SOUTH PUGET SOUND Salmon ENHANCEMENT GROUP

Phone (360) 412-0808
Email spsseg@spsseg.org
Web www.spsseg.org

6700 Martin Way East, Suite 112
Olympia, Washington 98516

Salmon in the Schools (SITS) Handbook

Thank you for participating in the Salmon in the Schools (SITS) program! Please use this handbook and as your go-to resource for fish/tank care throughout the magical salmon raising journey. Let the salmon adventure begin!

Contents

Contact Information

SPSSEG staff are available upon request to provide salmon aquarium set-up and maintenance trainings as well as within-season support to teachers for any and all components of the Salmon in the Schools (SITS) program.

Megan Brady
SPSSEG Education and Outreach Coordinator
Email: meganb@spsseg.org
Work Cell Phone: 360-701-6907

Thanks to the State of Washington Office of Superintendent of Public Instruction (OSPI), Washington Department of Fish and Wildlife (WDFW), Hood Canal Salmon Enhancement Group, and community donors to South Puget Sound Salmon Enhancement Group. Without you, this program would not be possible.

About the Salmon in the Schools Program

Salmon in the Schools (SITS) is an educational partnership coordinated by South Puget Sound Salmon Enhancement Group (SPSSEG) in Mason, Thurston, and Pierce counties. Other salmon enhancement groups, conservation districts, educators, and non-profits also participate throughout Washington. SPSSEG covers all SITS program costs.

The SITS program allows students to witness the salmon life cycle first hand by receiving salmon eggs from a local hatchery, monitoring water quality, watching the eggs hatch, and releasing "their" fish as the fry life stage into a local stream. Tanks can be assigned to individual teachers or shared by multiple teachers and placed in a common area of the school. Please see the Teacher Agreement (**Appendix A**) for complete details on program expectations.

SPSSEG Responsibilities

- Provide aquarium with chiller, aerator, and water testing supplies
- Assemble and install aquarium habitat in a lead teacher's classroom or school common space
- Teacher training in weekly tank maintenance and water testing
- Technical assistance throughout the entire program
- Coordinate Washington Department of Fish and Wildlife permits and delivery of up to 250 salmon eggs and all fish food
- Coordinate the fish release field trip
- Deliver in-person or virtual classroom presentations as the fry develop
- Cover program costs including tanks, equipment, SPSSEG staff, transportation

Teacher Responsibilities

- Provide a safe location for the aquarium
- Provide daily/weekly fish care including water quality testing, tank cleaning/water swaps, removal of dead eggs, and feeding
- Provide time in lesson schedule for 1-2 monthly salmon themed lessons delivered by SPSSEG
- Release fish only at the time/location designated on the WDFW permit
- Schedule transportation for students for the fish release field trip and coordinate with SPSSEG to schedule event
- Provide feedback to SPSSEG via teacher and student evaluations (pre-program, post-program, and post-lesson/-activity)

In addition to witnessing the salmon eggs develop first-hand, students are provided with multiple in-school and outdoor learning opportunities including salmon lessons, optional learning activities, and a fish release field trip.

Every component of SITS can be modified for VIRTUAL or IN-PERSON delivery.

For example, core lessons can be delivered as videos, art projects can be printed and done remotely, macroinvertebrates and games can be set up in outdoors spaces at your school if field trips are not possible, and fish releases can be live streamed. Core lessons can be delivered by SPSSEG staff or by the participating teacher. You are welcome to use our curriculum or your own so long as it covers the topics of salmon species, life cycle, habitat concerns, regional importance, and practical stewardship actions.

Salmon Lessons

1. Salmon Life Cycle & Food Webs:
    - **Questions**: What are salmon? What are the 6 stages of the salmon life cycle? What do salmon need at each life stage? What do salmon eat? What eats salmon?
    - **Activity**: Salmon life cycle book
2. Egg Delivery:
    - **Questions**: When will our salmon eggs hatch? When will our salmon become free swimming fry?
    - **Activity**: Deliver eyed eggs from the hatchery; predict the hatch and predict fry stage math worksheets (worksheets best to be led by teacher after SPSSEG drops eggs off)
3. Salmon Species:
    - **Questions**: What is a species? What are the 5 species of Pacific salmon? What makes salmon special?
    - **Activity**: Salmon species bookmark art project
4. Salmon Form & Function:
    - **Questions:** What is the external anatomy of a salmon? What is the internal anatomy of a salmon?
    - **Activity:** Dissect a salmon
5. Salmon Habitat & Water Quality:
    - **Questions:** What are the 3 habitats salmon live in throughout their lives? What are the 3 Cs of habitat? What is good salmon habitat? What water quality is good for salmon?
    - **Activity**: Water quality journal of Temperature, Nitrates, pH, DO, macroinvertebrate ID
6. Salmon Survival Demonstration
    - **Questions:** How many salmon survive each life stage? What obstacles do salmon face? Why are salmon important in Washington State (ecologically, culturally, economically)? How are salmon connected to your local community? How can we help salmon?
    - **Activity:** Marble demonstration of salmon survival; Salmon haiku poetry

Optional Learning Activities

- Kennedy Creek Salmon Trail virtual or in-person tour to watch chum salmon spawning
- Virtual career exploration field trips (spawning survey, smolt trap, tagging, etc.)

Fish Release Field Trip Activity Ideas

- Water quality
- Habitat assessment
- Salmon Survival math game
- Stream bug (macroinvertebrate) ID
- Gyotaku art prints/scientific illustration
- Edible salmon habitat

Your Salmon Year Timeline

The South Puget Sound Salmon Enhancement (SPSSEG) provides the following information to guide the designated salmon aquarium docent to ensure they can provide a functional and safe environment for salmon eggs and the resulting development and growth into fry prior to release into an appropriate salmon rearing habitat. Salmon aquarium maintenance and fish care occurs takes approximately 30-60 minutes per week from December to April.

SPSSEG staff are available for training and/or questions regarding salmon aquarium preparations, aquarium maintenance, and fish care. SPSSEG contact information for the SITS program is listed on page 1 of the Handbook.

