nostrils. They are used for smelling not breathing. Scientists believe that salmon use smells to recognize their way home from the ocean to spawn. Salmon's sense of smell is hundreds of times better than a dog's!"

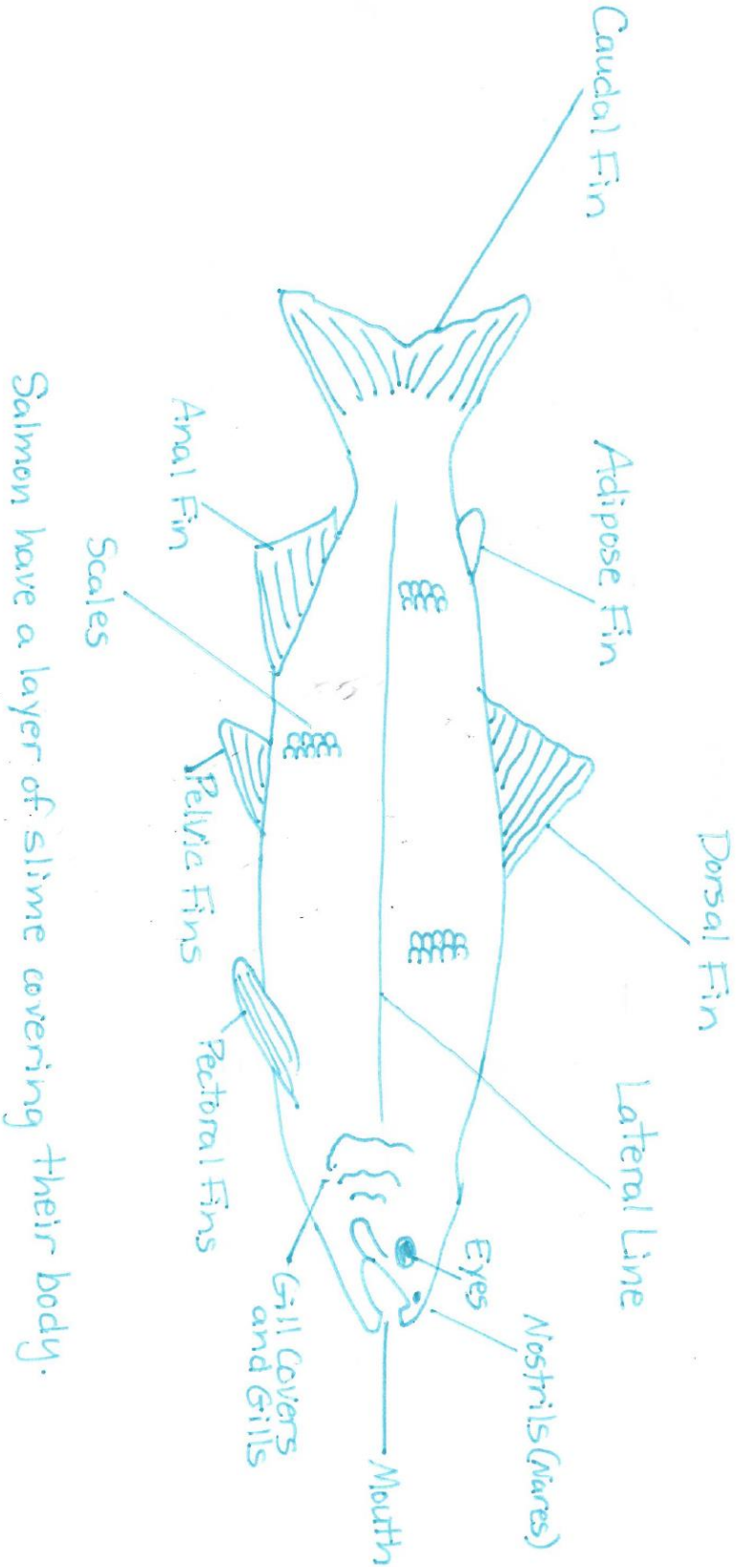
- *Lateral Line*: Draw and label the lateral line. "The lateral line functions sort of like an ear. It detects vibrations and pressure waves in the water. The lateral line can be used to tell distance/depth. Salmon do not have ears like humans. Sound waves travel through the water and through their body to the otolith bones in their inner ear. Scientists can tell how old fish are from their otoliths."
- *Parr Marks (young only)*: If you are drawing a young, or juvenile, salmon, be sure to include the parr marks—about 8-10—and they do not extend below the lateral line. "Parr marks act as camouflage, helping the fry blend into the stream and hide from predators."
- *Scales:* Add scales to the drawing and a label. "Salmon have a layer of scales covering their skin, like most fish. They are small, hard plates, like fingernails that cover the body for protection. They overlap to form a flexible armor plating to protect them from predators and bruising. They are born with a set number of scales that begin to grow at the fry stage. The scales start small and continue to grow throughout their life. If a salmon loses a scale, it will grow a new one.
- *Slime*: Underneath the diagram model have students write, *Salmon have a layer of slime covering their body*. "The slime layer helps salmon to: slip away from predators, like bears; slip over rocks to avoid injuries; slide easily through water when swimming; and to protect them from fungi, parasites, disease and pollutants in the water."

- To help students think scientifically about how these parts work together as a system discuss what would happen if a part was missing or did not work properly; What would a salmon be unable to do well with a damaged caudal fin? (jump or swim quickly), What would happen to a salmon that lost the use of its nares? (It may not be able to "smell" its way home and spawn.), etc. When used together, what do a salmon's mouth, gill cover and gills help it do? If you are raising salmon, have students observe salmon in the tank and how their parts work together as a system.

- Be sure to ask your students what they are thinking about their investigative question now that they have learned about salmon body parts.

A STORMWATER EDUCATION LESSON

Salmon Exploration



2-3 Salmon Traits

Method
Teacher Led; group work optional

Time Required
Approximately 120 minutes

Objective
- Read text about animal traits
- Define traits
- Apply text concepts to salmon
- Collect, organize, identify relationships in and interpret data about salmon traits
- Compare variations in traits in a grouping of similar organisms
- Discuss how the traits they observed might give salmon advantages in surviving, finding mates and reproducing

Materials
Provided by the classroom teacher

- Copies from provided blackline masters of:
  - Pacific Salmon Species Fact Sheets (5 total) available for reference (if raising salmon, post the Fact Sheet of the type of salmon you are raising near the tank)
  - Puppies and Their Parents ReadWorks article 1 per student
  - Salmon ID Poster 11 x 17, available for student reference
  - Salmon Trait Data Collection Sheet 1 per student
  - Salmonid Life Cycle Diagram, for reference
- Students' Salmon Body Part Diagram (completed in Lesson 2-2)
- Optional: observations of your in-class salmon tank

**Images included with permission from Students for Salmon, Nooksack Salmon Enhancement Association, 2016*

Background Information
Parents pass their physical characteristics, or traits, to their offspring. Offspring are the children of animal parents (humans too). When baby animals are formed, some of the traits from the mom and some of the traits from the dad are combined to create a baby that is unique. Sometimes traits can skip a generation. That's why you might be the only one in your family with freckles like your grandmother's. If you have siblings, you might have some of the same traits. However, other traits may be different, like your hair color or height. You cannot

have all of your mom's traits and all of your dad's traits. It's always a mixture. Babies get some traits from each parent.

Animals of the same kind share a common set of physical traits. For example, all salmon can be expected to have caudal fins. Animals also have common behavioral traits. We can expect that all salmon will return to their home stream to spawn.

Similarities in traits between parents and offspring, and between siblings, provides evidence that traits are inherited.

Differences in traits between parents and offspring, and between siblings, provides evidence that inherited traits can vary.

Variation in inherited traits results in a pattern of variation in traits in groups of organisms that are of a similar type.

Procedures

- Have your students read the Puppies and Their Parents ReadWorks article.

NOTE: Can I make photocopies of ReadWorks' materials? Yes. From ReadWork's website: Absolutely! Our curriculum was developed for use by teachers in their classrooms, to be shared broadly. You do have the right to copy the materials for use in your classroom with your students, and on behalf of teachers as long as they will be using the materials with their students in their classrooms as well. The Terms of Use are intended to protect the content from being changed or used for purposes outside of classroom use.

- Ask the following questions:
    - What is this passage mostly about? (Dogs and the traits that make them similar to or different from each other.)
    - Find the following in the article, "Puppies are usually like their parents. Chihuahuas have small puppies and German Shepherds have bigger puppies. This is because puppies inherit many **traits** from their parents." What does the word "traits" mean? (Physical features or qualities.) Do you think salmon have traits similar to their parents?
    - Puppies are similar to their parents, yet they are not exactly the same. Do you think salmon can have differences from their parents?
- Choose one salmon species for students to focus on for this lesson. If raising salmon in the classroom, choose the species you are raising.
- Model for your students how they are going to use the Salmon Trait Data Collection sheet, reference materials and, if available, salmon raised in the classroom tank, to
    - collect data about the traits of **salmon fry** (offspring) in your focus species and their parents

  - identify variations in traits of the **other four types of Pacific salmon**
  - identify relationships in patterns, similarities, and differences in traits between parents, offspring, and siblings
  - interpret what this data all means in terms of inherited traits and how they can vary.
- Point out that it is not possible for them to compare salmon fry (offspring) to their parents directly, so they will be gathering evidence and completing comparisons about salmon traits from printed materials and, if available, the salmon in the classroom tank. They may not be able to come to full conclusions about everything on the Salmon Trait Data Collection sheet. Encourage them to conclude what they can based on available evidence and have them suggest what a scientist would do to fully conclude this trait investigation. This sheet can be completed individually, in teams or whole class. It would also be a good idea for students to have their salmon body parts diagram that they drew earlier for reference of physical traits.
- Be sure to take time to share conclusions as a group.
- What are they thinking about their investigative question now that they have learned about salmon traits?
- Take it a step further and ask students how the traits they observed might give salmon advantages in surviving, finding mates and reproducing.

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3-1 You Ain't Nothing but a Hound Dog

Method
Teacher Led, group or independent work

Time Required
45-60 minutes

Objective
- Read text about the effect of environment on traits
- Analyze the cause and effect relationship between environmental factors and variations in inherited traits

Materials
Provided by the classroom teacher

- Copies from provided blackline masters of:
  - Scaffold - Environmental Effects on Inherited Traits (Optional scaffold to use/project)
  - You Ain't Nothing but a Hound Dog ReadWorks article, 1 per student

Background Information
Some traits are influenced by the environment. We are all born with the information that will determine our traits. However, different factors in a living thing's environment can influence the trait. For example, if a person is born with the potential to grow very tall, but they didn't get proper nutrition growing up, it is unlikely they will be tall.

The use of energy and fuels that are derived from natural resources can also affect the environment and in turn the organisms that live in it.

All these things contribute to habitats where some organisms can survive well, some survive less well, and some cannot survive at all.

This activity and several that follow will help your students bring their thinking full circle. They will use what they have learned about salmon and apply it to show the connections salmon have to their habitat.

Procedures

- Have your students read the ReadWorks article, You Ain't Nothing but a Hound Dog.
- Ask the following questions:
    - Besides its parents, what can determine the traits an animal develops? Give examples from the text. (Answers will vary but should come from the passage. They should focus on the idea that an animal's environment can also determine the traits an animal develops.)
    - When it comes to salmon, what traits do you think can be influenced by their environment (both in a stream and in the tank, if raising in class)?
- Use the *Scaffold – Environmental Effects on Inherited Traits* to help students frame their thinking. Here's an example:
    - Phenomenon: underweight salmon moving sluggishly
    - Variation in Inherited Trait (effect): salmon are underweight and sluggish
    - Environmental Factor (cause): water temperature increased due to removal of trees from streambank which destroyed most of the food source.
- Lead students as a class or have them work in small groups or independently, to come up with several other phenomenon, the cause, and the effect.

RS-FT-2 Engineering Activity – Salmon Release Tool (optional)

Method
Teacher led; group work

Time Required
Several days, concurrent with other lessons

Objective
- Using engineering principles students design, create, test, and improve a tool to assist with the release of salmon fry that meet the Criteria and Constraints.
- The tool created must meet the following Criteria and Constraints. The tool must be able to:
    - be easily transported by car or bus
    - hold a 12 oz. plastic cup
    - support 8 oz. of water and 3-4 salmon fry in the cup
    - reach approximately 4 feet from the stream bank to within 4 inches of the stream surface
    - be operated easily so water can be poured into stream to release salmon
    - be reused by each release team in your class
    - be operated without the need for any electrical power
    - complete the process of pouring the water, start to finish, in **1 minute or less**

Materials
Provided by the classroom teacher
- Copies from provided blackline masters of:
    - Phenomenon: Salmon Release Site Photo, projected for all students
    - Salmon Release Tool Challenge, one per student or Design Group
- Building materials. Some suggestions include:
    - PVC pipe
    - Rubber bands
    - Paper clips
    - Binder clips
    - String or yarn
- Optional Math Integration: assign a cost to each supply (can vary or be a fixed price per supply) and provide students a budget they must work within.

NOTE: CKSD teachers may have materials available through the Teaching and Learning Center

Background Information

You and your class have raised salmon to be released into the Clear Creek Ecosystem. The salmon fry need to be released within 3-4" of the surface of the water to avoid physical stress to the fry. Due to critical riparian habitat and stream levels that vary with rainfall, it may be difficult to get close enough to the stream during your field trip to safely release your salmon. This activity allows students to apply what they've learned about the engineering design process to develop a tool they and their classmates may use in real life.

Procedures

- Gather enough materials for all students in your classroom
- If using the Optional Math Integration, develop a price list and worksheet for students
- Project the *Phenomenon: Salmon Release Site Photo* for students to view. Ask students how easy they think it would be to release a salmon fry in this location:
    - Is there vegetation in the way?
    - Could the water level vary from day to day?
    - Are there any concerns with people standing right at the water's edge?
    - Is the water at the edge deep enough for salmon?
    - Student answers will vary, but should include concerns about erosion; damage to vegetation; unpredictable water level due to rain, or lack of; low water level may make it too silty to release salmon at the edge; students may fall in if reaching further to release salmon, etc.
- Distribute copies of the *Salmon Release Tool Challenge*
- Work together as a class to define the problem.
- Review the Criteria and Constraints with students.
- Work together as a class or divide into Design Groups so students can apply the Science and Engineering Practices to:
    - design and build a solution
    - test their solution
    - modify their solution, if time
    - Re-test if modified
    - as a class, vote on which two (2) Salmon Release Tools best fit the criteria and constraints and are successful. Those are the tools that should be brought to the field trip.
- Have each student practice how to use the tool in class so they are familiar with it and can use it quickly and efficiently at the field trip.

***NOTE**: one of the most critical criteria is that the tool must be functional and be able to release the water and salmon **within one minute or less** due to time constraints at the field trip.*

3-3 Performance Task: Saving Our Salmon: Clean Water

Method
Teacher Led

Time Required
Part 1: 60-90 minutes

Part 2: 70 minutes

Objective
- Identify information from text and media sources to support a topic
- Explain in an essay or speech why clean water is important to the life cycle of salmon and what humans can do to make a difference

Materials
Provided by the classroom teacher

- Copies from provided blackline masters of:
    - Task: Saving Our Salmon: Clean Water, Pacific Education Institute (PEI), 1 per student. (11 pages, including rubric. See Resources for information about and access to other free resources from PEI.)

Procedures

- Read through the entire performance task before sharing with students. Notice the Teacher Note and the rubric provided.
- Make necessary copies for students.
- Have source information listed in the task ready to share with students.
- Follow the directions in the performance task.

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3-4 Salmon Stream Design

Method
Teacher led; group work

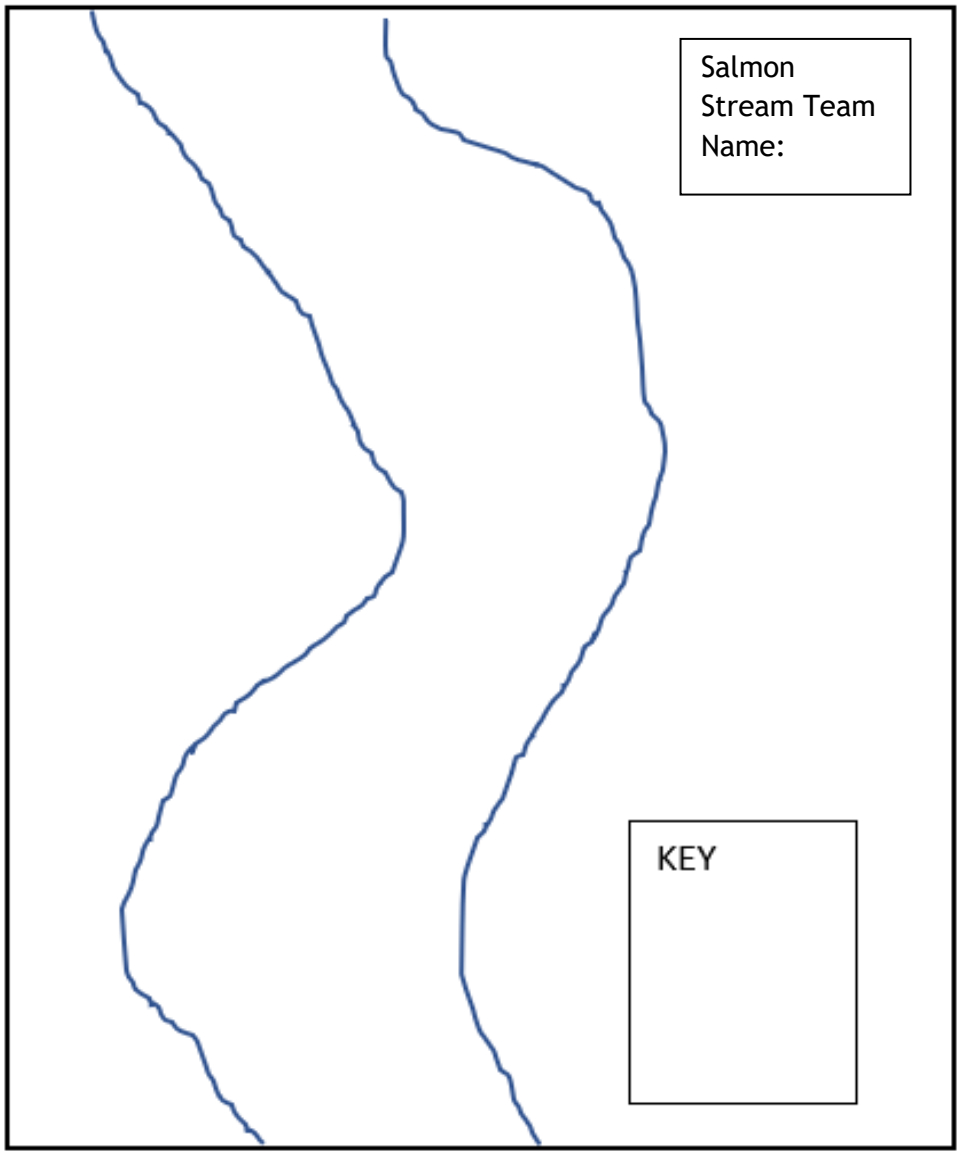
Time Required
150 minutes over multiple days

Objective
- Analyze and combine information learned throughout this unit to design a good salmon stream

Materials
Materials provided by classroom teacher:
- Copies from provided blackline masters of:
  - Probe - What Makes a Good Salmon Stream? Blank copies, 1 per team
  - Salmon Stream Design Gallery Walk Feedback, half sheets, 1 half sheet per student for each stream design
- Large poster size pieces of sturdy white paper, 1 per team
- Markers, crayons, colored pencils, pencils

Background Information
Students have spent the past several weeks learning about salmon, their life cycle, salmon body parts and function, salmon traits, and what salmon need to survive. This lesson provides students an opportunity to apply what they have learned and develop their own version of what a healthy stream for salmon looks like. It is also an opportunity to apply map development and reading skills.

Procedures
- Copy and cut enough Salmon Stream Design Gallery Walk Feedback sheets so each student has one for each Salmon Stream Design. (ie, if there are 5 stream designs, then each student should have 5 half sheets. Names of students providing feedback on these sheets is optional).
- Divide students into Salmon Stream Teams (3-4 per team); have them pick a team name.
- Be sure each team has a blank copy of the probe What Makes a Good Salmon Stream? and one piece of the large white paper.



- Model for teams how to draw their stream outline and start a key for the items they will be adding to their stream.
- Tell students that their job as members of a Salmon Stream Team is to design a stream that contains the parameters necessary for salmon survival.
- Have students refer to the probe What Makes a Good Salmon Stream? and as a team add the parameters, based on what they have learned throughout this unit, that they think

should be part of a good salmon stream. Encourage students to take time to understand the role each parameter on the probe plays in supporting or inhibiting salmon survival. They can refer to their previously completed probe to support their thinking. (Tell students to not worry about making revisions to their probe at this time. You will give them time to do that in Unit 4.)

- If a consensus cannot be reached on a parameter, provide resources to allow further research to decide on that parameter. For example, if students can't agree whether beaver dams are beneficial or harmful to salmon, this 4 ½ minute, 360-degree video from Olympic College about beavers in Chico Creek in Bremerton may provide some information. (Be sure to have students use their mouse to move the camera view around) https://www.youtube.com/watch?v=Ive-QiJyQ5U&feature=youtu.be https://www.youtube.com/watch?v=Zm6X77ShHa8.
- As teams make decisions about what to add to their stream, circulate and promote discussion with questions like: So, let me see if I've got what you're saying. Are you saying…? (always leave space for the student to agree or disagree and say more) Can you say more about that? Why do you think that? What's your evidence? How does that idea square with Sonia's example? Do you agree/disagree and why? Does anyone want to respond to that idea?
- When ready, hang each salmon stream design around the room.
- Distribute copies of the Salmon Stream Design Gallery Walk Feedback sheet—one half sheet to each student for each stream design in the class.
- Allow students to take a gallery walk of the stream designs either individually or with their group to complete the feedback form. Have students:
    - write the group's name at the top of the rating sheet
    - identify at least one thing they liked about each stream design
    - provide one suggestion for improvement they may have
    - be prepared to share their feedback verbally with the class **OR**
    - have them place their Feedback sheet in a teacher-provided container at each stream design
- After the gallery walk, provide time for the Salmon Stream Teams to regroup; gather the feedback about their stream design; discuss the feedback from the gallery walk; and make any desired revisions to their salmon stream.
- Wrap up by referring students to the investigative question for this unit and where their thinking is now.
- Post the streams, if space allows, and save students completed probes for use in Unit 4.

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3-5 Virtual Scavenger Hunt

Method
Teacher led; individual student or partners

Time Required
15 minutes for scavenger hunt; 15 minutes for discussion

Objective
- Identify and explain good salmon stream habitat in a local stream
- Provide an alternative for those that cannot attend a field trip

Materials
Provided by the classroom teacher:

- Copies from the blackline masters of:
  - Virtual Scavenger Hunt, 1 copy per student
  - Virtual Scavenger Hunt Key, teacher only
- 1 pencil per student

Background Information
Students have learned a lot about salmon. While it's important that students understand a habitat feature and its function, it is also important that they can identify that feature in an actual stream. This lesson provides an opportunity for students that cannot attend a field trip to apply the knowledge they have learned in the classroom to identify good habitat in a local stream. However, those that have attended a field trip may also benefit from this lesson.

Procedures
- Distribute the Virtual Scavenger Hunt – Good Salmon Habitat to students.
- Tell students this is a photo of an actual stream in Kitsap County—Clear Creek near Sunde and Winter Creek Roads in Silverdale.
- Following directions, have students look for each of the habitat elements that are listed below the photo.
- Some elements may be found in more than one place. Have students identify at least one square where an element is found. For example, *Vegetation Along Streambank* is found in the C-1 square. However, it can also be found in the E-1 or E-2 square as well as several others.
- Give students time to complete the Virtual Scavenger Hunt on their own or with a partner. You may want to consider having students complete this on their own, then

provide them with an opportunity to meet with their Salmon Stream Team to discuss their results.

- Circulate among students as they're completing the Hunt to answer questions and provide feedback.
- Once all students have completed their Virtual Scavenger Hunt, gather students together and review the answers together. Be sure all students are able to idenfity at least one location where each element is found.
- As you discuss where each element is found, ask students why that element is important for the stream. Remember some of the questions from Lesson 3-4, Salmon Stream Design, So, let me see if I've got what you're saying… Are you saying….? Can you say more about that? Why do you think that? What's your evidence? How does that idea square with Sonia's example? Do you agree/disagree and why? Does anyone want to respond to that idea?
- Using the key provided, ensure students have found all the elements in at least one location. Also ensure they have not incorrectly identified the location of an element. For example, the sun in the creek in square D-4 may look like a rock, but is actually loose gravel.

NOTE: The key provides one square where each element can be found, but there can be other squares where that same element may be found.

RS-FT-3 Salmon Release Field Trip

Method
Field Trip; Volunteer and staff-led

Estimated cost: transportation expenses

Time Required
2 hours plus transportation time to and from field trip location

Objective
Clear Creek field trips usually consist of 4 stations: Salmon Release, Stream Bugs, Water Quality, and Habitat. Objectives may vary depending on field trip stations but usually include:

- Release salmon raised in the classroom into Clear Creek
- Apply concepts learned in the classroom to a local stream
- Identify good habitat features for salmon
- Identify 3 stream bugs that are sensitive to pollution changes
- Explain how pollution can impact salmon's migration

Materials
- Teacher emails explaining logistics for the day of the field trip
- Any materials your school district requires for field trips
- Salmon in a bucket of tank water
- Materials specific to field trip stations will be provided at the field trip

Procedures
When raising salmon in your classroom, this is a good point to stop in your curriculum until your salmon are released. The eggs that were donated to your classroom, most likely by the Suquamish Tribe's Grovers Creek Hatchery, are covered under a permit that specifies into what creek those juvenile salmon are to be released.

- The release can happen in several ways:
    - If you participate in the Clear Creek Salmon in the Classroom Program, your salmon need to be released into Clear Creek. You have the option of signing up for a 2-hour field trip with your students. Information about this field trip is sent to program participants in mid-late January.

  - If you raise salmon in your classroom on your own or through another program, you can setup a field trip with your students to release your salmon. Just be sure to release them in the permit-specific creek.
  - You as the teacher can release the salmon into the stream on your own. Be sure to release them in the permit-specific creek and take photos and videos you can share with your students back in class.

- Follow instructions in your Clear Creek Salmon in the Classroom manual or from the group that sponsors your program to collect and transport your salmon from your classroom to the stream and to provide a count of the number of salmon released.
- Once your salmon have been released, follow instructions in Lesson R-8 and your manual to properly clean and store your aquarium for next year.

NOTE: Some equipment in the aquarium is breakable. Please be sure to store safely to ensue all equipment is ready to go for next year.

RS-8 Tank Cleanup and Storage

Method
Teacher only

Time Required
30-60 minutes

Objective
- Empty, clean, and store tank and all equipment safely for use next year

Materials
- Aquarium Maintenance Manual found in the Resources section
- Materials listed in Aquarium Maintenance Manual under Cleaning the Aquarium and Equipment
- Bubble wrap or towels to safely store equipment

Procedures
- Follow the procedures in the maintenance manual for your aquarium to:
    - Empty all water
    - Clean and dry the aquarium and all equipment
    - Store the aquarium and all equipment safely for use next year

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4-1 Revisit and Revise: Salmon Stream Design

Method
Teacher led; group work

Time Required
60 minutes

Objective
- Analyze, review, and revise the Salmon Stream Design completed in Lesson 3-4 based on information learned during the field trip or Virtual Scavenger Hunt lesson. Has student thinking about what makes a good salmon stream changed?

Materials
Provided by the classroom teacher

- Copies from provided blackline masters of:
  - Blank copies of the probe What Makes a Good Salmon Stream? 1 per team
- Student Salmon Stream Designs created in Lesson 3-4, Salmon Stream Design
- Reference material:
  - Any notes students took on their salmon field trip **OR**
  - Student completed Virtual Scavenger Hunt from Lesson 3-5
- Markers, crayons, colored pencils, pencils

Procedures
- Divide students into their Salmon Stream Teams from Lesson 3-4, Salmon Stream Design
- Give each team their original Salmon Stream Design and a blank copy of the probe What Makes a Good Salmon Stream?
- Be sure each student has their reference materials
- Remind students their job as members of a Salmon Stream Team was to design a stream that contains the parameters necessary for salmon survival.
- Have students revisit each of the parameters listed on the probe What Makes a Good Salmon Stream. As a team, students should add or remove parameters from their design based on what they've learned throughout this unit and at the field trip about what makes a good salmon stream. Remind students to take time to understand the role each parameter on the probe plays in supporting or inhibiting salmon survival. They can refer to their reference materials to support their thinking. As in the original

lesson, as teams make decisions about what to add to or remove from their stream, circulate and promote discussion with questions like: So, let me see if I've got what you're saying. Are you saying…? (always leave space for the student to agree or disagree and say more), Can you say more about that? Why do you think that? What's your evidence?, How does that idea square with Sonia's example? Do you agree/disagree and why? Does anyone want to respond to that idea?

- When ready, begin a class discussion on changes each group made and why. What evidence have they collected that supported that change? If there were no changes, why did they choose not to make any changes?
- Wrap up by referring students to the investigative question for this unit and where their thinking is now.

4-2 Wanted Poster

Method
Teacher led, individual work

Time Required
Approximately 30-60 minutes for instructions
Multiple days for project development

Objective
- Summarize information learned throughout this unit to design and create a poster about salmon traits, needs, environmental impacts and how humans can help

Materials
- Each student should have access to the information they gathered throughout their study of salmon—scientific illustrations, notes, etc.
- Reference materials from the blackline masters:
    - Pacific Salmon Species Fact Sheets
    - Salmon ID poster 11 x 17
    - Salmonid Life Cycle Diagram
    - Wanted Poster Guide, 1 copy to project to the class (optional—also included at the end of this lesson)
- Salmon Field Guide: Kitsap Edition:
    - One copy is provided with salmon tank.
    - An online version is available, https://extension.wsu.edu/kitsap/water-stewardship/kitsap-salmon-tours/
    - A class set can be checked out by contacting Kitsap County Public Works, help@kitsap1.com or 360-337-5777
- Other field guides, good fit books. Suggestions available in the Resources section.
- Writing, drawing, coloring instruments
- Glue
- Large colored construction paper in various colors for the background (12” x 18” or 18” x 24”)
- White paper cut into various sizes for each part of the poster (see following example)

Background Information
In the lessons in this unit students learned about salmon and their connections with their habitat. The Wanted Poster is a way for students to put all the pieces together and show what

they have learned. To do this, each student will develop a Wanted Poster. Some students may want to create an Appreciated For… rather than a Wanted Poster and write about what they have come to appreciate about the salmon they have chosen to represent on their poster. Refer back to your investigative question as part of this work.

Consider how you will share these posters with others in your school: present them to a buddy class, post them in the hallway or school library, do a gallery walk in class or with other classes, etc.

An option to display small versions of some of the posters on trail kiosks around Kitsap County may be available. Contact Kitsap County Public Works, help@kitsap1.com, or 360-337-5777, to inquire about this option.

This is an engaging application of the NGSS Science and Engineering Practice of Obtaining, Evaluating, and Communicating Information, and many other NGSS and CCSS standards. It is also an opportunity for assessment of these same standards. Remember that observable features of student performance found in NGSS evidence statements will help you know what to look for when assessing and should be used to create a rubric specific to your grade level to guide completion of and assessment of the final product. The components of the Wanted Poster shared here were based on the evidence statements from the NGSS standards listed in the Introduction section of this curriculum. CCSS standards that you plan to assess should be added to the rubric as well.

Procedures

- Develop a rubric appropriate for your grade level
- Collect a supply of colored construction paper
- Cut white paper into appropriate sizes for each part of the poster
- Go over your rubric with your students and how you plan to share the completed posters.
- Demonstrate how students will use the materials to create a finished product and share a completed Wanted Poster. Be sure to address gluing FINISHED pieces on the background only when pieces are complete and student is happy with the layout.
- Have each student choose *one type* of Pacific salmon and *one stage* of that salmon's life cycle to guide their content.
- Use the following guide for what students must include on their Wanted Posters. A copy of the layout is provided at the end of this lesson and is also available in the Blackline Masters:
    - *Title:* Wanted (or Appreciated For…) Surviving in the Wild. Student name can be included here or at the bottom of the poster.

NOTE: If Wanted posters will be located on park kiosks, have students only include their first name or school and/or teacher name on the front of the poster.

  - *Student Illustration*: Scientifically accurate illustration of the salmon at the chosen stage of life cycle (profile). Include common name, scientific name, aliases/nicknames and the featured stage of life cycle.
  - *Age and Size*: Scientific illustration of the full life cycle of the chosen salmon with all stages labeled. The featured stage chosen for poster should be highlighted. List age, average length, and weight for the featured stage.
  - *Distinguishing Feature and Behavior*: One notable internal or external feature for the featured stage of life cycle, its primary function, and an illustration of the feature.
  - *Last Seen Looking For*: Illustration and description of one element of a good habitat for the featured stage of life cycle and how that element meets the needs of the salmon.
  - *How You Can Help*: Choose a cause and effect relationship in a salmon's habitat for the chosen life cycle stage. Describe the relationship between the causal environmental factor, the effect on the habitat and the ultimate impact on the salmon. Describe ways people can help. Include an illustration.
- Once posters are complete, share them in the way you chose previously. Be sure students have their names on their poster or just their school and/or teacher name if posted publicly.
- Assessment: conference with students and use the rubric you created to assess their completed posters.

NOTE: This lesson is adapted from Pacific Education Institute's Guide, Fostering Outdoor Observation Skills. For access to this and other free, downloadable guides from PEI

visit https://pacificeducationinstitute.org/work/fieldstem-resources/#fieldstem-guides.

WANTED (or Appreciated)

for Surviving in the Wild! (student name optional)

Student Illustration

Common name, scientific name, aliases/nicknames, and stage

Age and Size

Student Illustration

Age:

Length:

Weight:

Distinguishing Feature and Behavior

Student Illustration

Primary function:

Last Seen Looking For

Student Illustration

Description of habitat feature and how it meets salmon's needs

How You Can Help

Student Illustration goes here

Description of relationship between the causal environmental factor, the effect on the habitat and the ultimate impact on the salmon, including ways people can help.

4-3 Revisiting the Probe

Method
Teacher led, class discussion

Time Required
30 minutes

Objective
- Define and explain the parameters of a good salmon stream based on evidence and reasoning from information learned throughout this unit

Materials
Provided by classroom teacher

- Copy of each students' completed Formative Assessment Probe from Lesson 1-1, What Makes a Good Salmon Stream?

Procedures
- Revisit the probe What Makes a Good Salmon Stream? given in Lesson 1-1. Have students review their initial response to the probe and ask them if they have any new thinking they would like to capture or any new questions.
- No need for a new copy of the probe. Explain first to students that scientists never erase any of their notes, they might become important evidence later. It's not about getting something wrong; it's about capturing the thinking at the time. Students can draw a line where their thinking left off last time (a "line of learning") and continue with capturing their current thinking. Another strategy is to add new information in a different color pencil or pen.
- Collect the probes. Revisiting the probe can give you and your students valuable information about their conceptual development toward a learning target. In the case of this probe, do students understand the connections between salmon and their habitat? Are they including information they have learned throughout their Salmon in the Classroom investigations? At this point in the unit this probe could be used as a summative assessment.
- Please share feedback about student growth by sending copies of your students' pre and post probes to the KCPW Educator. This data helps improve the programs provided to local schools. Probes can be copied and mailed or scanned and emailed to Stormwater Educator, Kitsap County Public Works, 614 Division Street, MS-26A, Port Orchard, WA 98366 or *help@kitsap1.com*.

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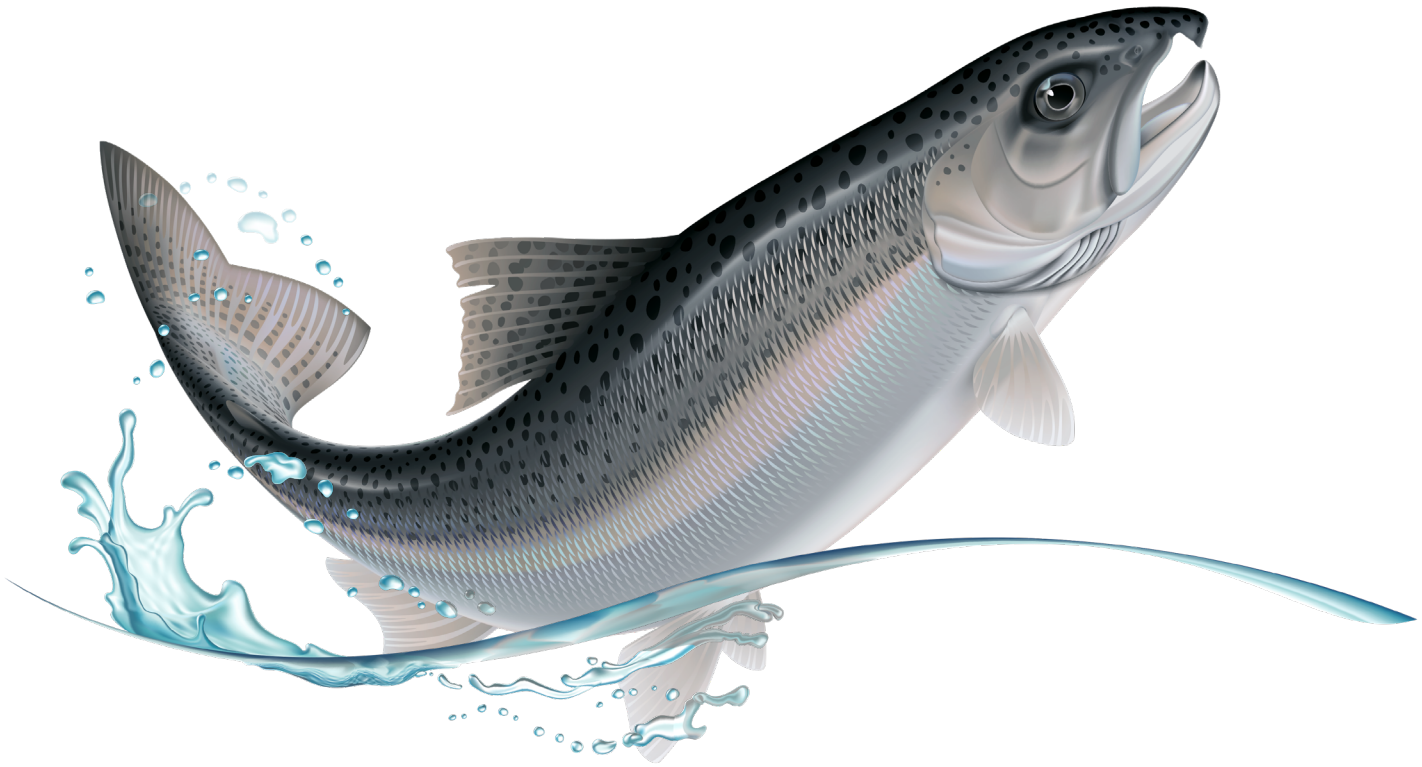
RESOURCES

Table of Contents - Resources

SALMON IN THE CLASSROOM

Aquarium Maintenance Manual

Instructions for Aquarium Preparation,
Maintenance, and Troubleshooting
During the Egg to Fry Lifecycle
(REV September 2018)



Clean Water Kitsap
Partners in Stormwater Solutions

Kitsap Public Health District | Washington State University Kitsap Extension | KPUD

Clear Creek Trail

For further information and instruction

Clear Creek Task Force
360.434.7665
Info@ClearCreekTrail.org

The Salmon in the Classroom Program was started by the Central Kitsap Kiwanis Club in 1988. It is now a partnership with the Clear Creek Task Force, Silverdale Kiwanis Club, Clean Water Kitsap, Kitsap Public Utility District, United Van Lines, Suquamish Tribe, Air Management Solutions and over 30 local classrooms with the shared goal of enhancing the salmon population in Clear Creek and educating students on the importance of ecosystems.

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Salmon in the Classroom Aquarium Maintenance Manual

REV September 2018

Table of Contents

The following information will provide users sufficient details to ensure they can provide a functional and safe environment for salmon eggs and the resulting evolution into fry prior to release into Clear Creek, the approved salmon stream.

The aquariums were built by the Kiwanis Club of Central Kitsap three decades ago. They were built from old refrigerator parts. There are three important things to keep in mind: 1) Never turn it on its side; 2) low refrigerant is the most common reason for temperature fluctuations; 3) dust accumulation on the mechanical parts underneath is the second most common reason for temperature fluctuations.

Section 1. Inspection, Cleaning and Operational Check

Very Important! Complete by Halloween

***NOTE**: Minor parts and labor are donated by Air Management Solutions in Bremerton. Repair requests need to be completed before the winter weather sets in. Air Management Solutions naturally gives priority to their paying customers.*

Materials and Equipment – Aquarium Inspection and Cleaning

- Flashlight
- Paint brush for dusting
- Vacuum with wand and brush fitting
- White vinegar
- Sponge or rags
- Towels for wiping up spills and drying the aquarium and parts for maintenance
- Egg tray (provided)
- 1/3 of a bucket of ¾” to 2" clean rocks (think redd)
- Two 5 gallon white buckets
- Siphon or small bucket
- Electrical Tape

Siphon Hose

Egg Tray on its side

1. Inspecting and Cleaning the Aquarium and Equipment

***NOTE**: Disconnect the aquarium from power source before cleaning. The aquarium should never be run dry.*

1. **Aquarium**
    a. Inspect the inside of the aquarium for cracks and fungus. If there are cracks, remove debris with a whisk broom or a cloth and patch with a marine sealant that is safe for aquariums. This can be purchased at pet stores. Contact the Clear Creek Task Force for further information, info@clearcreektrail.org, 360 434 7665.
    b. Wipe the inside of the aquarium with a mild white vinegar and water solution to remove any fungus. Do not use detergent (residual soap deposits cling and raise the phosphate level of the water). Remove any debris from the interior.
    c. Using the paint brush, dust off the motor and other parts in the bottom back of the aquarium cabinet to remove dust. You may also use a vacuum wand with a brush attachment to gently remove dust.