The program generally runs from December through early April with some flexibility expected due to the natural variability of developing salmon eggs. SPSSEG plans on 8 in-person interactions for each school participating: tank installation, 5 salmon lessons, 1 egg delivery + predict the hatch worksheets, and a fish release field event. Visits are not limited to this list though. We are happy to provide additional in-person and/or virtual assistance throughout the program. The timeline provided below is flexible but included to give you a general idea of program flow and key events:

November…… (optional) Kennedy Creek Salmon Trail tour
November-December…… Eggs from spawners are reared at hatchery
November-early December…… **Lesson 1: Salmon Life Cycle & Food Webs**
Mid-December…… **SPSSEG installs tanks; Tank maintenance/water quality workshop for teachers**
Early January…….. **Lesson 2: Egg Delivery**
Mid-Late January…….. **Lesson 3: Salmon Species**
Late January-early February…….. Eggs hatch into alevin life stage
Late February……**Lesson 4: Salmon Form & Function**
February-March…… Alevin develop into freely swimming fry life stage
Early March…….. **Lesson 5: Salmon Habitat & Water Quality**
March…… Fry begin feeding once “buttoned up”
Mid-late March…….. **Lesson 6: Salmon Survival Demonstration**
Late March-early April…… **Fish Release Field Trip**
April…….. Clean aquarium and equipment and store for next year

Materials and Equipment

SPSSEG provides all salmon rearing equipment on loan to schools participating in SITS. SPSSEG will assemble and set up the salmon aquarium at your school. You will receive the following equipment and supplies:

- ❑ 55-gallon Aquarium Tank
- ❑ Insulation and cover
- ❑ A table or stand that can hold the weight of the aquarium with water, gravel etc. (~650 pounds). Ideally the classroom provides this but SPSSEG can provide if necessary.
- ❑ Chiller
- ❑ Small fish net (~5” with long handle)
- ❑ Air pump
- ❑ Air pump tubing
- ❑ Air stones/aeration system
- ❑ Water filter, tubing/filtration system, and filter inserts (if applicable)
- ❑ Water Siphon/small container
- ❑ Turkey baster to remove dead eggs/debris
- ❑ Thermometer
- ❑ Two clean 5-gallon plastic buckets
- ❑ 4-5 gallons of ¾” to 1-1/2" clean aquarium gravel/rocks (not colored and not smaller than a BB)
- ❑ Water quality test kits (pH, Ammonia/Nitrite/Nitrate)
- ❑ Oxygen meter (not necessary)
- ❑ Battery-operated aerator (bubbler) for fry release
- ❑ Fish food (provided by hatchery)

Aquarium Set Up

Tank set up ideally occurs at least 3-4 weeks before salmon eggs arrive to ensure the system is working properly and water quality is appropriate for raising salmon. Check the aquarium to ensure that there is no fungus on the inside of the aquarium. If there is, clean with bleach diluted with water or distilled white vinegar diluted with water.

- ❑ Inspect and/or request replacement equipment and materials (water filters, air stones, chiller, all tubing, electrical cord). SPSSEG will assemble and install the tank and provide all necessary equipment.
- ❑ Rinse the tank in water only. If the tank is very dirty, scrub with baking soda and rinse thoroughly.
- ❑ Place rinsed rocks, filters, air stones, thermometer, and chiller (follow manufacturer's instruction) in aquarium.
- ❑ Plug in and turn on aerator, filter and water chiller. Inspect aquarium for 2 days. Check water temperature, aeration and filter to ensure they are working properly and within parameters for healthy salmon. If you are using a sensor attached to your chiller to maintain temperature, set it at 48 degrees Fahrenheit, with a 2-degree differential. Healthy water quality parameters are listed in **Appendix B.**
- ❑ Once you confirm that all systems are working, you may turn off everything <u>except the pump</u> that circulates water until <u>2 days before egg arrival</u>. Refrigeration of the tank water is unnecessary when there are no fish.
- ❑ **LOCATION**: Choose a suitable location that is
    - Easily accessible from at least 3 sides
    - Within close proximity to an electrical outlet
    - Near a water source (if possible)
    - Properly ventilated so chiller doesn't overheat
    - Has enough clearance under table for chiller maintenance
- ❑ **TANK STAND:** must be able to support at least 600 lbs., allow for lots of air circulation around the chiller, hold the tank at least 24 inches off the floor, and allow the chiller to be removed for servicing while the tank is full.
- ❑ **TANK:** 50 to 55 gallon capacity, glass or acrylic. Rinse the tank in water only (no soap or chemicals). Gently scrub with baking soda or a strong salt solution if dirty then rinse it thoroughly.
- ❑ **GRAVEL OR ROCKS**: either supports biological filtration and the rocks provide hiding places for alevin. If you choose gravel, use approximately 10 lbs of rinsed, natural pebble-sized gravel (never colored or very old gravel). If you choose rocks, use three piles of 4 or 5 clean fist-sized rocks.
- ❑ **AIR**: at a minimum, have a 60-gallon air pump with two air ports. Install check valves on tubing to prevent backflow. Install bubblers on the ends of the tubes and then place them near the chiller wand or the bottom of the tank.
- ❑ **FILTER**: install either hang-on-the-back or external filter systems. Bio-filtration systems need to be capable of filtering at a minimum a 100-gallon tank. Wrap netting over the filter intake or attach a foam rubber "fish sponge" to prevent empty egg cases and/or alevin from benig sucked in.
- ❑ **TEMPERATURE**: install a suction cup thermometer inside the tank as a backup to the readout on your chiller and so students can easily monitor temperature.
- ❑ **WATER**: fill the tank with cold tap water up to 2 inches below top (mark with sharpie). To avoid unwanted chemicals, do not use a garden hose, a galvanized bucket, or a bucket that has ever contained a cleaning product or other chemicals. Use a sharpie or tape to mark the fill line.
- ❑ **CHILLER**: blow all the dust of the condenser fins and motors. (newer chillers have hidden filters behind louvers.) failure to remove dust may cause your chiller to overheat, resulting in costly repairs. **IMPORTANT**: **After moving your chiller into place, always allow it to sit for a minimum of 30 minutes before powering up so internal fluids can resettle.**
    - **<u>If you have a wand chiller:</u>** Insert the silver portion of the wand along the inside back of the tank. Keep copper tubing out of the water as copper leaching will kill your fish. Insert the small grey-wired temperature sensor into the tank until it reaches the bottom. Secure this

wire to the tank with weather-proofing tape. Thermostat temperature should be set to 48° F, with a 2° differential.

➔ **Note**: If ice forms on the chilling wand, increase circulation around it by moving filter/circulation systems closer to the chilling wand. Check thermostat wire placement.

- **<u>If you have an inline chiller:</u>** Clean screens to remove dust and replace or rinse hoses with hot water to remove any build-up. Clean the intake foam screen on your pump with water and reinstall. You will need to clean this intake sponge weekly. Attach the outflow hose on the chiller and hang it over the back of the tank. Connect the intake hose to the water pump, then connect the other end to the chiller. Set this pump in the bottom of the tank.