***NOTE**: Most tanks are 25+ years old, do not be too vigorous with the cleaning.*

2. **Thermostat:** The thermostat controls the temperature of the water. It is located in the bottom back of the aquarium cabinet. Note where the setting is at in case you may have to change the setting. A picture on your phone is best.
3. **Copper Cooling Tube**: Copper is deadly to salmon. Check for exposed copper on the cooling tube inside on the back wall of the aquarium. Use a small mirror to see between the aquarium wall and the pipe. Cover exposed areas with electrical tape, covering the pipe in one long, continuous, overlapping wrap.

4. Accessories

***NOTE**: If you have issues with any of the accessories listed below or need assistance, contact the Clear Creek Task Force, 360 434 7665 or info@ClearCreekTrail.org.*

a. **Electrical Cord**: Check the electrical cord for any damage. To repair, contact the Clear Creek Task Force.

b. **Airstone**: This provides a source of dissolved oxygen in the form of tiny air bubbles. The 10” airstone is connected to the air pump (small aqua or black box next to the thermostat underneath on the left). If the airstone is damaged, you are responsible for replacing it, available at a pet store for about $6. Sometimes, it comes from the store damaged—be certain it is in one piece when you purchase it.

c. **Air Tubing**: This connects to the air stone and air pump. If there is mold present inside the tube, replace the tubing; available at a pet store or home improvement center. After the fry are released, hang the tube to dry so mold does not develop.

Airstone

d. **Thermometer**: Aquarium thermometers come with a suction cup so that the temperature can be easily monitored. Check that the thermometer is in working order by noting air temperature and then holding it in your hand. If needed, replacements can be purchased at a pet store.
e. **Siphon Hose**: A great tool to use when changing the water. A small mesh screen rubberbanded to the end in the tank keeps fish from getting sucked into the bucket. Hang to dry after each use. Contact the Clear Creek Task Force if you need a screen.
f. **Buckets**: You should have two white five (5) gallon buckets. They should be clean and only used for Salmon in the Classroom. These will be used to change the water. Use a mild vinegar solution to clean them. Do NOT use detergent (phosphates).

***NOTE**: It's easier to see the salmon fry in a white bucket.*

g. **Egg Tray**: Check that the custom made egg tray is free of rust and the screen is intact.
h. **Rocks**: Clean rocks as necessary to ensure no mold is present. Do this by lightly agitating them in a water and vinegar solution, rinse and dry.

2. Operational Check

To be *completed by HALLOWEEN* to allow time for any needed repairs. Repairs during the winter weather and holiday seasons are challenging for Air Management Solutions.

Materials and Equipment - Aquarium Operational Check

- Aquarium
- Airstone, air pump and tubing
- Thermostat set to the proper temperature (45° – 47° F
- Thermometer with suction cup
- Compressor (motor) connected to the cooling tube
- Two 5-gallon white buckets for water

1. Attach one end of the tubing to the airstone. The other end is attached to the air pump. Place the airstone directly underneath the cooling tube. This aerates the water (salmon need dissolved oxygen) and the rising bubbles inhibit ice forming on the cooling tube.
2. Add water (does not need to be off gassed) to cover the cooling tube, which will cool the water to the desired temperature.
3. Check for leaks around aquarium window. If leaking, contact the Clear Creek Task Force, Info@ClearCreekTrail.org.

Airstone in tank

NOTE: *Condensation on the window is normal.*

4. Plug the power cord into a 120V AC outlet. The motor should start running immediately. If not, contact the Clear Creek Task Force, Info@ClearCreekTrail.org.
5. Check that bubbles are coming out across the entire length of the airstone. If not, check that the tubing is connected properly and the airstone is not clogged. If still not working, replace airstone.
6. Check the thermostat setting (45° – 47°F). The thermostat is a silver box with a dial, located in the back on the bottom left. Put the lid on the tank. Within 5 minutes the cooling tube will begin to work. If not, contact the Clear Creek Task Force, Info@ClearCreekTrail.org.
7. Once the water is at the desired temperature (45°- 47° F), the compressor will cycle on and off as needed to maintain the set temperature. Compare thermometer and thermostat settings for future reference.
8. Your aquarium is functioning normally when:
   a. The water has reached the proper temperature (45° – 47° F) and can maintain this temperature for at least 4 hours
   b. The compressor cycles on and off after reaching the proper temperature
   c. The airstone is working properly directly underneath the cooling tube.
9. Disconnect the power cord and empty the tank. Hang the tubing to dry. Report the results of the Operational Check to the Clear Creek Task Force, Info@ClearCreekTrail.org.
10. If any of these parts is not functioning normally (see #8 above):
    a. Check the Troubleshooting Guide, Section 4 of this manual.
    b. If following the Troubleshooting Guide does not fix the problem, unplug the power cord and contact the Clear Creek Task Force, 360 434 7665, Info@ClearCreekTrail.org for assistance and/or repair.

Section 2. Aquarium Readiness!

(Complete at least 1 week before egg pick up)

1. Egg Tray

Needed to hold the salmon eggs until all the eggs hatch.

a. Remove the airstone and thermometer to a safe place
b. Set the egg tray in the aquarium with the mesh side up.
c. Place rocks on the wooden base of the egg tray to hold it in place.
d. If you need a new one, contact the Clear Creek Task Force, 360 434 7665 or Info@ClearCreekTrail.org.

2. Rocks for the Redd

a. GENTLY place cleaned rocks to cover 1/2 of the bottom of the aquarium

b. Just dumping the rocks in could chip or crack the sealant on the inside of the aquarium.

3. Adding Water

HELPFUL HINT: If this is done 2 or more days ahead of egg delivery, no need to off gas. (See Section 3.3d)

a. Fill the tank to one inch (1”) above the cooling tube. This will likely take 2 – 3 buckets of water—possibly more since full buckets are difficult to lift.

4. Power On

a. Place the airstone directly underneath the cooling tube.
b. Attach the thermometer to the window so it’s visible to the students.
c. Plug in the power cord. The system should start up immediately.
d. With the airstone directly under the cooling tube, check that the bubbles are coming out across the entire 10” length. This aerates the water (salmon need dissolved oxygen) and prevents ice build-up on the cooling tube.
e. Monitor the thermometer to confirm it’s working and the cooling tube is working. Before introducing salmon eggs, the water temperature needs to be between 45°-47°F. It will likely take that much water 1 to 2 days to reach the proper temperature depending on the room temperature.

Aquarium with cover

5. Covering the Window and Top

Salmon eggs are light sensitive, so cover the window with dark paper. You can cut out a flap in the front piece of paper so your students can check on egg development. A styrofoam or cardboard top is also needed to regulate the temperature.

6. Validation of Proper Set Up

a. Run the aquarium for at least one week before eggs are due to arrive.
b. Check water temperature often. It should be between 45°-47°F.
c. Check that the air stone bubbles continuously across the entire length.
d. If experiencing any problems with the above, refer to the Troubleshooting Guide in Section 4 of this manual.
e. If the problem is salmon life threatening or persistent, contact the Clear Creek Task Force immediately, 360 434 7665 or Info@ClearCreekTrail.org.

Section 3. Egg Pickup and Placement; Raising Salmon

1. Egg pickup

a. The 100 salmon eggs and fish food for each aquarium are donated by the Suquamish Tribe. Pickup dates are determined by weather but it usually occurs in early January. The tribe holds the permit for disbursing the chum eggs, which are best suited for Clear Creek.
b. Pick up eggs and food from Grover's Creek Fish Hatchery, 23175 Indianola Road NE, Poulsbo, WA. Hours are 8:00 am until 4 pm.
c. You are responsible for arranging the pickup. Pickup times are scheduled with hatchery staff and volunteers. Dates will be provided by email.
d. Central Kitsap School District teachers MAY have the option of picking up at the Science Kit Center. Check with your district Science Curriculum Specialist.
e. When you receive the eggs, they will be in a small cup with a damp paper towel. The eggs should be placed in the classroom aquarium within an hour of pickup from the hatchery.
f. You will also receive a small bag of food. DO NOT USE THE FOOD UNTIL YOUR SALMON BECOME FRY. See Section 3.5 for more information. Clearly label and store the food in a cool place.

2. Placing the Eggs in the Egg Tray

a. **Gently** place the eggs on the mesh of the egg tray. They should be orange similar to the picture on the right.
b. Gently spread the eggs out.
c. Remove any dead eggs. These are eggs with an opaque white appearance as opposed to red-orange and "eyed" eggs. A turkey baster works well for this.

Healthy Salmon Eggs

3. Changing the Water

Changing the water is necessary because these tanks do not have a filtering system. In a healthy stream, water would wash over the redd to clean it. In your aquarium, change the water based on the stage of your salmon:

a. Eggs: Water change is not necessary
b. Hatching: Change the water daily and remove egg cases after hatching has begun. If egg cases are left in the water, it would change the chemical balance of the water and become a detriment to the salmon.
c. Alevin: Change the water every other day.
d. Fry: Change the water every other day.

NOTE: *Water does not need to be changed on weekends unless the period between changes will exceed 3 days. If so, make arrangements to change the water at least every 3 days.*

Water should be changed as follows:

a. Fill one bucket at least 24 hours before placing the water in the aquarium. Do not cover. This allows any chlorine in the water to evaporate (off gas).
b. Remove about five gallons (one bucket full) of water from the aquarium using the siphon tube or a small container. The used water can be used for plants – they will love the natural fertilizer!
c. Immediately fill the tank with the off gassed, cooled water being careful not to disturb the salmon. You can use the siphon hose to transfer the water from the bucket to the tank. Fill so the cooling tube is covered. The cooling tube **MUST** be under water.
d. Fill the bucket with tap water and store outside to off gas and reach optimal temperature (45° – 47° F) for the next water change.
e. Hang the siphon hose to dry.

HELPFUL HINT: Setting the bucket of water outside to off gas obtains the proper temperature more efficiently.

NOTE: *The clean water should be stored in a protected, cool area. If the water becomes contaminated, DO NOT USE. Instead, discard it, refill the bucket with clean water, and store it for 24 hours before placing it in the aquarium.*

4. Egg Hatch

a. Eggs will usually hatch in about 10 days and the immature fish (alevin or sac fry salmon) will swim down into the rocks.
b. Remove egg cases and dead eggs regularly. A turkey baster works well for this.
c. Once all the eggs have hatched, egg cases and a few more dead eggs may be left in the tray. Carefully remove the tray and discard the dead eggs and cases.
d. The tray should be rinsed, dried and stored for use next year.

Alevin or Sac Fry Salmon

NOTE: *While the eggs are hatching, it is important to change the water daily (except for weekends) as the water will froth due to an enzyme released by the hatching eggs.*

5. Feeding the Fish

a. The fish will feed from their own egg sack for approximately one to two weeks. When the egg sacks are exhausted, the fish will begin to swim freely. ***Start feeding when ALL THE FISH START TO FREE SWIM****.*

PLEASE NOTE: Very little food is needed. Food that sinks to the bottom of the tank will not be eaten by the fish. Food on the bottom of the tank means cleaning by changing the water more often.

b. For the 100 fish you have, a pinch of food, four times each day is about the right amount. Measure about 1/8 teaspoon of food in a container. Use a popsicle stick to sprinkle tiny amounts of food four times a day. Slow feeding will give small fish a chance to get their share.
c. Feed only as much as your fish will eat in 1 minute. Avoid giving the fish more than they can eat as the uneaten food settles to the bottom of the aquarium. At each feeding observe the fish for 1 minute to see how much food settles to the bottom. Adjust feeding as necessary.
d. Missing a few days over a weekend is okay but make arrangements for longer periods.

6. Transferring the Fish in Preparation for Release into the Stream

***PLEASE NOTE**: The fish should not be removed from the aquarium until immediately prior to taking them to the release site. The water in the buckets will lose its dissolved oxygen in a couple of hours and the fish will die.*

Transfer the fry into a 5-gallon Transport Bucket half full of the aquarium water. Follow the steps below.

Waiting to be released

a. Unplug the aquarium.
b. With a fine screen secured around the siphon hose (a rubber band works well), siphon aquarium water to fill the Transport Bucket about half full.
c. Carefully remove the rocks from the aquarium.
d. Drain the remaining aquarium water until there is about 3" – 6" left.
e. Put the bucket on a table or sturdy chair close to the aquarium.
f. Using the small net, quickly transfer the fry into the Transport Bucket.

***NOTE:** Do not cover the bucket during transport. This deprives the fry of oxygen. Do not use ice or an ice pack in the bucket while in transport as it can crush the fry. If desired, you can purchase a portable aerator available at pet stores.*

7. Releasing the fry into the stream at the field trip

Releasing Salmon

a. If your class attends one of the scheduled field trips, instructions for releasing will be provided by trained Salmon in the Classroom volunteers at the release site.
b. **Salmon Release Tic Sheet**: For each fry that is released into Clear Creek, students should make a tick mark on a sheet. Teachers will turn this in to the Salmon in the Classroom Coordinators at the end of the field trip or by April 1st. These numbers are reported to the Washington Department of Fish and Wildlife so they can keep track of the number salmon that have been introduced into Clear Creek.

8. Releasing the fry into the stream on your own

If your class cannot attend a scheduled field trip, you can release the salmon on your own into Clear Creek.

a. Determine a date and time to release the salmon.
b. Identify a location along Clear Creek to release your salmon. Contact the Clear Creek Task Force if you need more information.
c. Have a dozen or so clear plastic cups, at least 6-8 ounces, two white 5-gallon buckets (the Transport Bucket and an empty bucket), the small net for use at the stream, and a clipboard, paper, and pen to mark each time a fry is released.
d. Right before you leave the school, transfer the fish into the Transport Bucket (see Section 3.6).
e. When you arrive at Clear Creek, fill the empty bucket with creek water.
f. Partially fill each cup halfway with the creek water. Using the net, put 1-5 salmon fry into each cup, depending on the number of fry and students.

Salmon fry waiting for release

***NOTE**: If cups are shallow or too full of water, salmon fry may jump out. You can also have students put their hand flat over the top of the cup to keep the fish from jumping out.*

g. If your class made salmon release tools, have participating students first test the equipment with a cup of water only before introducing the salmon fry.
h. Have the student move to the edge of the stream. Put the cup with the salmon fry in it into their tool. Put the cup in the water and slowly tilt it so the salmon can swim out into the stream.
i. Without a salmon release tool, have your students move to the edge of the stream one at a time. If possible, have students hold the cup in the water and slowly tilt it so the fish can swim out into the stream.

***NOTE**: Release salmon by putting the cup in the water and slowly tilting it so as not to shock the fish by just dropping them in the stream.*

j. Watch as they swim away.
k. Have students or an adult make a tick mark on the clipboard paper each time a fry is released.
l. Repeat until all the fish have been released into the stream.

9. Reporting Requirements

NOTE: *The Salmon in the Classroom program is monitored by Washington Department of Fish and Wildlife. Data on how many fry are released and where they are released is valuable to this program.*

For each fry that is released into Clear Creek, students should make a tick mark on paper. Teachers will turn this in to the Salmon in the Classroom Coordinators at the end of the field trip. For those not attending the scheduled field trip, turn in these reports by April 1st. to the Clear Creek Task Force, P.O. Box 1188, Silverdale, 98383 or Info@ClearCreekTrail.org.

10. Cleaning the Aquarium and Equipment

a. Return to Section 1 for a refresher on how to clean the equipment, then store for next year.
b. If you use the aquarium as a storage bin, please take the time to protect the aquarium lining, air stone, cooling tube and thermometer by wrapping in bubble wrap or an old towel.
c. If minor damage does occur, repair or replace the equipment using the information in this manual.
d. If major damage occurs, contact the Clear Creek Task Force to determine if a service technician can solve the problem. Some repairs are provided free of charge by our partners at AMS in Bremerton. Please extend your heartfelt thanks for this invaluable service to the aged equipment.

Section 4. Troubleshooting Guide

If you are having any problems with the aquarium, please review this Troubleshooting Guide first.

If you cannot solve the problem and need a service call, contact the Clear Creek Task Force for maintenance (Info@ClearCreekTrail.org or 360 434 7665), please provide the contact name, school, tank number, contact e-mail, phone number, description of the problem, and the current aquarium temperature.

Issue: Discolored tubing or hose—looks moldy

- Replace the tubing or hose. Measure the length or take the moldy one to a pet store or home improvement store.

Issue: The paint on the insides of my aquarium is **cracked and/or peeling**.

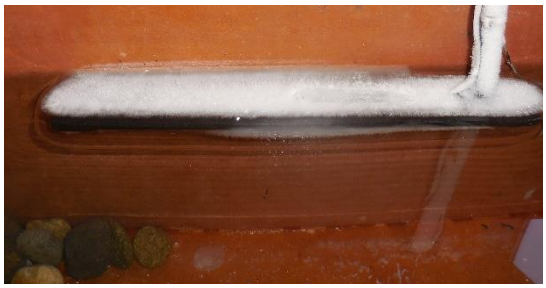
- Remove dried paint with a vacuum
- Use marine salmon safe adhesive to patch the crack.
- Contact the Clear Creek Task Force for more information, Info@ClearCreekTrail.org, 360 434 7665.

Issue: The **temperature is not holding** and the **cooling tube** is covered in frost.

- The cooling tube should always be submerged to operate sufficiently. Add enough off gassed water to cover the tube.

Issue: Ice forming on cooling tube

- Check to make sure that the airstone is positioned directly under the cooling tube. The air bubbles not only provide oxygen, but also circulate the water.
- Be certain the cooling tube is completely submerged.
- Check the water temperature. Adjust the thermostat as needed.
- If there is still no change, contact the Clear Creek Task Force, 360 434 7665 IMMEDIATELY.



Ice on Cooling Tube

Issue: Metal is **exposed on the copper** cooling tube

- The metal of the copper cooling tube should be covered to protect the salmon from exposure to copper, which is toxic to them. This should be done BEFORE FILLING THE AQUARIUM. See Section 1.1.3 for details.

- A quick fix is to cover the exposed metal with electrical tape. Unplug the unit and drop the water level to expose the tube. Dry off the tube so the tape will stick. When the tube is warmer and dry, wrap with electrical tape, overlapping as you go.
- When finished, add off gassed water to cover the cooling tube.

Issue: There is **condensation** on the window

- Because of the difference in room temperature and water temperature, condensation will form on the window. This is normal.

Issue: The **airstone** isn't working/no bubbles are coming from the airstone.

- Check that the air tubing is properly plugged in/seated at both ends.
- Check that the air pump is plugged in and functioning.
- Check that the tubing is not blocked and there are no kinks in the line. This can be easily accomplished with a wet finger held close to the tubing.
- If all of the above are functioning properly and air is still not coming from the airstone, purchase a 10" long air stone at a pet store for about $6. Check to make certain the purchased airstone is intact. They break easily.
- If the new airstone still does not work, contact the Clear Creek Task Force, 360 434 7665 IMMEDIATELY.

Issue: The **airstone** is only producing a stream of bubbles on one end.

- Check to make sure the tubing is properly connected to the air stone and the airpump.
- Check that the tubing is not blocked and there are no kinks in the line. This can be easily accomplished with a wet finger held close to the tubing.
- If air is still not coming from the whole airstone, purchase a 10" air stone at a pet store for about $6. Check to make certain the purchased airstone is intact. They break easily.
- If the new airstone still does not work, contact the Clear Creek Task Force, 360 434 7665 IMMEDIATELY.

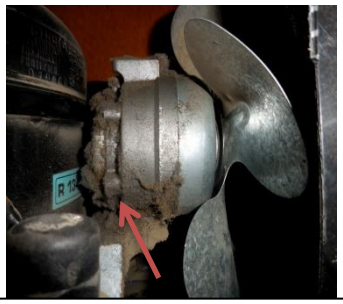
Issue: The **temperature** is higher than the recommended range of 45° 47° F.

- Check to see if there is a buildup of dust on the compressor. If so, carefully dust off or vacuum.
- Monitor the compressor to see if it cycles on and off indicating it is functioning properly. If it's not cycling, contact the Clear Creek Task Force 360 434 7665 IMMEDIATELY.
- If the compressor cycles, the dust has been vacuumed, and the temperature is still too high, adjust the thermostat. Monitor the thermometer constantly to determine if this works. See "Adjusting the Thermostat" at the end of this Troubleshooting Guide.