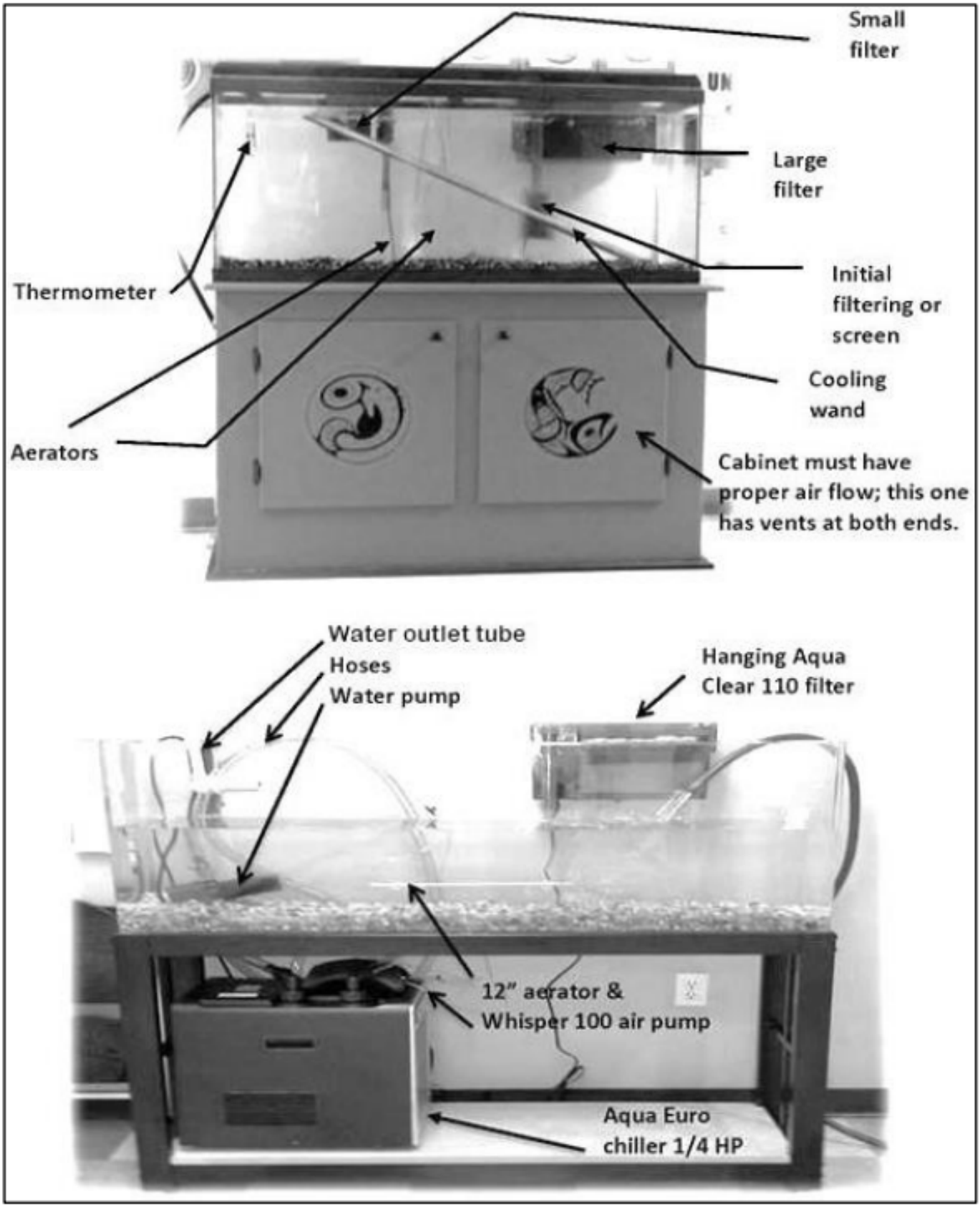
➔ **Note**: Always turn off power to your chiller and filters before doing water changes.

❑ **POWER-UP:** Check to make sure everything is working properly. Tap water may take 48 hours to cool to 48 degrees. "Cycling" an aquarium to build up nitrifying bacteria on gravel/rocks and filters takes four to six weeks. Recheck everything in two days; if your tank is not at 48 degrees, call your area coordinator.

Notes:

- Aquarium should be placed in a location with **little to no natural light** to avoid excess algae and fungus.
- Some new chillers have an on/off switch. We recommend covering these up so they do not invite additional "attention" from students.
- If new rocks are needed, find good mix of sediment sizes from small pebbles/sand all the way to cobble. 2/3 to a full 5-gallon bucket should do. Wash with light bleach solution and rinse thoroughly, or place in large soup pot and boil water with rocks for 5 minutes.
- Condensation will form on the outside of the aquarium windows when water chiller is working. This is normal and should not be mistaken for leakage. If thick ice forms on the chiller bar in the tank, provide more circulation to the tank or move filter/circulation systems closer to the chiller bar.
- If any materials and/equipment is missing, needs replacement, or you need assistance please notify SPSSEG staff. We may have replacement parts or we will find them for your tank.

**** SPSSEG staff will require temperature, pH, nitrite, nitrate, and ammonia readings before classrooms receive eggs. Confirmation of working aerator should be included as well. ****


Small filter
Large filter
Initial filtering or screen
Cooling wand
Thermometer
Aerators
Cabinet must have proper air flow; this one has vents at both ends.
Water outlet tube
Hoses
Water pump
Hanging Aqua Clear 110 filter
12" aerator &
Whisper 100 air pump
Aqua Euro chiller 1/4 HP

Life Stages in the Classroom

Eyed-Eggs

Eyed eggs are sensitive to light and extreme changes in temperature. Limit observing (when the front insulation is removed) to three 10-minute sessions each day. Check your tank daily for egg health. You can expect 5 - 10% of the eggs to die. Dead eggs are milky-white and opaque. Remove immediately from the water as they spread fungus to live eggs. To remove dead eggs, wash hands and use dipnet or clean slotted spoon.

Eyed Egg

Hatch

The eggs may hatch over a number of days. After hatch, a white froth will appear on the water surface. This is normal and should be skimmed off with a dip net. Remove egg casings on the bottom on the tank with a dip net. Rinse filters to remove egg casings. Test for ammonia levels at this time. If above normal, change some tank water.

Alevin

Alevins are sensitive to light and prefer the safety of the redd. Keep the tank covered and continue the guidelines of three 10-minute observations per day. Once the yolk sac is absorbed, the alevin is “buttoned-up” and will emerge from the redd.

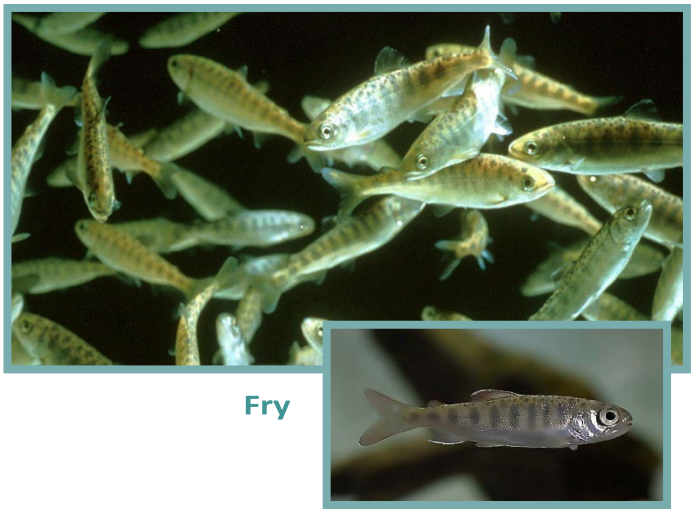
Alevin

Swim-up Fry

Fry need to inflate their swim bladder at the surface of the water before they have buoyancy. They must struggle to the surface and gulp the air. This usually occurs at night. When the fry are swimming freely in the water they will rise to the surface looking for food.

Release

Salmon species contain unique stocks that are attuned to their natal stream. All fry must be returned to an authorized stream under the direction of Washington Department of Fish and Wildlife (WDFW). Keep records of the number of fry released (count at release site). This data is required for scientific purposes.



Fry

Wrap-up

Your tank is lent “in trust” to raise salmon. Do not use for other purposes. Clean all equipment before storing in a safe place. Gravel may be reused after sterilization by boiling/baking.

From: Bev Bowler, Salmonids in the Classroom, Fisheries and Oceans Canada http://www.salmonidsintheclassroom.ca/

Egg Pick Up/Delivery

Pick up/delivery of eyed eggs most often occurs in early January, just after winter break. Your SPSSEG coordinator will notify you of dates and times you may go to the hatchery to get your eggs OR the day/time you can expect delivery of eggs to your school. It is often easiest to have the SPSSEG coordinator bring your eggs to you due to operating times of hatcheries and schools. The hatchery determines the date of pick up/distribution by the developmental stage of the eggs; eyed eggs have a small window during which they are most hardy and stable for transport.

You will receive 150-250 eggs per school, a small container of iodine to disinfect the eggs, and a small amount of started food for the fry once they hatch. Your tank MUST be ready for them!

Bring a clean, small cooler with ice to put your eggs in and take them right back to school. Don't stop along the way for lunch or errands! Before putting them in your tank, disinfect them as follows:

1. Put pre-measured iodine in 1 gallon of cold water in a bucket or other clean container. Never use a container that has been used for soap, detergent, or other chemicals.
2. Pour eggs into a strainer, colander, or large aquarium net.
3. Set the strainer in the bucket and leave it there for 10 minutes, making sure all eggs are covered by the water-iodine mixture.
4. Lift out the strainer and sprinkle eggs into the tank.

Follow this procedure exactly. Every fish that survives for release in the wild counts!

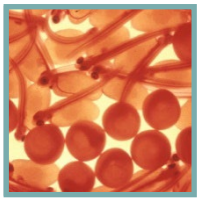
A fun math activity to include in egg delivery day is predicting salmon hatch date based on temperature units. See **Appendix C** for worksheets.

Weekly Aquarium Inspection & Maintenance

After salmon eggs are placed in the aquarium, inspecting the aquarium equipment for function and testing water quality at least once a week is essential. Using water quality testing materials, check that the water quality is within healthy parameters (see **Appendix B** for water quality parameters). Check for and remove dead or white eggs and dead fish each day. Keep count of losses to help you catch water quality problems. You may also need to remove fungus and/algae that may accumulate within the aquarium. Once you begin feeding the fry, bacteria can grow in the tank if the water is not kept clean. They aren't the problem directly, but the changes in acidity (pH), ammonia, and nitrite they produce can kill your fish. If you have to clean your tank more than once a week, reduce the amount of food you are giving.

Maintenance Schedule

From: Bev Bowler, Salmonids in the Classroom, Fisheries and Oceans Canada http://www.salmonidsintheclassroom.ca/

Stage	Tank	Water
Eyed Egg 	***Insulation*** • covers all sides and top • viewing limited to short periods ***Daily check*** • begin recording ATUs • remove dead eggs immediately monitor bubbles & temperature	***Before eggs arrive*** • age water 10 days in tank • check pH (6.5 - 7.5 range) • check ammonia if re-using gravel ***After eggs arrive*** • once a week check pH and ammonia levels
Hatch 	***Insulation*** • covers all sides and top • viewing limited to short periods ***Cleaning*** • remove any white froth on the water surface with a net • remove egg casings	***Testing*** • once a week check pH and ammonia levels • change water if required • clean filters in treated water (dechlorinated)
Alevin 	***Insulation*** • covers all sides and top • viewing limited to short periods ***Cleaning*** • remove any dead alevin • check water levels and add if needed	***Testing*** • once a week check pH and ammonia levels • change water if required • rinse filters in treated water (dechlorinated)
Fry 	***Insulation*** • front is removed completely ***Cleaning*** • remove redd and/or gravel • every week vacuum gravel ***Feeding*** • begin when fry swim-up	***Testing*** • every 2 days check pH and ammonia levels • change water every week: remove 5 gal. add 5 gal. clean water • rinse filters
Release 	***Cleaning*** • Clean all equipment with vinegar before safely storing. • Gravel may be reused after sterilization, (boiling) and stored dry.	***Transport*** • remove 5 gallons of tank water to clean pail (with cover) • dipnet fry into pail for transport to authorized stream • count and record fry released

Keep a chart of test results (aeration, water filter, temperature, pH, ammonia, nitrite, removing waste/fungus/algae, water swaps) for the students to update and monitor for changes (**Appendix D**).

Changing the Water and Cleaning the Tank

Water will usually not require changing during the eyed-egg stage. Once the eggs begin hatching, and especially after you begin feeding, you may need to replace a few gallons of water once or twice a week. If water quality parameters are not within healthy salmon range (see **Appendix B**), it will be necessary to change/replace 5 to 10 gallons of water in the aquarium. Usually, water quality falls out of healthy ranges when salmon are in the fry stage. It is necessary to change water at least once per week. Avoid replacing more than one third of the water at a time so that you don't stress the fish or upset the chemical balance. If you have a chemical imbalance and need to change out more water, try changing out several gallons spread throughout the day or over a couple days instead of all at once. To change water in aquarium:

- ❑ Fill a bucket with cold, clean tap water and let sit for 24 hours to remove any chlorine. Chlorine in the tap water, which can damage fish gills, will naturally neutralize over 24 hours. Never use warm water.
- ❑ Remove about five gallons (one bucket full) of water from the aquarium using the siphon tube or small container. Discard the old water.
- ❑ Using the siphon tube/turkey baster/gravel vacuum, suck out excess fungus, food, algae, dead eggs or salmon from the aquarium. If vacuuming the gravel, attach mesh/netting to the end of the gravel vacuum to keep the fry from being sucked in as you clean.
- ❑ You may also want to scrape algae off the glass with a fish tank scrubber or a clean sponge. The algae won't harm your fish or compromise water quality, but you may want to clean the front of your tank for a clear view.
- ❑ Gently pour clean bucket of water into the aquarium.

**** If you need assistance, please contact SPSSEG staff. ****

Tank Maintenance and Troubleshooting

Both mechanical and water quality issues can sometimes be solved with a little investigation and troubleshooting. The important thing is to keep up with maintenance and catch problems early. If you have a concern, check the section below and try to troubleshoot the problem yourself. If you still need help, call SPSSEG staff. We are happy to assist any time. Please don't hesitate to call.