- If there is still no change, unplug the unit and plug in the air pump only. Add ice in a gallon size ziplock bag to the aquarium to reduce the temperature and keep the fish cool until help arrives.
- Contact the Clear Creek Task Force, 360 434 7665, IMMEDIATELY for repair and an emergency cooling system until the repair can be made.

Issue: The **temperature is lower** than the recommended 45° – 47° F

- Adjust the thermostat. See "Adjusting the Thermostat" at the end of this Troubleshooting Guide.
- This lower temperature will not harm the salmon but will slow their development and the fry may not be fully developed in time for the scheduled field trip.
- If the thermostat does not adjust the temperature, contact the Clear Creek Task Force, 360-434-7665 IMMEDIATELY.



Dusty compressor! Needs to be vacuumed.

Issue: Compressor runs all the time or is louder than usual

- Check to make sure the compressor is free of dust. Vacuum gently or brush off to remove dust.
- Check the thermostat setting. (45° - 47° F) and compare with the thermometer.
- This is usually an indication that the unit needs service NOW. Unplug the unit and plug in the air pump only. Add ice in a Ziplock bag and call or text the Clear Creek Task Force, 360 434 7665 IMMEDIATELY.

Issue: A lot of the **eggs have turned white.**

- An opaque white egg indicates the egg is dead. Remove from the tank as soon as possible. A turkey baster works well for this.
- Check for proper temperature (45° – 47° F).
- Make sure the airstone is functioning properly.

Issue: There are lots of **particles floating** around in the water

- Remove egg cases, any dead (white) eggs, alevin or fry. These can spread fungus and disease if left in the water.
- Change the water as required. See Section 3.3.

Issue: Foam is forming on the top of the aquarium.

- Change the water immediately. Replace at least one 5-gallon bucket with each water change.
- Remove dead eggs, alevin, or fry as soon as possible. Using a turkey baster works well.
- If these are not causing the problem, replace 5 gallons of off gassed water twice in one day. Spread this out over time — possibly one 5-gallon bucket in the

morning and one in the afternoon to avoid stressing your fish. Plan ahead. Make sure the water is off gassed and the proper temperature.

Issue: The **power has gone out**

- Your salmon should be ok for about an hour.
- If you've started feeding your salmon, avoid feeding until the power is back on.
- If there is a storm predicted that could knock out power, change the water just before the storm.
- If the power outage lasts more than an hour:
    - Put ice in a gallon-size Ziploc bag and add that to the tank. Replace as needed.
    - You can GENTLY move the water around in the tank with a net periodically to simulate circulation.
    - For longer outages or if your school loses power regularly, consider getting a battery-operated aerator. You can also use this in the bucket when transferring your fish for release.

Issue: Our field trip is in less than 5 days and our **salmon are still alevin**.

- Colder temperatures slow the development of salmon. If your water temperature is lower than the recommended 45° – 47° F, try increasing your tank temperature by 1° each day.
- Be very careful—large temperature changes and too warm water (55°F) can be lethal to salmon.

Issue: The **rocks** that were in my tank are no longer there.

- Replace the rocks with ¾" to 1 ½" rock—about 1/3 of a bucket. Agitate the rocks in a vinegar solution, rinse, and dry them before putting them in the aquarium.

Issue: Adjusting the thermostat to reach the ideal temperature for salmon eggs (44° - 46°F)

- First and foremost, please make certain all mechanical parts under the tank are free from dust, then begin troubleshooting.
- In the back of the cabinet on bottom left, there is a silver box with a dial. This is your thermostat. It controls the compressor that controls the temperature of the water. Water temperature in the mid-40s is best for raising salmon eggs to fry.
- Make a note of where the dial is currently set and the tank's water temperature. A picture on your phone is the best method to see where the dial is set.
- If the tank temperature needs to be colder (mid-40s), turn the dial clockwise a few marks. Listen and record if and how often the compressor cycles on. Monitor the temperature and compressor cycles for at least an hour; record the results before making more adjustments.

Note: warmer temperatures will result in the salmon developing faster than in colder temperatures.

- If the tank temperature needs to be warmer (mid-40s), turn the dial counterclockwise a few marks. Listen and record if and when the compressor cycles on. Monitor the temperature and compressor for at least an hour; record the results before making more adjustments.
- When the compressor shuts off for a period of time, that means the tank has reached the temperature the dial is set at. Make a mark of the temperature on the thermostat for future reference.
- These tanks were built with refrigerator parts by the Silverdale Kiwanis Club. They are at least 30 years old. Over the years, the refrigerant will need to be refilled to operate properly. If the temperature will not stabilize in the mid-forties, this could be the problem.
- If the compressor does cycle on and off, but the temperature does not change, it may need to have the refrigerant refilled. Please be certain that the mechanical parts are dusted off before the technician arrives. Their time and expertise is donated.
- If the compressor does not cycle on and off at all, unplug and call or text the Clear Creek Task Force IMMEDIATELY, 360 434 7665.

If after following the Troubleshooting Guide you cannot solve the problem, contact the Clear Creek Task Force for repair and/or maintenance (Info@ClearCreekTrail.org or 360 434 7665). The following information will be needed: contact name, school name and address, hours/days available, contact e-mail, phone number, tank number, description of the problem, how long it's been a problem, and the current aquarium temperature. Info@ClearCreekTrail.org or 360-434-7665.

Project Timeline

Timeline for Teachers - Salmon in the Classroom REV August 2018												
Task	**Sept**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**August**
Determine with teaching partner(s) if you are particpating in Salmon in the Classroom this school year	•											
Complete registration when link emailed		•										
Inventory supplies for the aquarium		•										
Attend Aquarium Training (tentative)		•	•									
Inspect Aquarium		•										
Clean Aquarium		•										
Complete an Operational Check of the Aquarium		•										
Set up Aquarium at least 1 week before egg pickup				•	•							
Add water at least 1 week before egg pickup				•	•							
Pick up eyed salmon eggs					•							
Salmon Lessons		•	•	•	•	•	•					
Raise salmon					•	•	•					
Monitor aquarium					•	•	•					
Change water and maintain aquarium					•	•	•					
Respond to field trip registration					•							
Make field trip arrangements (transportation, permission slips, etc.)						•						
Release salmon at field trip or on own							•					
Clean and dry aquarium and equipment							•	•				
Store aquarium and supplies safely	•	•						•	•	•	•	•
Report # of salmon released							•	•				

For further information and instruction

Clear Creek Task Force
360.434.7665
info@clearcreektrail.org

The Salmon in the Classroom Program was started by the Central Kitsap Kiwanis Club in 1988. It is now a partnership with the Clear Creek Task Force, Silverdale Kiwanis Club, Clean Water Kitsap, Kitsap Public Utility District, United Van Lines, Suquamish Tribe, Air Management Solutions and over 30 local classrooms with the shared goal of enhancing the salmon population in Clear Creek and educating students on the importance of ecosystems.

Resources – Field Trip Opportunities and Websites

Field Trip Opportunities

There are several local opportunities for fall field trips to see salmon returning to local streams.

Grovers Creek Fish Hatchery: Located in Indianola and run by the Squamish Tribe, tours are offered in the fall while salmon are returning to spawn, https://suquamish.nsn.us/home/departments/fisheries/finfish/salmon-enhancement/

Kitsap Salmon Tours: Limited school field trips to several Kitsap locations to view adult salmon returning to spawn are available through the Kitsap Salmon Tours planning group. Visit the website *www.kitsapsalmontours.org* to inquire about availability.

Quilcene National Fish Hatchery: Run by the US Fish and Wildlife Service, the Quilcene National Fish Hatchery offers educational programming and tours of the hatchery, *https://www.fws.gov/quilcenenfh/Outside.cfm*.

Websites

Highlighted here are some websites that provide great resources for teachers and students studying salmon and our environment.

Clear Creek Trail: Located in Silverdale, the trail is more than just for walking. Citizen science and volunteer opportunities are also available, *https://www.clearcreektrail.org/*.

Great Peninsula Conservancy: A local organization working to protect land and water through land conservation, stewardship, and education. Volunteer opportunities available, *https://greatpeninsula.org/*.

Hood Canal Bridge Ecosystem Impact Assessment: Long Live the Kings, the Hood Canal Coordinating Council, tribes and state and federal agencies are working to address high steelhead deaths at the Hood Canal Floating Bridge that could also be impacting salmon. This website provides a summary of the program including a 13-minute video explaining the data collected. This resource can provide teachers with background information to share with elementary students at their level, *https://lltk.org/project/hood-canal-bridge/*.

Hood Canal Salmon Enhancement Group: Local research and restoration projects related to salmon and habitat. Volunteer opportunities also available, *https://www.eopugetsound.org/magazine*.

Methow Beaver Project: This project located in the Methow Valley of Washington State promotes beavers as a tool for stream restoration, *https://methowbeaverproject.org/beaver-solutions/education-programs/.*

Puget Sound Institute: This University of Washington resource provides analysis, research, and communication to inform and connect the science of ecosystem protection, *https://www.pugetsoundinstitute.org/* Resources include:

1. *Encyclopedia of Puget Sound*: The most current science on a variety of topics that can be searched by keyword, type or most recent, *https://www.eopugetsound.org/articles*.
2. *Salish Sea Currents*: This online magazine features stories about the science and research surrounding Puget Sound recovery. The latest stories are posted on the main page; click More Stories for links to previous stories, *https://www.eopugetsound.org/magazine* .

Salmon Breeding Colors: photographs of various salmon species and their spawning colors, *https://www.salmonography.com/Salmonid-Topic/Breeding-colors/.*

Salmon Homecoming Alliance, *https://salmonhomecoming.org/* **:** This Seattle nonprofit provides a variety of cultural and educational resources including:

1. *Virtual School Days*: a variety of videos celebrating the return of salmon and Coast Salish cultural activities, *https://salmonhomecoming.org/virtual-school-days/*.
2. *Salmon Homecoming Student Workbook*: at the bottom of the page, click on the link or icon to download the workbook, *https://salmonhomecoming.org/education/*.

Survive the Sound: This online interactive game from Long Live the Kings allows you and your students to pick a fish and follow it as it migrates through Puget Sound. Migration information is based on actual tracking data from previous years. The game begins in early May with registration opening sometime in April. *https://lltk.org/project/survive-the-sound/#:~:text=Survive%20the%20Sound%20is%20an%20interactive%20online%20game,of%20imperiled%20steelhead%20and%20the%20challenges%20they%20face*.

Resources – Good Fit Books

Several trade books support the learning targets of this investigation. Some may be available in your school's library or you can also access this extensive list developed by the Kitsap Regional Library, https://www.krl.org/celebrate-salmon-returning-kitsap. This KRL list includes children's books as well as a few adult books.

Salmon Forest by Suzuki & Ellis: One fall day, Kate goes with her father, a fish biologist, to the river where he works — a river in the Pacific rain forest — the "salmon forest," as he calls it. Together they watch the sockeye salmon returning to the river to spawn, and witness a bear scooping up a salmon. Next, Kate and her dad run into a Native boy named Brett and his family fishing at a pool in the river. From her adventures, Kate discovers how the forest and the salmon need each other and why the forest is called the salmon forest. David Suzuki and Sarah Ellis's charming and informative text and Sheena Lott's watercolors magically evoke the spirit and mystery of the West Coast rain forest.

Salmon by Ron Hirschi: You're watching a stream, when all of a sudden, SPLASH! A fish jumps up out of the water and heads . . . upstream? Salmon are incredible fish that make a journey upstream each year to spawn, or reproduce. Found in the cold, dark waters of the northern Pacific Ocean coasts from California to Alaska and from Japan to Siberia, these fascinating creatures can grow to weigh as much as 100 pounds! With breathtaking photographs and fact-filled text, watch salmon grow from tiny eggs, to small fry, to jumping fish.

Resources – Performance Task – Saving Our Salmon – Water Flow

Method
Teacher led

Time Required
Part 1: 60-90 minutes
Part 2: 70 minutes

Materials
Copies from provided blackline masters of:

- Performance Task – Saving Our Salmon – Water Flow

Background Information
This is the second of two ELA Performance Tasks included in this curriculum. A pdf of this task is included in the Blackline Masters. These are a good fit for supporting the CCSS ELA skills students need to access the science concepts worked with in Salmon in the Classroom. They can be used to provide additional research while learning about salmon or after investigations as a way to continue to develop your students' conceptual understanding of the concepts addressed.

These performance tasks use environmental problems or issues as the context while students apply English language arts (ELA) skills of reading, writing and researching to complete the work. Performance tasks are tailored to assist educators in integrating locally relevant, complex texts with the Next Generation Science Standards (NGSS) and Common Core while providing frameworks for constructing meaningful field experiences for students.

These performance tasks are included with permission from Pacific Education Institute (PEI) based in Olympia, Washington. PEI has other performance tasks available for download at https://pacificeducationinstitute.org/download-performance-task/g35/?pid=g35&newsignup=y.

Procedures
- Follow the procedures in the Performance Task

Resources: Salmon Field Guide, Kitsap Edition

Completed in 2016, this comprehensive guide provides information on the salmon life cycle, habitat, and biology as well as cultural connections and some Puget Sound history.

The guide can be accessed in a variety of ways:

- If you have a salmon tank in your school, there should be a copy of the Salmon Field Guide, Kitsap Edition, with the tank.
- Copies of the Salmon Field Guide, Kitsap Edition, are available for teachers by contacting Kitsap 1, *help@kitsap1.com*, 360-337-5777. One copy per teacher.
- A class set of the Salmon Field Guides, Kitsap Edition, is available for check out by contacting Kitsap 1, *help@kitsap1.com*, 360-337-5777.
- The Salmon Field Guide, Kitsap Edition and several posters from the Guide are also available online. Although the Guide is copyrighted, the posters listed can be printed and reproduced for educational purposes.

***NOTE**: Some of these posters are already included in the blackline masters section of this curriculum.*

  - Salmon Field Guide, Kitsap Edition Flipbook, http://online.anyflip.com/nhxs/vhmm/mobile/index.html#p=1
  - Salmon Life Cycle, https://www.kitsapgov.com/pw/Documents/Kitsap_Salmon_Guide_Salmonid_Life_Cycle.pdf
  - Salmon Mortality Pyramid https://www.kitsapgov.com/pw/Documents/Kitsap_Salmon_Guide_Salmon_Mortality_Pyramid.pdf
  - Salmon in Kitsap Streams *https://www.kitsapgov.com/pw/Documents/Kitsap_Salmon_Guide_Salmon_in_KC_Streams.pdf*
  - Salmon Identification Poster (11 x 17) https://www.kitsapgov.com/pw/Documents/Kitsap_Salmon_Guide_Salmon_ID_Poster.pdf
  - The Big Three (stream bugs) https://www.kitsapgov.com/pw/Documents/Kitsap_Salmon_Guide_Salmon_ID_Poster.pdf
  - Stream Habitat https://www.kitsapgov.com/pw/Documents/Kitsap_Salmon_Guide_Stream_Habitat.pdf


A STORMWATER EDUCATION LESSON
Salmon Exploration

Resources - Videos

Kitsap Salmon Tours

Kitsap Salmon Tours are coordinated by many local organizations. Over the years, various videos relating to salmon have been produced that may be a great addition to instruction about salmon. Many of these videos are also available on the Kitsap Salmon Tours website, *www.kitsapsalmontours.org*.

- **Kitsap Salmon Tours Playlist, 2020**. Kitsap County Public Works has a Kitsap Salmon Tours You Tube playlist includes videos about the salmon life cycle, salmon and beaver dams, and several short videos showing specific salmon behaviors in local streams. *https://www.youtube.com/playlist?list=PLQJx9SWWfqRoY0SVNpsiyzfTnLN4eg5LX*
- **Kitsap Salmon Tours Webinar Series, 2020.** A series of recorded webinars from WSU Extension Kitsap and Washington Sea Grant.
    - *Intro to Salmon and Their Life Cycle*. Learn about salmon, their amazing migratory journey and their anatomy that helps them through their migration. Includes a salmon dissection. *https://www.youtube.com/watch?v=KbTFn8A4_1M&feature=emb_title*
    - *Water Quality and Salmon*. Learn about research being conducted about salmon pre-spawn mortality in Puget Sound streams and rivers as well as how the Kitsap Conservation District supports local water quality. *https://www.youtube.com/watch?v=6LKOMVm6yh0&feature=emb_title*
    - *Climate Threats, Cultural, Humans and Economic Aspects*. Learn how salmon are affected by climate threats and humans impacts, as well as the local work being done in Kitsap County to improve salmon habitat. *https://www.youtube.com/watch?v=7Xb7JSp5TRI&t=8s*
- **Kitsap Salmon Report, 2020**. Kitsap Regional Library Youth Librarians teamed with the Clear Creek Trail, sharing what salmon need to survive. *https://www.youtube.com/watch?v=F2r0RLOSHeU&feature=emb_title*
- **Great Peninsula Conservancy, Grovers Creek Black Bear and Chinook salmon, 2020**. Watch as a bear and her cubs get lunch at a local creek in Kitsap County. *https://vimeo.com/98827663*
- **Salmon and Beaver Dams, Kitsap Salmon Tours 2019**. This 360° video from Olympic College Film School shows how salmon navigate beaver dams. Be sure to use your mouse to move around and look wherever you and your students want to! *https://www.youtube.com/watch?v=Ive-QiJyQ5U&feature=youtu.be*
- **Kitsap Salmon Tours 2018**. Kitsap Salmon Tours and salmon viewing. *https://www.youtube.com/watch?v=-8C-6ShWraw*

Local Videos

Several local groups and agencies have salmon-related videos available on You Tube.

- **Kitsap Conservation District (KCD) videos**. KCD works cooperatively with private landowners to help preserve our natural resources.
  https://www.youtube.com/user/KitsapCD/videos
- **Steelhead Eggs Hatching, US Fish and Wildlife Service**. Steelhead are sea-run versions of rainbow trout and have a life cycle similar to salmon. This video from the Quilcene Hatchery shows eggs hatching to alevin.
  https://www.youtube.com/watch?v=dnX4ZKvYTHs
- **Coho Salmon and Copper**: researchers from WSU show how small amounts of dissolved copper in water (usually from copper brake pads) can deaden a salmon's sense of smell, which normally alerts the fish to the presence of predators. Review this video and the text below it before showing to students. Note that the top tank has no copper and the bottom tank has 10 micrograms/liter (10 parts/billion) of copper. The green dot at the top will change to red once copper has been introduced. Have your students observe what happens to the coho salmon fry. Which is more likely to get seen, and most likely eaten, by a predator? (HINT: the one that keeps moving).
  https://www.youtube.com/watch?v=VkuwnYYEllA&feature=emb_logo
- **Bringing Clear Creek Back to Life, 2018**. Overview of how development in Silverdale impacted Clear Creek and recent projects completed to restore the creek and habitat. *NOTE: The Clear Creek Floodplain Project area is where students raising salmon as part of the Clear Creek Salmon in the Classroom program will release their salmon.*
  https://www.youtube.com/watch?v=OAwakWFGcMs&list=PLQJx9SWWfqRph9MGU29BQPyXeLHvkWXbq&index=5.
- **Manchester Stormwater Park, 2016.** This public park provides water quality treatment of stormwater for approximately 100 acres of the Manchester community, improving water quality for salmon and other aquatic life.
  https://www.youtube.com/watch?v=k6CQbin4czU&list=PLQJx9SWWfqRph9MGU29BQPyXeLHvkWXbq&index=6
- **Bucklin Hill Bridge Project, 2016.** The replacement of 2 six-foot culverts with a 240' bridge not only improved traffic in Silverdale, but it provided habitat improvement for the aquatic life living in Clear Creek.
  https://www.youtube.com/watch?v=yboMhZShNus&list=PLQJx9SWWfqRph9MGU29BQPyXeLHvkWXbq&index=2
- **Stillhope Productions**. John Williams is a local videographer. His short videos on nature and the environment are a great learning resource for you and your students. *https://vimeo.com/stillhope/videos/page:1/sort:date*. A few videos geared specifically for the younger age group include:

- **Is This Where Puget Sound Starts?**, 4 minutes. Ron Hirschi, local biologist and author, explores 2 creeks in Poulsbo. *https://vimeo.com/98827239*
- **Who Uses the Rain?**, 4 minutes. See how water flows from Klahowya Secondary school in Central Kitsap down to Chico Creek and how animals and runoff have an impact on the stream. *https://vimeo.com/98827663*
- **Who Swims in the Rain?**, 4 minutes. Students from Olalla Elementary School share ways to protect streams like Olalla Creek, *https://vimeo.com/98826947*.