**** If you need assistance, please contact SPSSEG staff. ****

Refrigeration Unit/Chiller

The most common mechanical problem is a malfunctioning refrigeration unit (chiller). Check water temperature daily. If it rises into the mid to upper 50's °F, your fish can die in a matter of hours. If the temperature rises above 52 degrees F, keep a close eye on your fish and the temperature. You can use contained ice to keep the temperature down as a stopgap measure.

Here's what to do if the temperature is in the danger zone:

1. Make sure that the chiller is on and that the temperature sensor is in the water.
2. Unplug the chiller for 5 minutes and then plug it in again to see if it resumes cooling.
3. If the unit is on and the sensor is in the water, add reusable ice/cooler packs or a bag (or more) of ice to the tank. Commercial ice or ice made from city water has chlorine in it, so put ice in a large zip closing bag; add a few drops of de-chlorinator to remove chlorine from any water that leaks from the bag.
4. Continue monitoring the temperature.
5. If you think your chiller might need repair, call SPSSEG immediately. We will work with you to get your unit repaired and operational ASAP

Even if your chiller is working fine, having ice on hand in a freezer at school is a good idea! Water can be frozen in clean milk jugs or other containers for use in your aquarium, as needed. Leave room for the water to expand when it freezes so freezing doesn't split the plastic jug.

A good way to avoid refrigeration problems is to keep the condenser (the motor, etc.) free of dust and have plenty of air circulation around it. Giving it a thorough cleaning with pressurized air once or twice a year will go a long way in keeping it working well. Chillers are expensive to purchase and expensive to repair.

Water Filter/Pump

Filtration is a necessary part of fish keeping. Just as an air filter cleans the air we breathe, an aquarium filter keeps aquarium water conditions clean and healthy for fish; it also helps keep the aquarium looking nice. In most cases, filters can also simplify the maintenance of your aquarium.

The best aquarium filters process three types of waste: solid, dissolved and biological. Solid waste is any type of dirt, particle and debris, such as fish food, fish waste, and uneaten fish food, floating in the aquarium water. This type of waste can be removed through mechanical filtration.

Dissolved waste is organic compounds, such as decaying tissue and tap water, which dissolve in the aquarium water and can cause odor and discoloration of the water. Chemical filtration is used to get rid of this type of waste.

The third type of waste is biological waste. Biological waste includes all unwanted contaminants, like ammonia and nitrate, which have to be biologically processed rather than filtered. This waste is removed through biological filtration, which provides surface area for nitrifying bacteria to grow.

A new system/filter will not have nitrifying bacteria present. Ammonia levels and nitrite levels can reach deadly amounts. If this happens, partial water changes will bring levels down without destroying all of the nitrifying bacteria. This will last only about four to six weeks before the tank "cycles."

Or, you can add SafeStart to your new aquarium. SafeStart accelerates the establishment of the bio-filter in newly set-up freshwater aquariums. The live bacteria start working immediately to provide a safe and healthy environment for your fish without the long wait. SafeStart can also be used after a water change.

Filter Maintenance

- Reduced water flow: rinse filter material in a bucket of tank water to remove slim and waste products.
- Change out filters as recommended by manufacture; search the web for missing filter information.
- Follow manufacture's recommendations to clean pump parts.

Although it is rare, the water filter (pump) may also fail. Almost always, the impeller that draws water into the pump has dried out and become roughened. It needs to be clean and smooth. It may be possible to purchase an impeller for your particular filter. If you need to order a part, inquire with SPSSEG to see if a pump is available to borrow. Your fish can tolerate a brief interruption in filtration.

Circulation is always essential! If necessary, power up your portable aerator with a hose long enough to reach the bottom of the tank. This it will provide enough circulation. You will need to replace alkaline batteries daily. The bubbles do not add oxygen throughout the tank; the oxygen dissolves into the top layer of water. Without proper circulation the bottom of the tank becomes oxygen depleted. The bubbles create mini-currents that mix oxygen-rich water from the top of the tank with oxygen-poor water near the bottom.

Feeding the Salmon

When the salmon have developed fully from alevin to fry stage and are free swimming salmon, regular feeding is necessary until salmon are released. Do not feed your fish until they have all completely absorbed their yolk sacs, or "buttoned up." Check by netting a few fish and looking closely at their bellies. You should not see even a little pink line (see photo in **Appendix E**). SPSSEG will bring you size #0 food from a local hatchery to feed your salmon.

Before beginning to feed salmon, please make sure that the majority of your salmon are free swimming in the aquarium.

Don't worry, the salmon won't starve if you need to wait a few days until most of the salmon are free swimming.

**** If you have any questions and/or need assistance on when to begin feeding, please contact SPSSEG staff. ****

When you have determined it is time to begin feeding:

- ❑ Remove the gravel. The fry no longer need their nest. The "redd" may hide dead eggs or alevins which will contaminate the water.
- ❑ Remove the front cover. Fry need light to see food. They will be shy at first, but will grow accustomed to the light and movement in the classroom. Keep sides covered and lid on tight or fry will jump from the water.
- ❑ TO START FEEDING: Put a daily supply (about ¼ teaspoon) of size #0 food in a vial or small lid. Use a popsicle stick to sprinkle tiny amounts of this food on the water twice a day. The first few days, your fish will mouth the food and spit it out but they should learn to eat within a week. Slow feeding will also ensure that smaller fish get their share.
- ❑ Feed fish twice a day. Feed only as much as your fish will eat in about one minute. If you find food on the bottom of the tank, reduce the amount.
- ❑ The fry eat only food falling through the water; they won't eat it once it hits the bottom. Avoid giving fish more than they can eat as the uneaten food settles to the bottom of aquarium and decomposes, degrading the water quality. The more food waste and fish waste, the more frequently you will need to monitor water quality and clean the gravel.
- ❑ Missing feeding a couple of days over the weekend is ok.
- ❑ If you are going to miss feeding over longer than 2 days, (spring break), make special feeding arrangements. SPSSEG staff may be able to assist with this if the building is still accessible.
- ❑ Store fish food in a cool (ideally refrigerated) area.
- ❑ About 4 weeks after the fish begin eating ,you can begin feeding size #1 food two to three times daily (if you have not already released your fish).
- ❑ About 8 weeks after the fish begin eating ,you can begin feeding size #2 food two to three times daily (if you have not already released your fish).

Salmon Release and Reporting

In the spring, SPSSEG will coordinate with teachers to plan and organize a fun fish release field trip event, including transportation of fish to the fish release site. It is very important that you release fish only in the location specified on your egg permit from WDFW. Releasing your fish is often the highlight of the experience of raising salmon! Here are some tips for a successful release.

SPSSEG will coordinate a release location and work with the teacher(s) to plan and implement field trip events. In general, the release site will have the following characteristics:

- ❑ Release location complies with WDFW permit
- ❑ Water quality: cool, flowing (aerated) water with pools
- ❑ Habitat: vegetation, wood, and/or rocks to provide shelter from predators
- ❑ Safe access for students to reach the water
- ❑ Enough space for your group to gather and not trample habitat

Transfer the fry to a bucket for transport (30-90 minutes)

When the salmon release day has arrived, salmon fry should be removed immediately prior to taking them to the release site. When salmon fry are placed into buckets, oxygen in the buckets will be lost in a couple of hours and fish will die. We place bubblers in the coolers/buckets to help prevent oxygen depletion, but the less time spent in buckets the better for the fish as the water temperature also rises to unhealthy levels. Do not use ice or ice packs in the buckets as they can crush the fry in transport.

- ❑ Make sure your buckets are really clean and has never been used with soap, detergent, or other chemicals. Buckets with lids are helpful for transport. You can drill a hole in the lid for the aerator tube to go through.
- ❑ Turn off or unplug the aquarium equipment
- ❑ Move all the rocks to one side of the aquarium.
- ❑ Fill buckets half full with water from the aquarium.
- ❑ Remove all but 6” of water from the tank using a siphon or small container. This will make it easier to catch the fry. Don’t worry about counting fry at this point, as it is easier to count during the release.
- ❑ Add battery-powered bubblers to each bucket.
- ❑ Using small long-handled nets, carefully remove the salmon fry and gently place them immediately into the aerated buckets.
- ❑ Put an air stone on the end of the bubbler tube to keep it weighted under the water.
- ❑ Secure the bubbler to the bucket lid with tape or Velcro.
- ❑ Secure the bucket lid and carefully transport salmon fry to release site. Also, take small nets, and small, clear plastic cups to the release site for actual release into creek.

**** If you need assistance, please contact SPSSEG staff. ****

Releasing your fry (30 minutes)

Do this as soon as possible after you arrive on site. If you wait too long, the water may get too warm and injure the fish. Be sure to put the bucket in the shade if you must leave it to sit. Be sure to have a battery-powered aerator in each bucket. Open the lid to give the bucket more oxygen.

- ❑ Carry the bucket close to the water's edge. Leave enough room for students to line up or form small release groups in tighter areas.
- ❑ Explain to the students that fish do not like sudden changes in their water. It is best to accustom them to the water in the creek before releasing them. The students will each bring a cup of water from the creek and pour it into the bucket to mix with the aquarium water so the fish can begin to get used to creek water. When the buckets are nearly full, the students are to line up by the bucket, cup in hand.
- ❑ Have an adult ready to tally the fish as they are netted. Either the adult that is netting the fish or the student with the cup will call out the number of fish.
- ❑ When all students are lined up, explain the procedure for release. You may tell students:
    - When you get a fish, immediately put your hand over the top of your cup so that the fish can't jump out. Call out the number of fish for the tally person.
    - Walk, don't run! Watch where you are going!
    - Take time to look at your fish. Salmon fry are easy to see when they are in a cup, but their camouflage markings will make them nearly invisible in the stream. Look at the fish in the cup and then hold the cup right above the water. Look down at your fish to see how well it will be camouflaged in its new home.
    - Don't dump fish in from high above the water as it may injure them. Hold the cup at the surface of the water and gently pour the fish in, or dunk the cup and let the fish swim out.
- ❑ Chaperones/volunteers can help dispense fish into the cups and monitor the releases.
- ❑ After all fish are released, pour the remaining water from the buckets on the ground. Collect the cups, fish nets, and aerators. Leave no garbage from your visit, please.

**** If you need assistance, please contact SPSSEG staff. ****

Other fish release field trip activities (60-120 minutes)

While releasing the fish is the highlight of the release day field trip, there are several other options for fun hands-on activities that complement the classroom lessons the kids have been learning over the past several months. Rotating through stations in groups of 10-12 students is ideal. See **Appendix F** for station rotation examples. Each station delivers approximately 30-minutes of hands-on activities. Consider using some or all of the following stations in your fish release event: water quality, habitat check/assessment, gyotaku art prints, plant scavenger hunt, stream bug (macroinvertebrate) identification, salmon survival math game.

Reporting fish release information

After you release your fish, you must report how many fish you released, when, and where. Reporting is very important and MUST be done to ensure that your school may participate in the program next year.

You will receive an email in April from SPSSEG with a link to an online form. You may also get a reminder in May or June. Please fill out the form AFTER you have released your salmon so that there is an accurate count of fish.

End-of-Year Tank Care

Cleaning should take place as soon as possible after salmon released. Waiting to clean the aquarium for too long may cause an unpleasant odor! Please let SPSSEG know if you would like assistance in tank cleaning and we can come out to your school to make this happen ASAP.

- ❑ After the salmon are released, turn off the refrigeration (chiller) unit and thoroughly blow (with computer duster/air canister) or vacuum the dust off the chiller.
- ❑ Lightly scrub out any remaining fungus, algae, or feed from the aquarium.
- ❑ Scrub tank with baking soda.
- ❑ Rinse thoroughly.
- ❑ Remove remaining water from aquarium and allow both aquarium and gravel to dry.
- ❑ Store to be ready for next salmon season!
- ❑ Change out the gravel every three years. More frequently if pH is difficult to maintain.

Note: If the staff at your school decides not to participate this year, please let us know ASAP. If your school does not participate two years in a row, we will remove the tank and pass it along to another school, unless other arrangements are made.

Appendix A: TEACHER AGREEMENT

South Puget Sound Salmon Enhancement Group

- Provide on loan a working aquarium with chiller, aerator, water testing supplies, and other necessary equipment
- Assemble and install aquarium habitat in a lead teacher's classroom or school common space
- Provide training and resources for weekly tank maintenance and water testing
- Coordinate all permits and release reporting on behalf of the Washington Department of Fish and Wildlife
- Organize delivery or pick-up schedule for eyed eggs
- Coordinate the fish release field trip
- Deliver in-person or virtual lessons as the fry develop
- Provide curriculum materials, technical support, and advice about maintenance, problems, and fry release
- Cover program costs including tanks, equipment, SPSSEG staff, and transportation

Participating Teacher Shall

Tank and Fish Care

- Provide a safe location for the aquarium
- Feed the fish per instructions*
- Maintain the tank, chiller, and other equipment per recommendations*
- Monitor water chemistry per recommendations*
- Complete and submit all reporting and other requests for information
- Inform school personnel about the importance of leaving the tank undisturbed and request help in feeding the fish over breaks, if necessary
- Do not use the tank to hold any other species as doing so may endanger the health of your fish
- Perform end-of-season equipment care per recommendations*

**See Teacher Handbook for details.*

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. SPSSEG requires every participating teacher to 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 tank monitoring and care.