- **The Hidden Treasures of Kitsap County, 2008.** Join Community Forester Jim Trainer to learn about trees of Kitsap County and their cultural and habitat importance. *https://www.bing.com/videos/search?q=jim+trainer+bremerton+video&docid=607998383985132390&mid=8CF35F011799237A664A8CF35F011799237A664A&view=detail&FORM=VIRE*

Deep Look Series KQED and PBS

This series, created by KQED San Francisco and presented by PBS Digital Studios, has an amazing variety of short (3-5 minute) ultra-HD (4K) videos on a variety of natural and animal occurrences—but seen very closely. Here are a few that connect to salmon and streams:

- There's Something Very Fishy About These Trees *https://www.youtube.com/watch?v=rZWiWh5acbE&feature=youtu.be*.
  Take a close look at how salmon impact the vegetation all around streams.
- Sticky. Stretchy. Waterproof. The Amazing Underwater Tape of the Caddisfly *https://www.youtube.com/watch?v=Z3BHrzDHoYo&list=PLdKlciEDdCQDxBs0SZgTMqhszst1jqZhp&index=82&t=0s*.
  See how these bugs that salmon may eat build their homes.
- Why Beavers are the Smartest Thing in Fur Pants *https://www.youtube.com/watch?v=Zm6X77ShHa8*.
  Learn about beavers, their history, and how they support other wildlife.
- This is Why Water Striders Make Terrible Lifeguards, *https://www.youtube.com/watch?v=E2unnSK7WTE*.
  How do water striders walk on water and what do they eat? Also makes connections to properties of water like surface tension.
- A Baby Dragonfly's Mouth Will Give You Nightmares *https://www.youtube.com/watch?v=EHo_9wnnUTE*.
  Learn about the unique parts of a dragonfly nymph's mouth and watch it in action. (Another stream critter salmon may eat!)

Resources – Vocabulary List

These vocabulary words are important to understanding salmon. Those words with a * can also be found on the Washington Comprehensive Assessment of Science vocabulary list.

The vocabulary words are listed in two ways:

1. Alphabetical
2. By topic relating to needs of salmon as well as field trip stations at the Clear Creek Salmon in the Classroom field trips.

Alphabetical

- ***acclimated***: get used to new conditions.
- ***adipose fin***: small fin on back between dorsal and tail with no known function.
- ***adult***: salmon living in the ocean waters for 1-7 years.
- ***advantage****: a better chance or position.
- ***alevin***: newly spawned salmon or trout that still have the yolk sac attached. Salmon is dependent on yolk sac for nutrition. Alevins are usually buried within the gravel of the stream bottom.
- ***anadromous***: fish born in freshwater that spends most of its life in the sea/ocean and then returns to freshwater to spawn (e.g. salmon, sturgeon, smelt, shad, striped bass)
- ***anal fin:*** help fish to keep its balance and not tip.
- ***aquarium***: a glass/plastic container (tank, bowl or the like) in which fish or other living aquatic animals or plants live or are kept.
- ***behavior****: the typical actions of a person, animal, thing or group, either in general or in certain situations.
- ***benthic***: relating to the bottom of a body of water or the organisms living there.
- ***bioaccumulation***: process by which toxic chemicals, industrial waste, etc. gradually accumulate or build up in living tissue.
- ***bioindicators of stream health***: macroinvertebrates living in a stream can provide information about the health of the stream (healthy vs. unhealthy).
- ***biological monitoring***: continual examination of biological specimens taken from an environment (such as air, water, food) or from a body (such as blood, urine, body tissue) for identification of health risks or for course of therapy.
- ***camouflage****: a way of hiding something by covering or coloring it so it looks like its surroundings.
- ***caudal fin:*** tail fin used for jumping and swimming.
- ***cause****: something or someone that brings about a result of effect.
- ***Celsius***: denoting a scale of temperature in which water freezes at 0 degrees.

- ***characteristic****: having to do with a typical or special quality of a person, animal, group or thing.
- ***chemical monitoring***: checking certain characteristics of water (dissolved oxygen, temperature, pH, etc.) using chemical tests.
- ***confluence***: a place where two (2) rivers or streams join to become one (1).
- ***culvert***: a tunnel (usually a pipe) carrying a stream or open drain under a roadway or railway.
- ***cumulative***: increasing or growing by accumulation or successive additions.
- ***deposition***: geological process in which sediments, soil, and rocks are added to a landform or land mass through forces of erosion.
- ***disadvantage****: a condition or situation that makes it more difficult to succeed.
- ***dissolved oxygen***: tiny bubbles of oxygen in a gas form mixed in the water, and available for aquatic organisms to use.
- ***diversity***: showing a lot of variety.
- ***dorsal fin:*** keeps the fish upright and controls direction.
- ***egg***: fully ripe released egg in freshwater (Roe are the internal egg masses in the ovaries of a female fish.)
- ***environment****: all things together that surround animals and humans in the natural world, including the air, the water, and the soil.
- ***environmental stressor***: something in the environment that can negatively impact an organism (e.g. pollution, extra sediment from erosion, urban and agriculture runoff, sewage, clearing land, alien/non-native species, channelization, temperature change).
- ***erosion****: the process by which water, ice, wind, and gravity moves fragments of rock and soil.
- ***estuary***: the area where the fresh water from a river or stream meets the salt water of a sea. Estuaries experience tidal flows, so the water is a changing mixture of salt and fresh water.
- ***evidence****: something that gives proof or reason to believe.
- ***Fahrenheit***: denoting a scale of temperature in which water freezes at 32 degrees.
- ***fertilizer***: a chemical or natural substance added to soil to help plants grow.
- ***fins:*** exterior parts of a fish's body used to move it through the water.
- ***flood plain***: flat land bordering a river that is naturally subject to flooding.
- ***food chain***: linear network of links of organisms in an ecosystem in which each link feeds on the one before it and then is fed upon by the one after it. The first link is a ***producer*** (plant) and the rest are ***consumers*** (animals/organisms that feed on other animals/organisms). The food chain is a diagram showing how food energy is moved/transferred from one organism to another.
- ***food web***: intertwining network of different food chains that show feeding relationships by which energy and nutrients are passed/transferred from one organism to another.

- ***forage***: to search for food.
- ***fry***: young salmon who have absorbed the yolk sac and have emerged from the gravel nest (redd). Salmon emerge in the spring when water temperatures reach about 50F and begin feeding on invertebrates.
- ***function****: the purpose or role that an object or a person fulfills or is suited for.
- ***gills***: respiratory organ found in many aquatic organisms that filters oxygen from the water.
- ***graph****: a diagram that shows a relationship between two or more changing things by lines, bars, dots, or portions of a circle.
- ***groundwater****: water held underground in soil or pores and crevasses in rock. It completely fills the air spaces between rock and soil particles.
- ***habitat****: the natural home or environment where an animal, plant, or other organism lives.
- ***hatchery***: a place where people raise and hatch eggs of fish, chickens, etc. under artificial conditions to raise young.
- ***impact****: a strong and powerful effect.
- ***impervious surface***: a surface that does not allow/permit liquid (e.g. water) to pass through or be absorbed which leads to runoff.
- ***insensitive or not sensitive***: organisms that can live and thrive in high levels of pollution or environmental stressors.
- ***interaction****: the action or influence of people, groups, or things on another.
- ***invasive plants:*** not a native to a location and usually tends to spread to cause damage to the environment, human economy, or human health.
- ***invertebrate***: organism or animal with no backbone.
- ***investigation****: to study by close examination and structured inquiry.
- ***large woody debris***: trees, logs, root wads, and large tree branches that fall into streams and interact with the water, sediment, and organisms in a channel of water.
- ***larvae***: immature phase of complete metamorphosis for a bug's life cycle. Larva generally do not look like the adult. Maggot is a term used for larva of some flies.
- ***lateral line***: a sensory organ along the side of the fish used to detect motion and vibration.
- ***life cycle****: the sequence of changes a living thing goes through as it grows and develops.
- ***macro***: able to see with the naked eye.
- ***macroinvertebrate***: organism that lives underwater in the streams and rivers that lacks a backbone, and can be seen by the naked eye (e.g. insects, worms, crustaceans, mollusks, etc. Also, aquatic critters such as mayflies, stoneflies, caddisflies, dragonflies, rat-tailed maggots, scuds, snails, leeches.).
- ***marine****: relating to the sea or ocean.
- ***meandering***: a winding stream, path, or course (not straight).

- ***migration***: seasonal movement of animals from one region to another. Migration is usually a result of changing temperatures, food supply, or amount of daylight. Salmon migrate from freshwater to salt water and then later from salt water to fresh water to spawn.
- ***milt***: a milk-colored substance the male releases into a red to fertilize the female's eggs.
- ***nares:*** fish nostrils used for smelling, but not breathing.
- ***native plants***: plants that occur naturally in a particular region or ecosystem.
- ***nymph***: immature phase of incomplete metamorphosis for a bug's life cycle. Nymphs generally resemble the adult but are smaller and do not have wings.
- ***observation****: the act or an instance of perceiving the environment through one of the senses; a comment or remark.
- ***offspring****: the child or young of a particular human, animal, or plant.
- ***parr marks***: dark vertical marks on the sides of young salmon that help them hide.
- ***parts per million (ppm)***: usually describes the concentration of something in water or soil with how many parts out of a million. 1ppm=1mg of something per liter of water OR 1mg of something per kilogram of soil.
- ***pectoral and pelvic fins:*** used for turning, backing up, stopping, and balancing.
- ***pervious or permeable surfaces***: allow water to percolate into the soil to filter out pollutants and recharge the water table (groundwater).
- ***pesticides***: a chemical used to kill harmful animals or plants. Pesticides include fungicides, herbicides, insecticides, and rodenticides.
- ***pH***: measure of hydrogen ion concentration or the acidity or alkalinity of a solution on a scale from 0 to 14. Less than 7 is acidic, more than 7 is alkaline, and 7 is neutral.
- ***pollution****: the presence of a substance or thing that has harmful or poisonous effects on the environment.
- ***redd***: gravel nest made by the spawning female with her tail in a freshwater stream.
- ***riffle***: a rocky, shallow part of a stream with rough water.
- ***riparian zone or habitat***: area bordering a river or other bodies of water that include floodplains and water-loving plants.
- ***runoff****: the draining away of water and the substances carried in it from the surface of an area or land. Also see Stormwater runoff.
- ***salmonid***: any elongated, bony fish of the family Salmonidae such as salmon and trout.
- ***scales***: small, hard plates that cover the body for protection.
- **Scientific diagram**: a simple, clear representation that explains the parts or operation of something, a scientific process, an experiment, or equipment.
- ***sediment****: small, solid particles of material from rock or organisms which are moved by water or wind resulting in erosion and deposition.

- ***sense receptor****: a part of the body that takes in information and sends it to the brain.
- ***sensitive:*** organisms that are easily impacted/changed by environmental stressors which may cause infertility or death.
- ***slime:*** a clear, slippery substance that covers a salmon's body and protects it.
- ***smolt***: silvery-colored young, juvenile salmon migrating from freshwater to saltwater so their internal organs can change and adapt from fresh to salt water.
- ***spawning***: when a fish releases or deposits eggs or milt. The female digs a red in the stream bottom and deposits her eggs; the male then covers the eggs with milt to fertilize them.
- ***species****: a group of living things that can mate with one another but not with those of other groups.
- ***stormwater runoff:*** the water and substances carried from the surface after a storm event. Also see Runoff.
- ***structure****: a thing made up of several parts joined together in a certain way.
- ***survive****: to continue to live despite serious threat to one's life.
- ***temperature****: the measure of warmth or coldness of an object or substance with reference to some standard value or scale.
- ***trait****: a characteristic or quality that makes a person or animal different from others.
- ***turbidity***: a measure of how clear the water is.
- ***water or hydrologic cycle***: the continuous movement of water on, above, and below the surface of the earth through evaporation, condensation, precipitation, and transpiration; the natural sequence through which water passes into the atmosphere as water vapor, precipitates to earth as a liquid or solid form, and ultimately returns to the atmosphere through evaporation.
- ***water quality:*** describes the condition of water with respects to its chemical, physical, and biological characteristics.
- ***watershed***: area of land that drains water and everything in the water into the same body of water (creek, river, lake, bay, etc.).
- ***wetland****: areas that are saturated by surface or groundwater much of the year; where water covers the soil or is present either at or near the surface of the soil all year or varying periods of time during the year. Wetlands contain plants and soils that have adapted to wet or soggy conditions. Examples of wetlands are estuaries, marshes, swamps, bogs.
- ***zooplankton***: tiny animals that salmon feed on during the ocean stage of life.

Sorted by Field Trip Station – Clear Creek Salmon in the Classroom

Stream Bugs

- ***benthic*:** relating to the bottom of a body of water or the organisms living there.
- ***bioindicators of stream health***: macroinvertebrates living in a stream can provide information about the health of the stream (healthy vs. unhealthy).
- ***biological monitoring***: continual examination of biological specimens taken from an environment (such as air, water, food) or from a body (such as blood, urine, body tissue) for identification of health risks or for course of therapy.
- ***chemical monitoring***: checking certain characteristics of water (dissolved oxygen, temperature, pH, etc.) using chemical tests.
- ***diversity***: showing a lot of variety.
- ***environmental stressor***: something in the environment that can negatively impact an organism (e.g. pollution, extra sediment from erosion, urban and agriculture runoff, sewage, clearing land, alien/non-native species, channelization, temperature change).
- ***insensitive or not sensitive***: organisms that can live and thrive in high levels of pollution or environmental stressors.
- ***invertebrate***: organism or animal with no backbone.
- ***larvae***: immature phase of complete metamorphosis for a bug's life cycle. Larva generally do not look like the adult. Maggot is a term used for larva of some flies.
- ***macro***: able to see with the naked eye.
- ***macroinvertebrate***: organism that lives underwater in the streams and rivers that lacks a backbone, and can be seen by the naked eye (e.g. insects, worms, crustaceans, mollusks, etc. Also, aquatic critters such as mayflies, stoneflies, caddisflies, dragonflies, rat-tailed maggots, scuds, snails, leeches.).
- ***nymph***: immature phase of incomplete metamorphosis for a bug's life cycle. Nymphs generally resemble the adult but are smaller and do not have wings.
- ***pesticides***: a chemical used to kill harmful animals or plants. Pesticides include fungicides, herbicides, insecticides, and rodenticides.
- ***pollution****: the presence of a substance or thing that has harmful or poisonous effects on the environment.
- ***riffle***: a rocky, shallow part of a stream with rough water.
- ***runoff****:* the draining away of water and the substances carried in it from the surface of an area or land. Also see Stormwater runoff.
- ***sensitive:*** organisms that are easily impacted/changed by environmental stressors which may cause infertility or death.
- **scientific diagram**: a simple, clear representation that explains the parts or operation of something, a scientific process, an experiment, or equipment.
- ***stormwater runoff: t***he water and substances carried from the surface after a storm event. Also see Runoff.

Salmon Release

- ***acclimated***: get used to new conditions.
- ***adipose fin***: small fin on back between dorsal and tail with no known function.
- ***adult***: salmon living in the ocean waters for 1-7 years.
- ***alevin***: newly spawned salmon or trout that still have the yolk sac attached. Salmon is dependent on yolk sac for nutrition. Alevins are usually buried within the gravel of the stream bottom.
- ***anal fin:*** help fish to keep its balance and not tip.
- ***caudal fin:*** tail fin used for jumping and swimming.
- ***confluence***: a place where two (2) rivers or streams join to become one (1).
- ***dorsal fin:*** keeps the fish upright and controls direction.
- ***egg***: fully ripe released egg in freshwater. (Roe are the internal egg masses in the ovaries of a female fish.)
- ***fertilizer***: a chemical or natural substance added to soil to help plants grow.
- ***fins:*** exterior parts of a fish's body used to move it through the water.
- ***forage***: to search for food.
- ***fry***: young salmon who have absorbed the yolk sac and have emerged from the gravel nest (redd). Salmon emerge in the spring when water temperatures reach about 50F and begin feeding on invertebrates.
- ***gills:*** respiratory organ found in many aquatic organisms that filters oxygen from the water.
- ***hatchery***: a place where people raise and hatch eggs of fish, chickens, etc. under artificial conditions to raise young.
- ***lateral line***: a sensory organ along the side of the fish used to detect motion and vibration.
- ***marine****: relating to the sea or ocean.
- ***migration***: seasonal movement of animals from one region to another. Migration is usually a result of changing temperatures, food supply, or amount of daylight. Salmon migrate from freshwater to salt water and then later from salt water to fresh water to spawn.
- ***milt***: a milk-colored substance the male releases into a red to fertilize the female's eggs.
- ***nares:*** fish nostrils used for smelling, but not breathing.
- ***parr marks***: dark vertical marks on the sides of young salmon that help them hide.
- ***pectoral and pelvic fins:*** used for turning, backing up, stopping and balancing.
- ***redd***: gravel nest made by the spawning female with her tail in a freshwater stream.
- ***riffle***: a rocky, shallow part of a stream with rough water.
- ***salmonid***: any elongated, bony fish of the family Salmonidae such as salmon and trout.

- ***scales***: small, hard plates that cover the body for protection.
- ***slime:*** a clear, slippery substance that covers a salmon's body and protects it.
- ***smolt***: silvery-colored young, juvenile salmon migrating from freshwater to saltwater so their internal organs can change and adapt from fresh to salt water.
- ***spawning***: when a fish releases or deposits eggs or milt. The female digs a red in the stream bottom and deposits her eggs; the male then covers the eggs with milt to fertilize them.
- ***zooplankton***: tiny animals that salmon feed on during the ocean stage of life.

Water Quality

- ***bioaccumulation***: process by which toxic chemicals, industrial waste, etc. gradually accumulate or build up in living tissue.
- ***biological monitoring***: continual examination of biological specimens taken from an environment (such as air, water, food) or from a body (such as blood, urine, body tissue) for identification of health risks or for course of therapy.
- ***Celsius***: denoting a scale of temperature in which water freezes at 0 degrees.
- ***chemical monitoring***: checking certain characteristics of water (dissolved oxygen, temperature, pH, etc.) using chemical tests.
- ***cumulative***: increasing or growing by accumulation or successive additions.
- ***dissolved oxygen***: tiny bubbles of oxygen in a gas form mixed in the water, and available for aquatic organisms to use.
- ***Fahrenheit***: denoting a scale of temperature in which water freezes at 32 degrees.
- ***gills***: respiratory organ found in many aquatic organisms that filters oxygen from the water.
- ***groundwater****: water held underground in soil or pores and crevasses in rock.
- ***parts per million (ppm)***: usually describes the concentration of something in water or soil with how many parts out of a million. 1ppm=1mg of something per liter of water OR 1mg of something per kilogram of soil.
- ***pesticides***: a chemical used to kill harmful animals or plants. Pesticides include fungicides, herbicides, insecticides, and rodenticides.
- ***pH***: measure of hydrogen ion concentration or the acidity or alkalinity of a solution on a scale from 0 to 14. Less than 7 is acidic, more than 7 is alkaline, and 7 is neutral.
- ***pollution***: the presence of a substance or thing that has harmful or poisonous effects on the environment.
- ***riffle***: a rocky, shallow part of a stream with rough water.
- ***temperature****: the measure of warmth or coldness of an object or substance with reference to some standard value or scale.
- ***turbidity***: a measure of how clear the water is.

- ***water or hydrologic cycle***: the continuous movement of water on, above, and below the surface of the earth through evaporation, condensation, precipitation, and transpiration; the natural sequence through which water passes into the atmosphere as water vapor, precipitates to earth as a liquid or solid form, and ultimately returns to the atmosphere through evaporation.
- ***water quality***: describes the condition of water with respects to its chemical, physical, and biological characteristics.

Habitat

- ***anadromous***: fish born in freshwater that spends most of its life in the sea/ocean and then returns to freshwater to spawn (e.g. salmon, sturgeon, smelt, shad, striped bass).
- ***aquarium***: a glass/plastic container (tank, bowl or the like) in which fish or other living aquatic animals or plants live or are kept.
- ***confluence***: a place where two (2) rivers or streams join to become one (1).
- ***culvert***: a tunnel (usually a pipe) carrying a stream or open drain under a roadway or railway.
- ***deposition***: geological process in which sediments, soil, and rocks are added to a landform or land mass through forces of erosion.
- ***erosion****: the process by which water, ice, wind, and gravity moves fragments of rock and soil.
- ***estuary***: the area where the fresh water from a river or stream meets the salt water of a sea. Estuaries experience tidal flows, so the water is a changing mixture of salt and fresh water.
- ***flood plain***: flat land bordering a river that is naturally subject to flooding.
- ***food chain***: linear network of links of organisms in an ecosystem in which each link feeds on the one before it and then is fed upon by the one after it. The first link is a ***producer*** (plant) and the rest are ***consumers*** (animals/organisms that feed on other animals/organisms). The food chain is a diagram showing how food energy is moved/transferred from one organism to another.
- ***food web***: intertwining network of different food chains that show feeding relationships by which energy and nutrients are passed/transferred from one organism to another.
- ***groundwater***: water below the Earth's surface that completely fills the air spaces between rock and soil particles.
- ***habitat****: the natural home or environment where an animal, plant, or other organism lives.
- ***impervious surface***: a surface that does not allow/permit liquid (e.g. water) to pass through or be absorbed which leads to runoff.

- ***invasive plants:*** not a native to a location and usually has a tendency to spread to cause damage to the environment, human economy, or human health.
- ***large woody debris***: trees, logs, root wads, and large tree branches that fall into streams and interact with the water, sediment, and organisms in a channel of water.
- ***meandering***: a winding stream, path, or course (not straight).
- ***native plants***: plants that occur naturally in a particular region or ecosystem.
- ***pervious or permeable surfaces***: allow water to percolate into the soil to filter out pollutants and recharge the water table (groundwater).
- ***riffle***: a rocky, shallow part of a stream with rough water.
- ***riparian zone or habitat***: area bordering a river or other bodies of water that include floodplains and water-loving plants.
- ***sediment****: small, solid particles of material from rock or organisms which are moved by water or wind resulting in erosion and deposition.
- ***watershed***: area of land that drains water and everything in the water into the same body of water (creek, river, lake, bay, etc.).
- ***wetland****: areas that are saturated by surface or groundwater much of the year; where water covers the soil or is present either at or near the surface of the soil all year or varying periods of time during the year. Wetlands contain plants and soils that have adapted to wet or soggy conditions. Examples of wetlands are estuaries, marshes, swamps, bogs.

*these words can be found on the Washington Comprehensive Assessment of Science vocabulary list.

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Wanted Poster Guide

When Will They Hatch Calendar

When Will They Hatch Worksheet

You Ain't Nothing But a Hound Dog

Clear Creek Salmon in the Classroom Aquarium Use Agreement

The Salmon in the Classroom Aquariums were built by members of the Central Kitsap Kiwanis Club when they first started this program almost 30 years ago. When they disbanded, they persuaded the Clear Creek Task Force and Kitsap County's Surface and Stormwater to administrate the program.

The Clear Creek Task Force (CCTF) along with its partners, Kitsap County Surface and Stormwater Management, Kiwanis Club of Silverdale, Kitsap Public Utilities District #1, Suquamish Tribe, Central Kitsap School District, Kitsap Health Department, Air Management Solutions and many dedicated volunteers have successfully managed the salmonid lifecycle education program Salmon in the Classroom (SitC) since 2003.

The most important and expensive part of these aquariums are the chillers built from refrigerator parts. As these 30-some year old parts fail, they will be replaced with modern chillers at around $300 each. As a nonprofit organization, our financial resources allow replacement of two per year with one chiller held in reserve for emergency use only. Please treat your chiller with care as outlined in our Aquarium Maintenance Manual.

We have put together this agreement so everyone participating in the program will know their important role and hopefully pass on this vital information. Thanks a million.

The Salmon in the Classroom Administrators Shall

- Coordinate all permits and release reporting on behalf of the Suquamish Tribe.
- Assist in acquiring the necessary equipment.
- Provide resources and/or training to support setup and maintenance of the aquarium and equipment.
- Organize pick-up schedule for salmon eggs and food from Grover's Creek Hatchery.
- Provide a loaner chiller on a first-come, first-served basis if the school's chiller fails. The loaner will be available only until the school's chiller is repaired or replaced.
- Assist with repair costs of equipment that fails through normal deterioration.
- Provide Aquarium Maintenance Manual, aquarium checklist*, technical support, and advice about maintenance, problems, and an opportunity for the organized fry release field trips to Clear Creek.

Participating Teachers Shall

- Become familiar with the Aquarium Maintenance Manual before signing this agreement.
- Test equipment readiness* before Thanksgiving break. This allows ample time for repairs to any of the 34 aquariums before egg distribution the first week of January.
- Maintain* the aquarium, chiller, and other equipment according to the procedures in the Aquarium Maintenance Manual.
- Monitor* the aquarium's water temperature daily per the Aquarium Checklist*.
- Keep equipment in a location that the whole school can see unless space and maintenance do not permit.
- Inform school personnel about the importance of leaving the aquarium undisturbed.
- Do not use the aquarium* for anything other than the raising of the salmon provided.
- Release salmon fry* into Clear Creek only per WDFW permit.
- Timely completion and submission of all reporting* and requests for information.
- Perform end-of-season equipment care* as outlined in the Aquarium Maintenance Manual.
- Replace moldy, broken or lost equipment.
- If the aquarium lining, cover, cooling tube, air stone, hoses or thermometer are damaged from improper* use, storage or maintenance, the school will be responsible for the cost of repair.

**Details in the Aquarium Maintenance Manual.*

Classroom Learning

Classroom learning about salmon may take any form that a teacher finds effective, both in providing special salmon lessons and/or incorporating salmon into other activities that address state learning standards. It is recommended that every participating teacher cultivate student learning through observation during the rearing process and strongly encourages every teacher to equip students with broad knowledge of salmon and engage them in aquarium monitoring and care.

- Ensure that students are engaged in monitoring (document daily temperature readings) and maintaining their aquarium.
- Ensure that students observe eggs, alevin, and fry in their aquarium and summarize observations by report, poem, collage, or etc.
- Ensure that students get an overview of salmon species, lifecycle, regional importance, habitat concerns, and practical stewardship actions for their watershed.
- Prepare students for the mid-March release of their fry into Clear Creek either on your own or the optional Salmon in the Classroom Field Trips.

Project Wrap-Up and Reporting

1. Release fry into Clear Creek, report date and fry count to the Clear Creek Task Force Coordinator, ClearCreekTrail@yahoo.com
2. Summarize classroom learning activities and objectives addressed. Submit to ClearCreekTrail@yahoo.com
3. Inform the Clear Creek Task Force Coordinator ClearCreekTrail@yahoo.com if you no longer wish to participate, are changing schools, or are passing the aquarium along to another teacher in your current school.

By signing this agreement, you agree to adhere to all points above to the best of your ability.

This agreement needs to be signed by the responsible teacher. One copy needs to be kept with the aquarium, one copy kept by the school principal, and the original signed copy sent to the Clear Creek Task Force Coordinator, PO Box 1188, Silverdale 98383, or info@clearcreektrail.org.

School Name _____ Office Phone _____

Tank # _____

_____ _____ _____
Lead Teacher's Signature Printed Name Date

_____ _____
Lead Teacher's Phone Lead Teacher's email address

_____ _____
School Principal's Name School Principal's email address

Helpful Hints to remember our Pacific salmon!

Chinook (*King****)***
The king of all fingers

Sockeye (red) the finger you use to point to your eye

Coho *(Silver)*
You wear silver on this finger

Pink (Humpy)
like your pinky

Chum (dog)
rhymes with thumb

Adapted with permission from Students for Salmon, Nooksack Salmon Enhancement Assoc., 2016

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Name _____

Pacific Salmon Species Chart

Species Name (Common and Scientific)	Weight	Length	Interesting Fact	Found in Kitsap Streams - A little OR A lot

Adapted with permission from Students for Salmon, Nooksack Salmon Enhancement Assoc., 2016

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Chinook

Nicknames: King, Tyee, Blackmouth

Scientific Name: Oncorhynchus tshawytscha

Average Weight: 10-24 lbs. (4.5-10.9 kg) (can reach up to 125 lbs.)

Length at Maturity: 36-58 inches (91.4-147.32 cm)

Life Cycle and Status in Kitsap County

- Can live up to 7 or 8 years; most return to large rivers and streams after 3-4 years.
- Young Chinook live in rivers and streams for up to a year before venturing to the ocean.
- Use Kitsap's nearshore to forage (search for food).
- Adults returning to Kitsap streams are from hatcheries in Gorst, Grovers, and Dogfish Creeks.
- Returns in Kitsap peak in late August through September.
- Chinook is named after a native tribe, so always capitalize the name.

Habitat Needs: Chinook are most often found in rivers and occasionally in larger creeks. Spawning usually occurs in fast-water side channels and areas with fist-sized gravel.

They are the largest, but least abundant salmon. When in the ocean they have bluish-green backs and silver sides with irregular spotting on the back, dorsal fin, and both lobes of the tail. Another distinguishing characteristic is their black gum line. Spawning colors are olive brown to dark brown in color. Males also develop a hooked snout.

Chum

Nicknames: Dog, Keta, Calico

Scientific Name: Oncorhynchus keta

Average Weight: 9-15 lbs., up to 40 lbs. (4.1-6.8 kg, up to 18.1 kg)

Length at Maturity: 25-40 inches (63.5-101.6 cm)

Life Cycle and Status in Kitsap County

- Generally live 3-5 years.
- Young chum migrate to salt water soon after emerging from the gravel.
- Spawn in the lower sections of streams close to the estuary.
- The most abundant salmon in Kitsap streams.
- Return to Kitsap streams late October through November.
- Hood Canal Summer Chum begin to return in August.
- They are usually the species raised in local classrooms.

Habitat Needs:

Chum can often be found spawning where groundwater upwells through the spawning gravel. Upon entering the estuary, juveniles prefer tidal sloughs and small estuaries associated with the nearshore.

They have the most widely distributed population, found from California to Korea. They are the second largest salmon (following the Chinook). When in the ocean they are metallic, greenish-blue along the back with black speckles which closely resemble sockeye and coho. During the spawning phase males get vertical bars in reds, greens, and purples, while females get a black horizontal stripe.

Coho

Nicknames: Silver, silverside

Scientific Name: Oncorhynchus kisutch

Average Weight: 6-12 lbs., up to 31 lbs. (2.7-5.4 kg, up to 14.1 kg)

Length at Maturity: 24-38 inches (61.0-96.5 cm)

Life Cycle and Status in Kitsap County

- Generally live about 3 years.
- Young coho spend 1-2 years in fresh water, preferring upper reaches of streams and off-channel areas like beaver ponds.
- Adult coho spawn in the upper sections of small streams.
- One of the more common species in Kitsap, they return to Kitsap streams in the fall, peaking in late November.

Habitat Needs:

Spawning coho are often found in small, lowland creeks.

While coho are one of the most commercially sought after salmon species, they make up only 7-10% of the commercial salmon fishery. Some coho travel less than 100 miles from the mouth of their stream for reproduction while others travel over a thousand miles. While in the ocean, they have dark metallic blue or greenish backs with silver sides and a light belly. They have small black spots on their backs and the upper lobe of the tail. Another distinguishing feature is their gum line, which is white. Spawning colors are dark with reddish coloration on their sides.

Pink

Nicknames: Humpback, humpy/humpie

Scientific Name: Oncorhynchus gorbuscha

Average Weight: 2-5 lbs., up to 12 lbs. (1.0-2.3 kg, up to 5.4 kg)

Length at Maturity: 20-30 inches (50.8-76.2 cm)

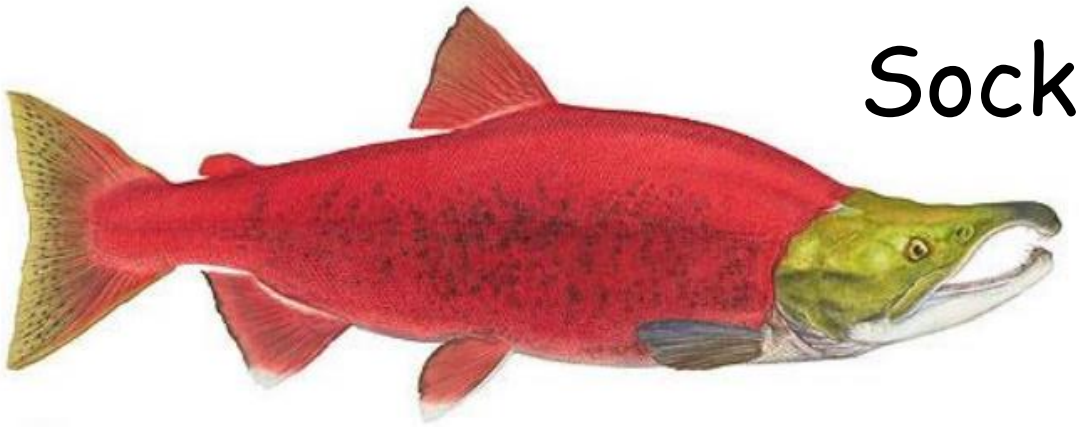
Life Cycle and Status in Kitsap County

- Generally live for 2 years.
- Young pink salmon migrate to saltwater right after emerging from gravel.
- Adult pink salmon spawn close to the estuaries of rivers and streams.
- Only a few spawn in Kitsap streams—less than a dozen spotted by Suquamish Tribe biologists every other year.
- They return to rivers and streams during late summer and early fall every other year.

Habitat Needs:

They are known as humpies due to the very large hump males get just behind the head during the spawning phase. They are the smallest of the species and spend the least amount of time in freshwater, spawning in two-year cycles very close to the mouth of streams with little to no upstream migration. While in the ocean, they appear to have steel blue to blue green backs, silver sides, and a white belly with large oval spots covering their back, adipose fin and both lobes of the caudal fin. During the spawning phase, pinks have dark backs with a pinkish wash and green blotches on their sides.

Sockeye



Nicknames: Redfish red, Blueback

Scientific Name: Oncorhynchus nerka

Average Weight: 4-8 lbs., up to 15 lbs. (1.8-3.6 kg, up to 6.8 kg)

Length at Maturity: 25-33 inches (63.5-83.8 cm)

Life Cycle and Status in Kitsap County

- Generally live 2-6 years.
- Young sockeye spend 1-2 years in lakes before migrating to the ocean. However Sockeye in the Nooksack River in WA have learned to survive without a lake.
- Adults return to spawn in late summer to fall.
- They spawn near shorelines, the bottom of lakes, or hundreds of miles upstream in tributaries to large lakes.
- Seen occasionally in Kitsap streams. One was spotted in Gorst Creek in 2018.

Habitat Needs:

The most important commercial species, sockeye have long gill rakers as they primarily feed on plankton when in the ocean. While in the ocean they are greenish blue on top of the head and back, silvery on the sides, and white to silver on the belly. During the spawning phase the head and caudal fin become bright green and the body turns scarlet. Land locked populations are known as kokanee.

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Screenshot used with permission from Kevin Belcher
View full video at https://www.youtube.com/watch?time_continue=434&v=vBME9YT3N2M&feature=emb_logo.
Chinook Salmon Spawning Act3 2016
Phenomenon begins at the 7:05 mark

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Phenomenon - Salmon Release Site Photo

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Name: _____

Probe: What Makes a Good Salmon Stream

Put an X in front of the things that can make a good Salmon stream.

___shade	___ deep pools and ponds	___loose gravel
___Beaver dams	___cold water	___culverts
___places to hide	___clean water	___clear water
___meandering stream	___human-made dams	___rocks
___consistent water	___riffles	___air (oxygen)
___ free-flowing rivers	___fallen trees	
___boulders	___wood & vegetation along streambank	
___food	___excess mud, sand and/or silt from erosion	

Explain your thinking. How did you decide whether something makes a good salmon stream?

_____

_____

_____

_____

_____

_____

Questions I have:

_____

_____

_____

_____

_____

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Puppies and Their Parents

What makes a dog a dog? Dogs can look and sound very different from each other. German Shepherds are big and weigh as much as 80 pounds. That's more than a six-year-old human! On the other hand, a Chihuahua is tiny and can fit in a purse. Dogs also have different types of fur. Chihuahuas have short hair but collies have long hair. Poodles have curly hair. Some dogs are brown and some are black. Some dogs howl and some others bark. But they are all dogs. They have four legs, fur and a tail. Many of them do not like cats.

Puppies are usually like their parents. Chihuahuas have small puppies and German Shepherds have bigger puppies. This is because puppies inherit many traits from their parents. Puppies often have the same color or type of fur as their parents. They often grow to be the same size as their parents. But they are not exactly the same. This is why you can tell apart puppies who are brothers and sisters, even when they look similar to each other.

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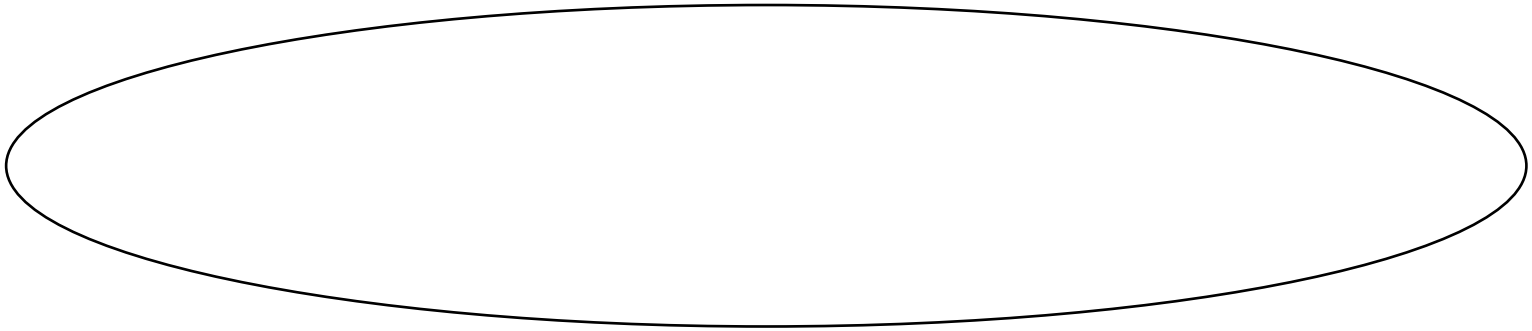
Name _____

Salmon Body Parts



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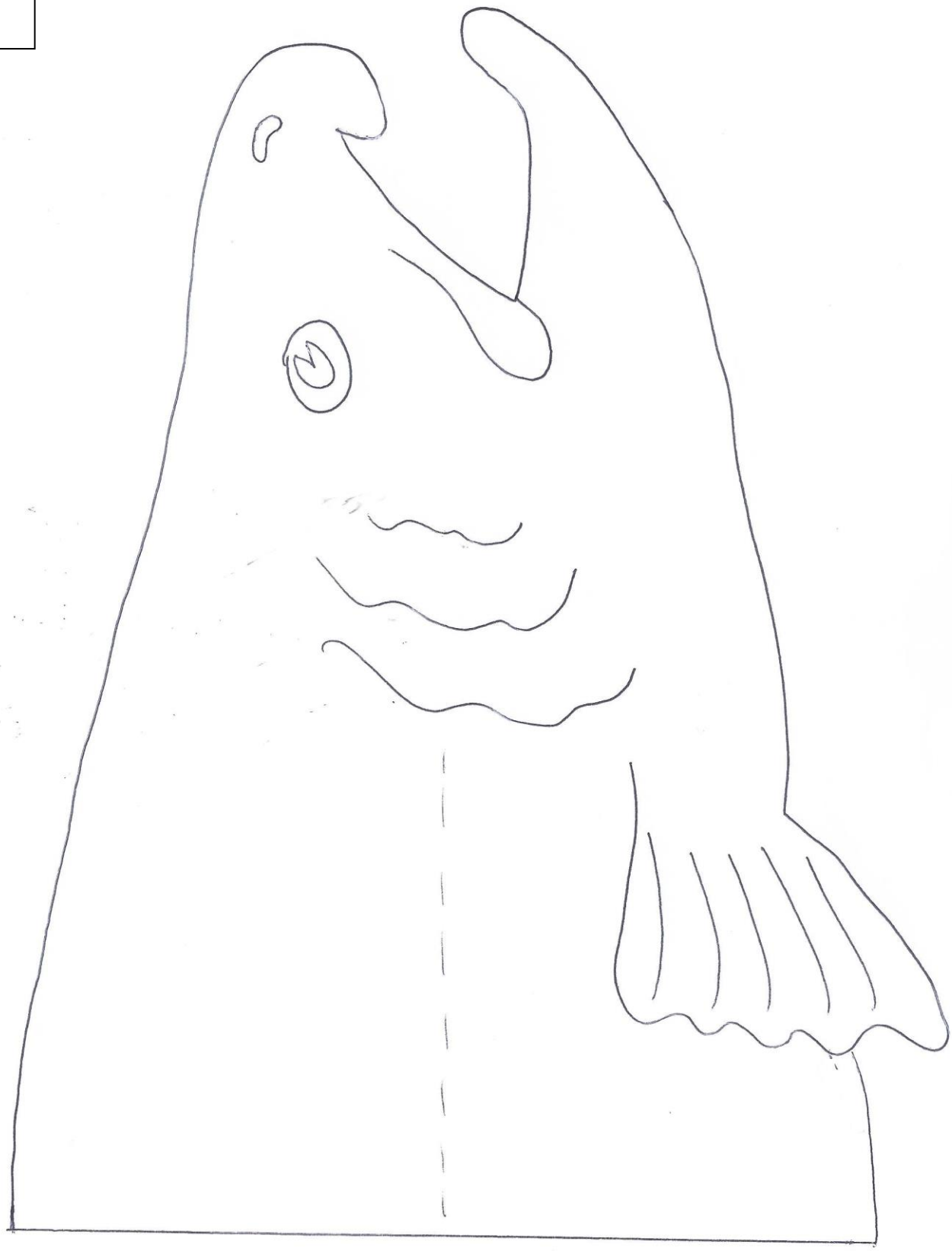
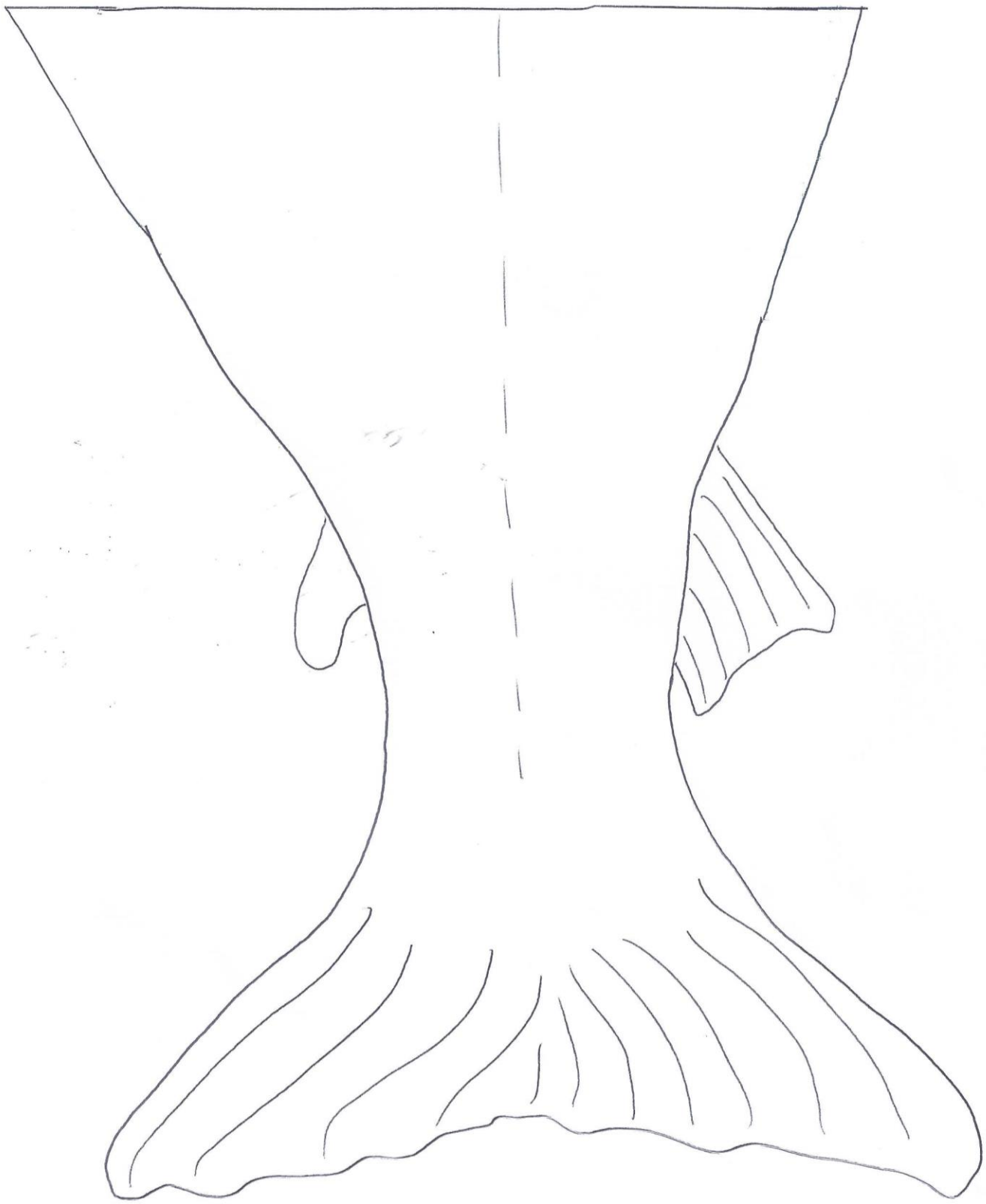
Salmon Head