- At a minimum, ensure that students observe eggs, alevin, and fry in their tank, document observations in a journal, and summarize observations (report, poem, collage, etc.)
- Ensure that students get an overview of salmon species, life cycle, regional importance, habitat concerns, and practical stewardship actions (slideshow, speaker, report, videos, field trips, etc.)
- Ensure that students are engaged in monitoring and maintaining their tank
- If possible, take students on naturalist-led field trips that connect to the in-school experiences listed above

Project Wrap-Up and Reporting

- Release fry at permit-designated release site and report date and fry count to the SPSSEG program coordinator
- Schedule transportation for students for the fish release field trip and coordinate with SPSSEG to schedule event
- Summarize classroom learning activities and objectives addressed via teacher and student evaluations (pre-program, post-program, and post-lesson/activity)

Appendix B: WATER QUALITY PARAMETERS FOR HEALTHY SALMON

Salmon aquarium water quality should be monitored once per week. Water quality testing can be done using dipstick test kits or chemical solutions. SPSSEG will provide testing materials to teachers. Keep a chart of test results for the students to update and monitor for changes (**Appendix D**).

Test/Check	Healthy Parameter/Ranges	What to do if above or below healthy parameter?
Temperature	Ideal: 48 degrees F Acceptable: 44 to 52 degrees F	Check water chiller. May need to adjust settings.
pH	Ideal: 6.7 to 7.4 Acceptable: 6.5 to 8.0	Remove one 5 gallon bucket of water from aquarium and replace with one 5 gallon bucket of fresh tap water. Retest
Ammonia	Ideal: 0 mg/L Acceptable: less than 1.0 ppm (0 to 0.10mg/L)	Stop feeding for one day; if still high, remove one 5 gallon bucket of water from aquarium and replace with one 5 gallon bucket of fresh tap water. Retest
Nitrite	Ideal: 0 ppm Acceptable: less than 1.0 ppm	Remove one 5 gallon bucket of water from aquarium and replace with one 5 gallon bucket of fresh tap water. Retest
Algae/Fungus	None - little	Siphon out fungus and algae from water, rocks and equipment in aquarium. Check to make sure natural light levels are low or none. May need to place dark paper around outside of aquarium to minimize light.
Oxygen	Above 6 ppm	Make sure air filters and aerators are creating adequate air bubbles on top of or in water.

pH (acidity): pH is measured from 0 to 14, with 7 being neutral. A pH of 14 is completely alkaline (basic) and a pH of 0 is completely acidic. High pH levels harm fish by destroying cell membranes. High pH levels also convert ammonium to toxic ammonia, which can be fatal to fish. Low pH levels accelerate the release of metals from sediment and rock. These metals can alter fish metabolism and hinder a fish's ability to breathe.

Ammonia: Ammonia results when beneficial bacteria break down egg casings, fish waste, and uneaten food. It isn't dangerous in acidic water (pH below 7.0) but becomes very harmful when the pH approaches 8.0. To be safe, keep your pH below 7.6 and the ammonia below 1.0 ppm. Ammonia can be very caustic and corrode gill and fin tissue; red streaks on the fin indicate high ammonia.

Nitrite: Nitrite results when other beneficial bacteria break down the ammonia. Nitrite impairs breathing by inhibiting the uptake of oxygen and the release of carbon dioxide. Fish thus weakened are susceptible to infection.

Appendix C: PREDICT THE HATCH

Salmon eggs develop at a rate that is partially determined by water temperature. Even cold water contributes thermal energy that is measured in Thermal Units (TUs). When a salmon egg has accumulated enough TUs, it hatches. Very cold water will result in slower egg development and a later hatch date. Warmer water will result in quicker egg development and an earlier hatch date. The optimal temperature for developing salmon eggs is 40-55 degrees F, with 48 degrees as a desirable goal. Eggs will survive temperatures close to freezing but develop very slowly. If the water is too warm, the eggs die.

Accumulated Thermal Units (ATUs) provide us with a way of using math to predict salmon hatch date and when they will be free-swimming as fry.

Here is a chart with some examples of ATUs for various salmon species (Note - we only raise chum and coho salmon for Salmon in the Schools):

Accumulated Temperature Units (ATUs) in Fahrenheit Required to Reach Developmental Stages in Salmonids		
SPECIES	**HATCH**	**FRY**
Chinook	920-980 (avg. 950)	1500-1800 (avg. 1650)
Chum	**870-1000 (avg. 935)**	**1520-1900 (avg. 1710)**
Coho	820-900 (avg. 860)	1360-1520 (avg. 1440)
Pink	1000-1200 (avg. 1100)	1600-1900 (avg. 1750
Sockeye	1120-1280 (avg. 1200)	1720-2000 (avg. 1860)

This is how ATU prediction of salmon egg hatch date works:

1. ATU is the addition of each day's temperature increment over freezing to the previous sum. In degrees Fahrenheit, 32 is freezing. If your chiller is set to 48 degrees Fahrenheit, each day your eggs will accumulate 16 ATUs because 48-32=16. Similarly, if your chiller is set to 50 degrees Fahrenheit, each day your eggs will accumulate 18 ATUs because 50-32=18.
2. Your hatchery will provide the date the salmon were spawned and the temperature the eggs have been kept at. Looking at calendar, have the kids count out how many days have elapsed since egg fertilization (spawn date) and eyed-egg delivery to your school.
    a. Example:
        i. The eggs were spawned on November 20, 2021.
        ii. Eyed eggs were delivered to your school on January 3, 2022.
        iii. The eggs were kept at an average of 48 degrees Fahrenheit every day.
        iv. Looking at the calendar, 44 days have elapsed between spawning and egg delivery (not counting the day of delivery).
        v. We use our formula of average daily temperature – freezing temperature to calculate 48-32=16
        vi. We multiply days by ATUs, so 44 days x 16 ATUs = 704. This means our eggs have already accumulated 704 thermal units.
3. Using the table above, we know that Chum salmon need an average of 935 ATUs to hatch and 1710 ATUs to start swimming freely as fry. To calculate hatch date, we need to subtract the ATUs the fish have already

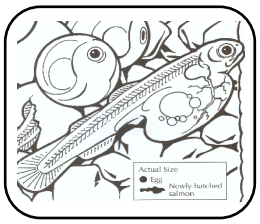
accumulated in the hatchery from the total ATUs required to hatch and become fry. Then we need to divide this number of ATUs by the average temperature of the classroom aquarium.

   a. Example:
      i. Chum need 935 ATUs to hatch. Our eggs have already accumulated 704 ATUs.
         1. To calculate remaining ATUs needed, we find that 935 – 704 = 231
      ii. Next, we need to divide our remaining ATUs to hatch by the average tank temperature (in this case, 16 ATUs per day since our tank chiller is set at 48 degrees Fahrenheit)
         1. We calculate 231 / 16 = 14 days
      iii. Now we know that our eggs should hatch approximately 14 days.
      iv. Have your students look at a calendar to count out how many days from now that is. In this example, it would be a predicted hatch date of January 16, 2022.
4. Do the same calculations to predict days until the eggs are fry as you did for hatch.
5. Use the following worksheets to predict hatch date and fry stage with your students.

Introducing the worksheets to students:

1. Begin the worksheet by asking 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 the Eggs Hatch and the When Will the Salmon Become Fry worksheets. 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 worksheets 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. Use the weekly tank care sheet to record the number of TU's that accumulate each week.
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.

Name: _____



WHEN WILL THE EGGS HATCH?

Chum Salmon eggs need between 870 and 1000 Accumulated Thermal Units (ATUs) to hatch. The average ATUs to hatch is 935. A Thermal Unit is the average temperature in degrees Fahrenheit minus 32 degrees (freezing).

1

Date the eggs were spawned: _____ Number of days at the

Date the eggs were delivered: _____ hatchery: _____

2

To find the amount of TUs the eggs received while at the hatchery:

Temperature at the hatchery: _____

— 32 deg. F

Equals: _____

Multiplied by the days at the hatchery: x _____

Equals the amount of TUs the eggs have accumulated by arrival: _____

3

To find the amount of TUs left until hatching:

	Lower	Upper	Average
Thermal Units needed to hatch:	870	1000	935
Minus the amount of TUs the eggs had accumulated by arrival:	— _____	— _____	— _____
Equals Thermal Units left until hatching:	_____	_____	_____

4

To find the amount of TUs the eggs will receive each day:

Average temperature in the aquarium: _____

— 32 deg. F

Equals the amount of TUs the eggs receive each day: _____

5

To estimate hatch time:

	Lower	Upper	Average
Thermal Units (TUs) left until hatching:	_____	_____	_____
Divided by the TUs the eggs receive each day:	÷ _____	÷ _____	÷ _____
Equals # of days left until the eggs hatch:	_____	_____	_____

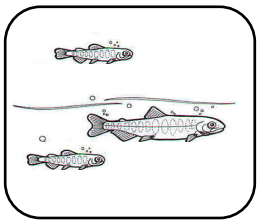
6

Use a calendar to count the # of days for lower, upper, & average hatch dates.

I predict the eggs will hatch between _____ and _____.

The average date the eggs may hatch is _____.

Name: _____



WHEN WILL THE SALMON BECOME FRY?

Chum Salmon eggs need between 1520 and 1900 Accumulated Thermal Units (ATUs) to start swimming freely as fry. The average ATUs to hatch is 1710. A Thermal Unit is the average temperature in degrees Fahrenheit minus 32 degrees (freezing).

1

Date the eggs were spawned: _____

Date the eggs were delivered: _____

Number of days at the hatchery: _____

2

To find the amount of TUs the eggs received while at the hatchery:

Temperature at the hatchery: _____

— 32 deg. F

Equals: _____

Multiplied by the days at the hatchery: x _____

Equals the amount of TUs the eggs have accumulated by arrival: _____

3

To find the amount of TUs left until fry stage:

	Lower	Upper	Average
Thermal Units needed to become fry:	1520	1900	1710
Minus the amount of TUs the eggs had accumulated by arrival:	— _____	— _____	— _____
Equals Thermal Units left until fry stage:	_____	_____	_____

4

To find the amount of TUs the eggs will receive each day:

Average temperature in the aquarium: _____

— 32 deg. F

Equals the amount of TUs the eggs receive each day: _____

5

To estimate when the salmon become fry:

	Lower	Upper	Average
Thermal Units (TUs) left until fry stage:	_____	_____	_____
Divided by the TUs the eggs receive each day:	÷ _____	÷ _____	÷ _____
Equals # of days left until salmon are fry:	_____	_____	_____

Use a calendar to count the # of days for lower, upper, & average fry dates.

6

I predict the salmon will become fry between _____ and _____.

The average date the salmon may become fry is _____.

Appendix D: PRINT AND INSTALL WEEKLY FISH CARE CHECKLIST NEAR TANK

1. Mark an X to show that feeding and aeration (are there bubbles) have been checked.
2. Track mortality (dead eggs or fish) and keep the total count of live eggs or fish up-to-date.
3. Test and enter your results for Temperature, pH, Ammonia, and Nitrite.
4. Record ATUs (# of days x (tank daily temperature – 32 degrees) + previous total of thermal units)
5. Comments to include: date of hatching, “buttoning up” visual checks, water swaps, cleaning, etc.

Predicted Hatch Date: _____

Date	Feeding	Aeration	Mortality	Count	Temp °F	pH	Ammonia	Nitrite	ATUs	Comments

Appendix E: "BUTTONING UP" AND SUTURE LINES

When is it time to feed your salmon?

This is the "suture line," where the salmon's yolk sac used to be. <u>This needs to be almost completely invisible before they are fed.</u> The full absorption of the yolk sac is known as "buttoning up."

These Chinook were fed for the first time about **A WEEK AFTER** this picture was taken.

The fish will look very skinny at this point, but they are OK!

Helpful Hint:

Put one to three fish in a clear plastic cup so you can look under them to view their bellies.

Appendix F: FISH RELEASE EVENT STATION ROTATION EXAMPLES

1 classroom: 20 students divided into 2 groups

Time	Station 1: Water Quality/ Habitat Check	Station 2: Release Your Fish!	Station 3: Stream Bugs	Station 4: Gyotaku Art Prints	Station 5: Plant Scavenger Hunt	Station 6: Salmon Survival Math Game
9:30	Group 1			Group 2		
10:00	Group 2	Group 1				
10:30		Group 2	Group 1			
11:00	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
11:30			Group 2	Group 1		
12:00					Group 1	Group 2
12:30					Group 2	Group 1

5 classrooms: 100 students divided into 10 groups requiring 2 of each station

Time	Station 1: Water Quality/ Habitat Check	Station 2: Release Your Fish!	Station 3: Stream Bugs	Station 4: Gyotaku Art Prints	Station 5: Plant Scavenger Hunt	Station 6: Salmon Survival Math Game
9:30	Group 1		Group 5	Group 4	Group 3	Group 2
10:00	Group 2	Group 1		Group 5	Group 4	Group 3
10:30	Group 3	Group 2	Group 1		Group 5	Group 4
11:00	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
11:30	Group 4	Group 3	Group 2	Group 1		Group 5
12:00	Group 5	Group 4	Group 3	Group 2	Group 1	
12:30		Group 5	Group 4	Group 3	Group 2	Group 1

Time	Station 7: Water Quality/ Habitat Check	Station 8: Release Your Fish!	Station 9: Stream Bugs	Station 10: Gyotaku Art Prints	Station 11: Plant Scavenger Hunt	Station 12: Salmon Survival Math Game
9:30	Group 6		Group 10	Group 9	Group 8	Group 7
10:00	Group 7	Group 6		Group 10	Group 9	Group 8
10:30	Group 8	Group 7	Group 6		Group 10	Group 9
11:00	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
11:30	Group 9	Group 8	Group 7	Group 6		Group 10
12:00	Group 10	Group 9	Group 8	Group 7	Group 6	
12:30		Group 10	Group 9	Group 8	Group 7	Group 6