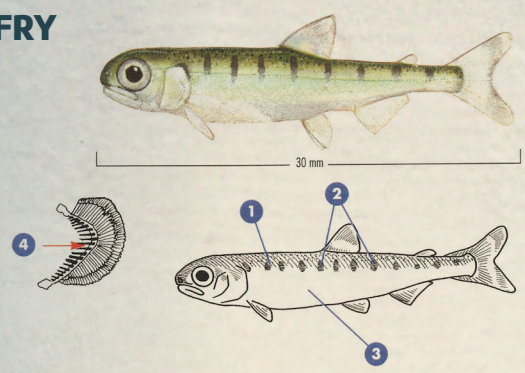
Salmon Tail



CHUM SALMONID
Oncorhynchus keta

1. Parr marks are smaller than vertical diameter of eye, and faint or absent below lateral line.
2. Parr mark height is more regular than on Sockeye.
3. Area below lateral line has pale greenish iridescence.
4. Gill rakers are short and stubby, about half the length of gill filament, 19 to 26 on first gill arch.

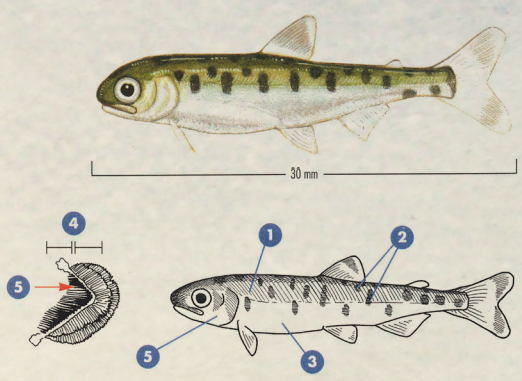
FRY



SOCKEYE SALMONID
Oncorhynchus nerka

1. Parr mark length less than vertical diameter of the eye.
2. Parr marks are irregular—height is irregular.
3. Area below lateral line is silver or white—no greenish sheen.
4. Gill raker length is almost equal to length of gill filaments.
5. 30–39 gill rakers on first arch.

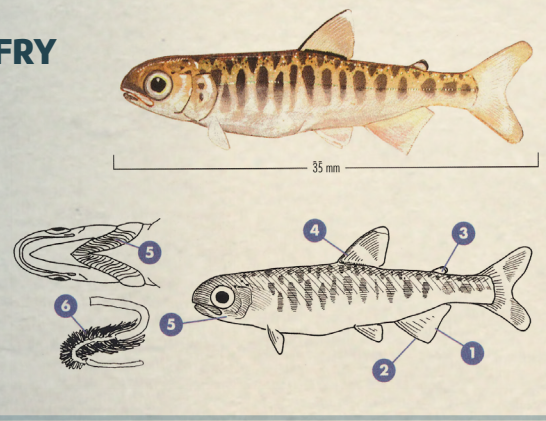
FRY



CHINOOK SALMONID
Oncorhynchus tshawytscha

1. Anal fin is not sickle-shaped; leading edge of anal fin shorter than length of base.
2. Anal fin leading edge is white.
3. Adipose fin has clear center or "window."
4. Dorsal fin has dark leading edge and white tip.
5. Species has 16–18 branchiostegals.
6. Species usually has 135–185 pyloric caeca.

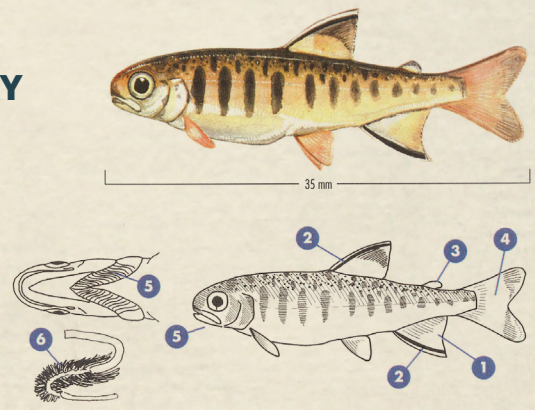
FRY



COHO SALMONID
Oncorhynchus kisutch

1. Anal fin is sickle-shaped, leading edge longer than base.
2. Leading edges of anal and dorsal fins have white followed by black.
3. Adipose fin has dark edge; center is opaque.
4. Caudal, anal, and adipose fins are pale orange.
5. Species has 13–14 branchiostegals.
6. Species usually has 45–80 pyloric caeca.

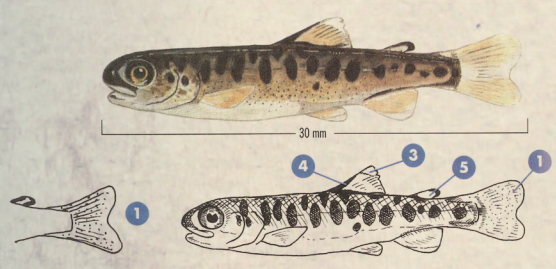
FRY



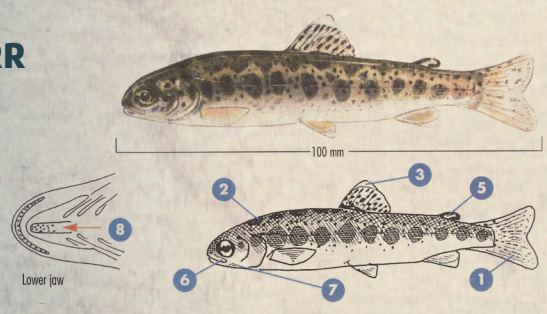
STEELHEAD SALMONID
Oncorhynchus mykiss

1. Melanophores are evenly speckled on caudal fin of fry.
2. Median-dorsal area has parr-like marks, about 5.
3. White tip on dorsal covers 3 to 5 interspaces between dorsal fin rays.
4. First ray is black on fry.
5. Adipose usually has continuous rim of pigment or one break.
6. Maxillary does not extend past back margin of eye of parr.
7. Jaw has no red or yellow slash.
8. There are no hyoid teeth.

FRY



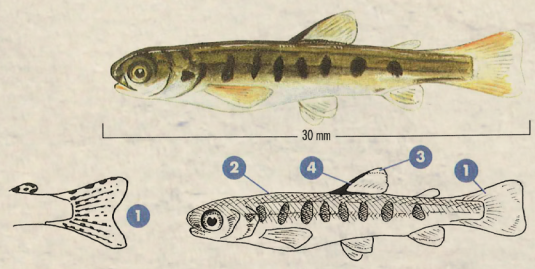
PARR



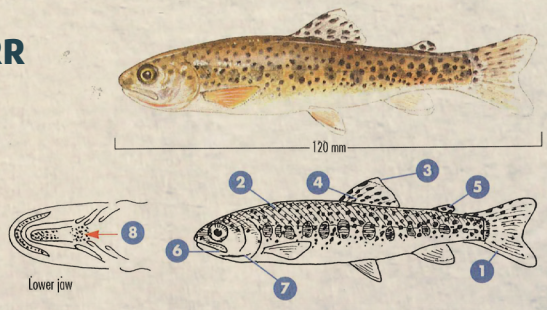
CUTTHROAT SALMONID
Oncorhynchus clarki clarki

1. Melanophores are in spots or streaks along rays in caudal fin or fry <50mm.
2. Median-dorsal parr-like marks are usually absent.
3. White tip on dorsal covers 1 to 3 interspaces between dorsal fin rays.
4. First ray is black on fry.
5. Adipose may have 1-2 breaks in pigment on rim and often spotted on parr.
6. Maxillary extends past rear margin of the eye on fish >80mm.
7. Underside of jaw (on parr) has red or yellow slash.
8. Hyoid teeth are present at the base of the tongue behind first gill arch—see inside lower jaw.

FRY



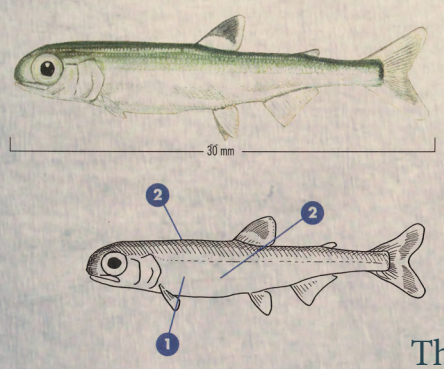
PARR



PINK SALMONID
Oncorhynchus gorbuscha

1. Parr marks are absent.
2. Dorsal surface is green; ventral is silver.

FRY



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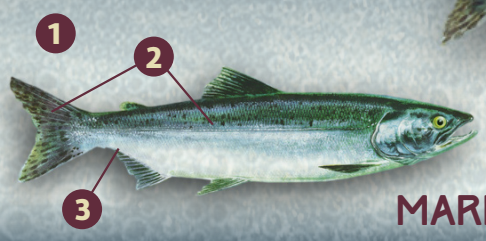
kitsapsalmontours.org

Illustrations by: *C. Groot* from the *Field Identification of Coastal Juvenile Salmonids*, prepared by the *Department of Fisheries and Oceans and Weyerhaeuser Ltd.*

ADULT IDENTIFICATION

PINK

1. Small Scales
2. Large Oval Spots
3. 13–17 Anal Rays

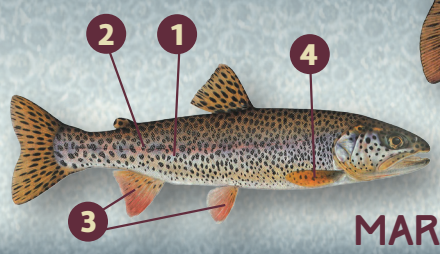


MARINE

SPAWN

CUTTHROAT

1. Silvery Body
2. Heavily Spotted
3. Yellow, Pink, and Orange–Red Anal and Pelvic Fins
4. Dull Orange–Red Cutthroat Mark

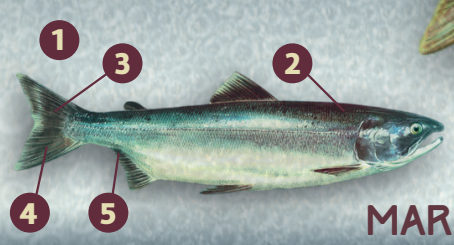


MARINE

SPAWN

SOCKEYE

1. Scales Large and Distinct
2. Small Black Speckles
3. No Spots
4. Dark Color
5. 13–18 Anal Rays

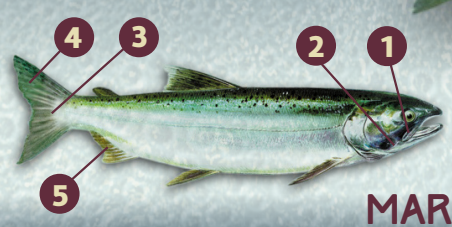


MARINE

SPAWN

COHO

1. White Base of Teeth
2. Black Edge of Gums
3. Silver Color Adjacent to Caudal
4. Spots on Upper Lobe
5. 13–16 Anal Rays



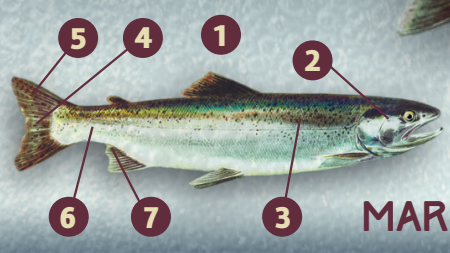
MARINE

SPAWN

Most commonly found in Kitsap streams

STEELHEAD

1. Slender Lateral Profile
2. Short Head
3. Small Black Spots
4. Square Tail
5. Uniform Spots on Tail
6. Wide Caudal
7. 8–12 Anal Rays

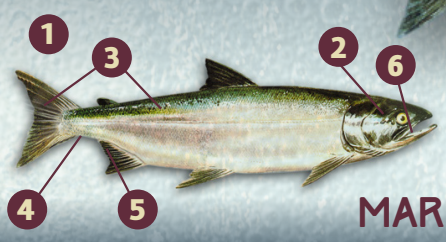


MARINE

SPAWN

CHUM

1. Silver Streaks
2. Large Pupil
3. No Spots
4. Narrow Caudal
5. 13–17 Anal Rays
6. Large Mouth



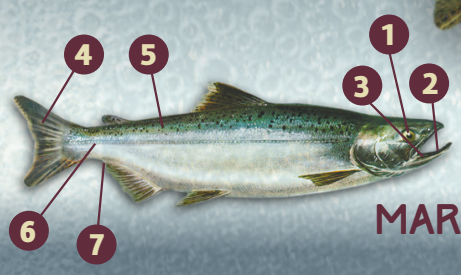
MARINE

SPAWN

Most commonly found in Kitsap streams

CHINOOK

1. Small Eye
2. Black Base of Teeth
3. Black Gums
4. Tail Covered with Spots
5. Long Black Spots
6. Thick Caudal
7. 13–19 Anal Rays



MARINE

SPAWN

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All salmon and steelhead illustrations courtesy of: *Fisheries and Oceans Canada*
Cutthroat illustrations by: Joseph R. Tomelleri from *Trout and Salmon of North America*, by Robert J. Behnke

Name _____

Salmon Release Tool Challenge

GOAL: Use the Engineering Design Process to design and build a tool to release salmon fry. Must meet all the Criteria and Constraints.

BACKGROUND: The salmon you have raised need to be released into Clear Creek within 3-4 inches of the surface of the water. The water level, the plants, and loose dirt beside the stream can make it hard to get close to the water. Design a tool to provide a way to release salmon that is safe for the fish, the stream, and for students.

CRITERIA AND CONSTRAINTS

Your salmon release tool must be able to:

1. be easily transported by car or bus
2. hold a 12 oz. plastic cup
3. support 8 oz. of water and 3-4 salmon fry in the cup
4. reach approximately 4 feet from the stream bank to within 4 inches of the stream surface
5. be operated easily so water can be poured into stream to release salmon
6. be reused by each release team in your class
7. be operated without the need for any electrical power
8. complete the process of pouring the water, start to finish, in **1 minute or less**

THE PROTOTYPES

1. Test each tool in the classroom and decide which TWO (2) tools work best and within 1 minute.
2. Ensure all students know how to use the chosen tools
3. Bring those TWO (2) tools to the field trip to be used at the release station

NOTE: ALL TOOLS MUST BE SUCCESSFULLY TESTED IN CLASS BEFORE BEING BROUGHT TO THE FIELD TRIP

Define the Problem

Ideas for a Solution

Materials needed

Sketch your solution

Build, Test, and Vote on Prototypes

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Salmon Stream Design
Gallery Walk Feedback

Salmon Stream Team Name: _____

One thing I liked

One suggestion for improvement

Salmon Stream Design
Gallery Walk Feedback

Salmon Stream Team Name: _____

One thing I liked

One suggestion for improvement

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Salmon Tank Checklist Monitoring Weekly Summary					
Item	**Date and Result**				
Water 1" above tube (Yes/no)					
Water Temperature (acutal temp)					
Excessive icing on cooling tube (yes/no)					
Airstone bubbling (yes/no)					
Compressor cycling on and off (yes/no)					
Feeding (times or amount/day)					
Water Changed (yes/no)					

Salmon Tank Checklist Monitoring Weekly Summary					
Item	**Date and Result**				
Water 1" above tube (Yes/no)					
Water Temperature (acutal temp)					
Excessive icing on cooling tube (yes/no)					
Airstone bubbling (yes/no)					
Compressor cycling on and off (yes/no)					
Feeding (times or amount/day)					
Water Changed (yes/no)					

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Name: _____ Our species being studied/in tank _____ Salmon Trait Data Collection Sheet

Traits of our species of salmon fry (offspring)	Traits of salmon adult (parent)–same species	Variation in similar traits of other 4 salmon species

Similarities and Differences between our salmon fry (offspring) and the adults (parents) in their same species

Similarities

Differences

Fry (offspring)

Adult (parent)

Similarities and Differences between the salmon in our tank (siblings). No tank – list similarities or differences you think siblings of this species may have.

Similarities

Differences

Use the data you collected to describe *patterns of similarities in traits* between adults (parents), our salmon (offspring) and siblings of our salmon that provide *evidence that traits are inherited.*

Use the data you collected to describe *patterns of differences in traits* between adults (parents), our salmon (offspring) and siblings of our salmon that provide *evidence that traits can vary*.

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SALMONID LIFE CYCLE

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DEATH FROM
- Predators
- Disturbance of gravel
- Temperature changes
- Pollution

DEATH FROM
- Habitat Destruction
- Predators
- Pollution

CHUM, PINK, AND SOME CHINOOK FRY MIGRATE DIRECTLY TO SALT WATER WITHIN WEEKS OR MONTHS

EGGS IN GRAVEL

SPAWNING

DEATH FROM SPAWNING

ALEVINS EMERGE FROM GRAVEL

COHO, STEELHEAD, CUTTHROAT, SOCKEYE, AND SOME CHINOOK LIVE IN FRESH WATER AS JUVENILES

COURTSHIP

SPAWNING MIGRATION

SMOLTS ADAPT TO SALT WATER

DEATH FROM
- Predators
- Habitat Destruction
- Delays in downstream migration

DEATH FROM
- Delays in migration
- Predators
- Fishing

ADULT SALMON

YOUNG ADULTS

Adapted from: *Field Guide to the Pacific Salmon*, Sasquatch Books.
Original Illustration by: Sandra Noel. Modified by: Marissa Chargualaf, Otak, Inc.

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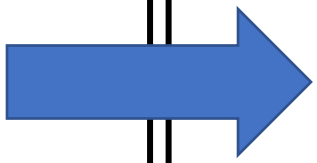
Scaffold - Environmental Effects on Inherited Traits

Phenomenon

Environmental Factors (cause)



Variation in Inherited Trait (effect)

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Salmon in the Classroom TANK CHECKLIST

171

DAILY CHECKS

(NOTE: Complete with a wipe-off marker each time you check the tank)

TANK # _____

Date _____

- ☐ Water is at least one inch above the top of the cooling tube
- ☐ The temperature is between 45°F and 48°F
- ☐ There is not excessive icing on the cooling tube (some light frosting above the water level is normal)
- ☐ The airstone is bubbling
- ☐ The cooling compressor is cycling on and off throughout the day
- ☐ When fry begin swimming:
  - ◊ **Fish are fed 1 pinch of food each day.** *Note time below with wipe-off marker (skipping weekends is ok)*
    - ♦ Time #1: _____
    - ♦ Time #2: _____
    - ♦ Time #3: _____
    - ♦ Time #4: _____

- Water is changed daily, if possible, but at least every three days including during long weekends and holidays. Steps are noted below

Last date water changed: _____

- ◊ Always have a bucket of water in a cool place waiting for use to allow the chlorine in the water to evaporate.
- ◊ Remove about 5 gallons of water from the aquarium using a siphon tube or a small container. This water can be discarded or used for plants
- ◊ After rinsing, fill that bucket for use next time
- ◊ Gently pour the "prepared" water into the aquarium
- ◊ Monitor the water temperature—should be 45°F – 48°F

Any questions or issues, please contact the Clear Creek Task Force, clearcreektrail@yahoo.com, 360.434.7665 or Kitsap County Stormwater Division, kitsap1@co.kitsap.wa.us, 360.337.5777.

7079 (12/14)

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Task: Saving Our Salmon: Clean Water

PART 1 (60-90 minutes)

Student Directions:

Your assignment:

Help! You have been asked to educate other students about the importance of clean water for salmon and actions we can all take to keep the water clean. You will read one article and watch three videos to gather information, taking notes on these sources. Then you will answer three questions before writing your essay.

Steps you will be following:

In order to plan and compose your speech, you will do all of the following:

1. Read an article.
2. Watch three videos.
3. Answer three questions about the sources.
4. Write your essay.

Directions for beginning:

You will now watch the videos and then read an article about clean water taking notes with the templates provided. You will want to refer to your notes when writing your essay. You may refer back to any of the sources as often as you like.

Teacher Note: Prior to reading the article, pre-teach the term "habitat." You may also want to pre-teach "salt water," "fresh water," and "salmon cycle". Preview the article with the students including discussing the text features. Provide scaffolded support as needed with this task.

Source Information:

Source #1: Article	*Clean Water and Salmon* N. Skerritt, 2015
Source #2: Video #1	*Making a Sound Impact Entry Power to The Puget Rap* (1:59) https://www.youtube.com/watch?v=vfb2C3dQTsU
Source #3: Video #2	*Water Pollution Enviromercial* (1:25) https://www.youtube.com/watch?v=D_SWLi7K7_Q
Source #4: Video #3	*Sound System: A Runoff Experience* (1:57) https://www.youtube.com/watch?v=SvJ4FtNOfQo

Clean Water and Salmon

Like every living thing on earth, salmon need water to survive. Their **habitat** or home is water. Salmon live in rivers, streams and oceans. They depend on clean water to stay healthy and produce the next generation of fish. Water pollution is a major problem for salmon. When the water is polluted, the salmon are in danger of dying before they have a chance to complete their life cycle.

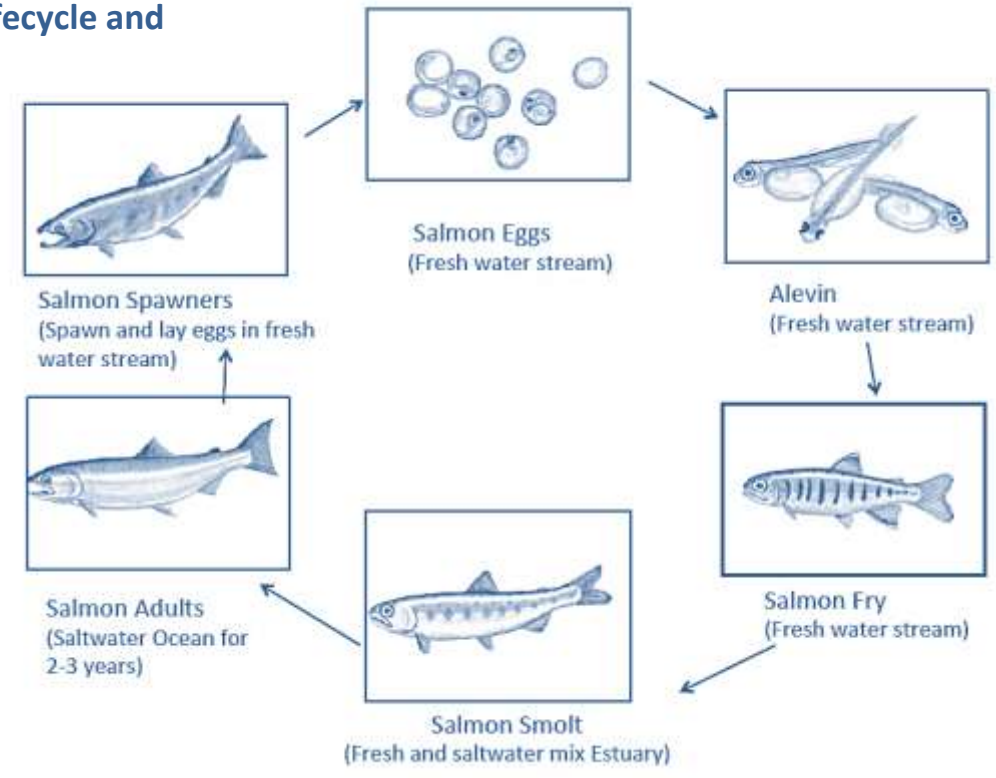
Fresh and Salt Water

Salmon live in two different habitats. One habitat is fresh water and the other is salt water. Salmon begin their life cycle in the shallow fresh water of a stream. Adult salmon lay eggs in the stream. When the salmon eggs hatch, the small fish (alevins) begin their lives. The salmon continue to grow larger in fresh water until they are big enough to begin their journey as adults to the ocean.

Alevins

The ocean is made up of salt water. The salmon become large and strong by swimming and feeding in the ocean. After three or four years, depending on the type of salmon, the fish return to their homes in the fresh water of the streams. They travel from salt water into the mouths of rivers and swim up them to the streams where they were born. Here, the salmon will spawn and lay their eggs. This begins a new life cycle for the salmon.

Salmon Lifecycle and Habitat



Water Pollution

Salmon call water their home as do many other plants and animals. When the water is polluted, the salmon cannot stay healthy. Trash in rivers and streams can block the salmon from swimming to their birthplaces. Chemicals and certain bacteria can also harm the water. Chemicals that we use on our lawns and gardens can be **toxic** to fish. Soap from washing our cars can find its way down storm drains and out into the rivers and ocean. Pet waste is another major way that water is polluted. Here are some actions you and your families can take to help save our salmon:

What can YOU do?

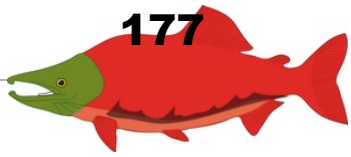
- ✓ Use lawn and garden products that are safe for the environment.
- ✓ Wash cars on grass or at car washes where the water is recycled
- ✓ Pick up pet waste and dispose in the garbage
- ✓ Buy cleaning products for the home that are free of ***toxic*** chemicals
- ✓ Do not dump garbage in streams, rivers or oceans
- ✓ Volunteer to pick up trash along water ways, including ocean beaches

Water is the home to many living creatures including the Northwest salmon. When chemicals, garbage, and pet waste pollute these habitats, salmon may not be able to survive. Can you image life without salmon? Salmon are an important food source for people all over the world. **Clean water is one way we can Save Our Salmon.** Do your part to protect the habitat of these amazing fish!

Task: Saving Our Salmon: Clean Water

NOTE TAKING TEMPLATE

	Clean Water and Salmon Article
Why Salmon need Clean Water	
How water becomes polluted	
Actions we can take to keep the water clean	



Task: Saving Our Salmon: Clean Water

Source	What I learn about Water Pollution	What I learn about how I can help
Video #1: Rap		
Video #2: Environ-mercial		
Video #3: No speaking		

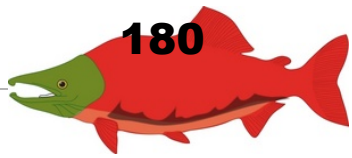
Task: Saving Our Salmon: Clean Water

Questions

1. Explain why clean water is important to salmon. Use information from the article. ***(Claim 4, Target 2)***

Task: Saving Our Salmon: Clean Water

2. Compare the three videos. Which video tells the best story about water pollution and how we can help? Explain your choice. ***(Claim 4, Target 3)***



Task: Saving Our Salmon: Clean Water

3. Defend this opinion: We can make a difference in keeping our water clean for salmon. Use information from the any of the sources in your response. ***(Claim 4, Target 4)***

Task: Saving Our Salmon: Clean Water

PART 2 (70 minutes)
Student Directions:

You will now have about 70 minutes to review your notes and sources, plan, draft, and revise your essay. While you may use your notes and refer to the sources, you must work on your own. Now read your assignment and the information about how your essay will be scored, and then begin your work.

Your Assignment:
Write an essay where you explain to your reader why clean water is important to the life cycle of salmon. Tell your reader what we can do to make a difference. Use information from the video and the article to write your essay. Outline your ideas on the template provided.

How your essay will be scored:

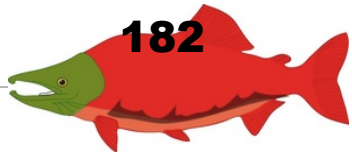
The people scoring your essay will be assigning scores for

1. ***Statement of Purpose/Focus*** – how well you clearly state and maintain your controlling idea or main idea
2. ***Organization*** – how well the ideas progress from the introduction to the conclusion using effective transitions and how well you stay on topic throughout the essay.
3. ***Elaboration of Evidence*** – how well you provide evidence from sources about your topic and elaborate with specific information.
4. ***Language and Vocabulary*** – how well you effectively express ideas using precise language that is appropriate for your audience and purpose
5. ***Conventions*** – how well you follow the rules of usage, punctuation, capitalization, and spelling

Now begin work on your essay.
Manage your time carefully so that you can:

- Plan your essay
- Write your essay
- Revise and edit for a final draft

Word-processing tools and spell check function are available to you.



Task: Saving Our Salmon: Clean Water

Outlining My Essay:

Introduction: How can I capture the reader's attention?
Why Salmon need clean water:
How the water becomes polluted:
What we can do to make a difference:
Conclusion: How can I sum up my ideas?

Informative / Explanatory
Performance Task Writing Rubric (Grades 3-5)

Score	4	3	2	1
Statement of Purpose/Focus	**The response is fully sustained and consistently and purposefully focused:** • controlling or main idea of a topic clearly communicated, and the focus is strongly maintained for the purpose, audience, and task	**The response is adequately sustained and generally focused:** • controlling or main idea of a topic is clear, and the focus is mostly maintained for the purpose, audience, and task	**The response is somewhat sustained and have a minor drift in focus:** • controlling or main idea may be somewhat unclear, or the focus may be insufficiently sustained for the purpose, audience, and task	**The response has little or no discernable organizational structure:** • controlling or main idea may be confusing or ambiguous; response may be too brief or the focus may drift from the purpose, audience, and task
Organization	**The response has a clear and effective organizational structure creating unity and completeness:** • consistent use of a variety of transitional strategies to clarify the relationship between and among ideas • effective introduction and conclusion • logical progression of ideas from beginning to end; strong connections among ideas with some syntactic variety	**The response has an evident organizational structure and a sense of completeness, though there may be minor flaws and some ideas may be loosely connected:** • adequate use of transitional strategies with some variety to clarify the relationship between and among ideas • adequate introduction and conclusion • progression of ideas from beginning to end; strong connections among ideas	**The response has an inconsistent organizational structure, and flaws are evident:** • inconsistent use of transitional strategies and/or little variety • introduction and conclusion, if present, may be weak • uneven progression of ideas from beginning to end; and/or formulaic; inconsistent or unclear connections between and among ideas	**The response may be related to the topic but may provide little or no focus:** • few or no transitional strategies are evident • introduction and/or conclusion may be missing • frequent extraneous ideas may be evident; ideas may be randomly ordered or have an unclear progression
Elaboration of Evidence	**The response provides thorough and convincing support/evidence for the controlling idea and supporting idea(s) that includes the effective use of sources, facts, and details:** • comprehensive evidence from sources is integrated; references are relevant and specific • effective use of a variety of elaborative techniques*	**The response provides adequate support/evidence for the controlling idea and supporting idea(s) that includes the use of sources, facts, and details:** • adequate evidence from sources is integrated, some references may be general • adequate use of some elaborative techniques*	**The response provides uneven, cursory support/evidence for the controlling idea and supporting idea(s) that includes partial or uneven use of sources, facts, and details:** • some evidence from sources may be weakly integrated, imprecise, or repetitive; references may be vague • weak or uneven use of elaborative techniques*; development may consist primarily of source summary	**The response provides minimal support/evidence for the controlling idea and supporting idea(s) that includes little or no use of sources, facts, and details:** • evidence from the source material is minimal or irrelevant; references may be absent or incorrectly used • minimal, if any, use of elaborative techniques*
Language	**The response clearly and effectively expresses ideas, using precise language:** • vocabulary is clearly appropriate for the audience and purpose • effective, appropriate style enhances content	**The response adequately elaborates ideas, employing a mix of precise and more general language:** • vocabulary is generally appropriate for the audience and purpose • generally appropriate style is evident	**The response expresses ideas unevenly, using simplistic language:** • vocabulary use is uneven or somewhat ineffective for the audience and purpose • inconsistent or weak attempt to create appropriate style	**The response is vague, lacks clarity, or is confusing:** • vocabulary is limited or ineffective for the audience and purpose • little or no evidence of appropriate style

Score	2	1	0
Conventions	**The response demonstrates an adequate command of conventions:** • adequate use of correct sentence formation, punctuation, capitalization, grammar usage, and spelling	**The response demonstrates a partial command of conventions:** • limited use of correct sentence formation, punctuation, capitalization, grammar usage, and spelling	**The response demonstrates little or no command of conventions:** • infrequent use of correct sentence formation, punctuation, capitalization, grammar usage, and spelling

NS	**Unintelligible, in a language other than English, off-topic, copied text. (Off-purpose writing will still receive a score in Conventions.)**

*Elaborative techniques may include the use of personal experiences that support the controlling idea.

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Thermal Unit (TU) Chart TUs needed by chum salmon from Grovers Creek Hatchery	
Stage	**Thermal Units (TUs) Needed**
Eye Up (stage when picked up)	750
Hatch	950 – 1100
Emergence (Swimming)	1600

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Virtual Scavenger Hunt – Good Salmon Habitat

Name:_____

Look for the following elements of good habitat in the photo below. Using the grid, write the letter and number of the section where you found an example of each element. *The first one is done for you. You might find some things in more than one place!*

Vegetation Along Streambank	C-1	**Loose Gravel**		**Clear Water**	
Places to Hide		**Fallen Trees**		**Food**	
Wood Along Streambank		**Pools and Ponds**		**Rocks**	
Meandering Stream		**Riffles**		**Shade**	

7268 (09/20)

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WANTED

for Surviving in the Wild!

By student first name or teacher/school

Student Illustration

Common name, scientific name, aliases/nicknames, and stage

Age and Size

Student Illustration

Age:

Length:

Weight:

Distinguishing Features

Student Illustration

Primary function:

Last Seen Looking For

Student Illustration

Description of habitat feature and how it meets salmon's needs

How You Can Help

Student Illustration goes here

Description of relationship between the causal environmental factor, the effect on the habitat and the ultimate impact on the salmon, including ways people can help.

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When Will They Hatch Calendar – Recorded in Fahrenheit

SPECIES ________________ DATE FERTILIZED___________________ DATE RECEIVED _______________ ATUs WHEN RECEIVED ___________

MONTH ______________________

S *	M	T	W	T	F	S *
Date _______ Temp. today ______ - 32^0 F ATU today ________ ATU to date _______	Date _______ Temp. today ______ - 32^0 F ATU today ________ ATU to date _______	Date _______ Temp. today ______ - 32^0 F ATU today ________ ATU to date _______	Date _______ Temp. today ______ - 32^0 F ATU today ________ ATU to date _______	Date _______ Temp. today ______ - 32^0 F ATU today ________ ATU to date _______	Date _______ Temp. today ______ - 32^0 F ATU today ________ ATU to date _______	Date _______ Temp. today ______ - 32^0 F ATU today ________ ATU to date _______
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*Weekends and holidays can be estimated

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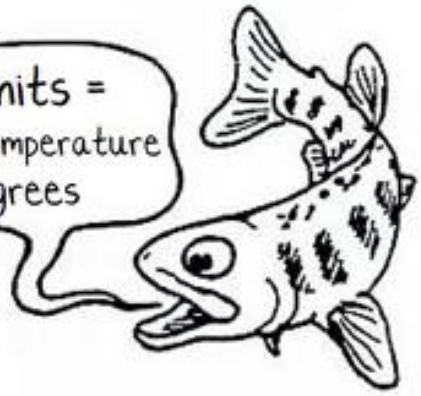
Name_____

When will they hatch?

_____ need _____ T.U. to hatch.

Hatchery Data:

Thermal Units = average water temperature minus 32 degrees



Date eggs were fertilized: _____

Date eggs arrived in your room: _____

TOTAL DAYS spent at the hatchery ☐

Average hatchery water temperature ☐°

☐ T.U./day × ☐ days = ☐ T.U.

In the Classroom:

Total T.U. required for hatching: _____

Thermal units at hatchery: _____

Thermal units still needed: ☐

Average water temperature has been: ☐°

This means that ☐ T.U. will accumulate each day.

Our fish will hatch in ☐ days!

The date will be: ☐ !

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You Ain't Nothing but a Hound Dog (but Only If Your Parents Were Too)

Dogs and cats are said to be natural enemies. However, this is not always true. While some cats and dogs fight, others often live together and get along fine. For example, on many farms, farmers keep both cats and dogs on their property. Each of them does important jobs. For example, cats are very good at hunting and catching rats and mice. Having a cat on a farm can prevent the rats and mice from eating crops the farmer has harvested. The dog may do a number of chores. If the farmer raises horses, the dog may help herd them. Or the dog may bark if a stranger arrives on the farm.

Sometimes, if the farmer has more than one dog—male and female—the dogs will breed and make puppies. If the farmer has more than one cat, the cats might breed and make kittens. While both kittens and puppies are very small, they look and act differently because they have different parents. A puppy does not look like a cat, and a kitten does not look like a dog. This is because animals pass down a lot of their own traits to their offspring.

When a male dog and a female dog have puppies, you can expect that the puppies will look something like each of their parents. If both the puppies' parents are big dogs, then the puppies will probably grow up to be big dogs as well. If both the parents have curly hair, then their puppies will probably have curly hair too. The same is true for how the puppies behave. If the parent dogs are friendly, then the puppies may grow up to be friendly too.

Dogs come in different breeds, each with its own characteristics. For example, a Greyhound is a small, thin dog that can run very, very fast. A Great Dane is a large dog that is a good guard dog. A puppy will always look and act somewhat like its parents, because the things that define its parents are passed down to it. So, if two Greyhounds mate, their puppies will look and act like Greyhounds, while if Great Danes mate, their puppies will look and act like Great Danes. If a Greyhound mates with a Great Dane, the puppies may look and act like a combination of their parents. It may be a small dog that is good at guarding things, or it may be a big dog that runs fast. It may also be a medium-sized dog that is fast and good at guarding things.

The same is true of cats. Kittens look and act like their parents. If two cats are both shy, then the kittens they have will probably be shy too. If the two cats are adventurous, then they have adventurous kittens. A cat will never grow up to look like a dog because it cannot inherit dog traits from its parents. The only animal that can grow up to look like a dog is a puppy.

However, the traits an animal gets from its parents are not the only things that define what that animal becomes. The animal may also develop some traits based on the environment in which it was raised. For example, if a puppy gets lots of food growing up, then the animal will probably grow up to be big and strong. However, if a puppy does not get very much food, it may grow up to be skinny and weak. So, the world in which an animal grows up can affect the way it develops.

This can apply both to the look of an animal and how it behaves. There have been cases in which a kitten has grown up with a family of dogs and has actually begun acting like the dogs. When the dogs went chasing a tennis ball, the kitten went chasing the tennis ball too. And when the dogs gnawed on bones, the kitten joined them. When she grew up into a cat, she kept acting like the dogs. Because there were no cats around her, the kitten did not learn to act like a cat—she learned to act like a dog.