

Tacoma Salmon in the Classroom

TANK MANUAL

2022/23

Table of Contents:

Contacts.....	3
Keys to Success.....	4
Supplies.....	5
Tank Preparation.....	6
Setting up Your Equipment.....	7
Tank Maintenance & Troubleshooting.....	9
Cleaning, Testing and Water changes.....	11
Water Changes & Cleaning.....	12
Monitoring Water Quality Parameters.....	13
Egg Pick-up/Delivery.....	15
Feeding your Fry.....	15
Salmon Release.....	17
End-of-year Tank Care.....	18
APPENDIX A: Web Resources.....	19
APPENDIX B: Sample monitoring sheet (for feeding).....	20

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KEYS TO SUCCESS

If this is your first year as an Tacoma Salmon in the Classroom (TSIC) teacher, here are the most important keys to your success:

- **Get your students doing the work!** Your tank should be in an area that is as visible as possible to students and faculty. With the help of your Salmon Ambassadors intern your students should be feeding, cleaning, and maintaining the water quality.
- **Create a schedule/log information throughout.** Keep a log of when your fish are fed (and how much you are feeding), water changes/clean the gravel (how much you removed), water quality readings (ammonia, nitrites & nitrates), and what chemicals you are adding.
- **Attend all PD's or watch recordings.** Attending PD's is a great place to ask questions and learn from others who have experience in the program.
- **Read this handbook!!** It will answer most of your questions.
- **Ask for help immediately** if you suspect something is wrong with your equipment, if water-quality takes a nosedive, or if fish seem in distress. We are here to support you!!

TANK EQUIPMENT

- 55 gallon **tank** and tank **stand**
 - A **filtration** Fluval 407 canister
 - An **additional** Whisper EX45 Power Filter
 - A **chiller** system
 - A Mag Drive 700 **Water Pump**
 - An **air pump system** for ≥ 60 gallons with two hose ports, two check valves, and an 8 ft. air hose
 - A **5" fish net** with long handle
 - An aquarium **thermometer** (preferably with suction cups)
 - **5 ft. clear siphon hose** for cleaning the tank and replacing water
 - A dedicated **power outlet** and a **power surge strip** with 5 ports
 - A battery-operated **air pump/aerator** for your fry release (your partner organization may have loaners)
 - Two 5-gallon **buckets** to use for water exchanges and transporting fry
- *Extra **intake sponges** for pumps and filter intakes
- *Turkey baster or tongs for removing dead eggs or debris
- *A plastic two-quart water pitcher or a marked bucket to aid in exchanging water

SUPPLIES-CONSUMABLES

- **Fish food** from the hatchery
- **Safe:** It is the complete and super-concentrated dry conditioner for both fresh and saltwater. Safe removes chlorine, chloramine and detoxifies ammonia, nitrite, and nitrate. It is non-acidic and will not impact pH. Safe may be used during tank cycling to alleviate ammonia/nitrite toxicity. It contains a binder which renders ammonia, nitrite, and nitrate non-toxic, allowing the biofilter to more efficiently remove them. Use at start-up and whenever adding or replacing water.
- **Prime:** Removes chlorine, chloramine and detoxifies ammonia, nitrite, and nitrate. It is non-acidic and will not impact pH. It may be used during tank cycling to alleviate ammonia/nitrite toxicity. It contains a binder which renders ammonia, nitrite, and nitrate non-toxic, allowing the biofilter to more efficiently remove them. It will also detoxify any heavy metals found in the tap water at typical concentration levels. Use at start-up and whenever adding or replacing water.
- **Stability:** Will rapidly and safely establish the aquarium biofilter in freshwater and marine systems, thereby preventing the #1 cause of fish death: "new tank syndrome". Stability is formulated specifically for the aquarium and contains a synergistic blend of aerobic, anaerobic, and facultative bacteria which facilitate the breakdown of waste organics, ammonia, nitrite, and nitrate. The bacteria employed by Stability are non-sulfur fixing and will not produce toxic hydrogen sulfide. Stability is completely harmless to all aquatic organisms as well as aquatic plants, thus there is no danger of overuse.
- **Stress Coat:** Is a water conditioner that makes tap water safe for fish by removing chlorine, chloramines and heavy metals from tap water, and contains the healing power of Aloe Vera to reduce fish stress by up to 40% and to heal damaged tissue and wounds. Stress coat water conditioner also reduces electrolyte loss in your fish, and should be used when: Handling, netting, or adding fish to a bag for the trip home from the store, Starting an aquarium, Performing monthly water changes, When adding new fish to your aquarium. Our unique formula is scientifically proven to reduce fish stress and heal damaged tissue by forming a synthetic slime coating on your fish. Stress coat water conditioner also helps reduce fish susceptibility to disease and infection.
- **Freshwater Test Kit:** Is used to test ammonia, nitrate, nitrite and pH. Use every time before you do a water change and record your results in your notebook. Follow up with a second test after your water change if you need certain levels to go down.
- Extra **filter media**

TANK PREPARATION

New to 2022/23 You will have two high school interns from the Next Move program (**Salmon Ambassadors**) available to help you maintain your tank on a weekly basis. They are there to supervise your students while they feed, clean, and maintain your salmon tank. They are not, however, fully responsible for your tank's & salmon's general health. It is very helpful to utilize other teachers, faculty, and volunteers in monitoring your tank's overall condition.

You will prepare your tank a few weeks prior to when you will receive eggs. This will enable you to work out any issues in the system before baby salmon are at risk - to check equipment, get the water to the proper temperature, and begin establishing the biological filter. Once you confirm that all systems are working, you may turn off everything except the air pump and filter system. Turn on your chiller 2-3 days before eggs go in and set the temperature between 48°F-52°F.

Follow these steps to get your tank ready for eggs:

TANK STAND: Position your stand in a hallway or other common space where you, your students, and your tank ambassadors have ready access and everyone in the school can easily visit the tank. Consider your closest water source and drain. Water will need to be transported to the tank via buckets or hoses.

TANK: Rinse the tank in water only (no soap or chemicals), gently scrub with a soft sponge and not anything abrasive, and rinse again thoroughly. (You may have done this step in the spring.)

GRAVEL OR ROCKS: Use up to 10 lbs. of rinsed, natural pebble-sized gravel (never colored gravel, dirty gravel, or very old gravel). Rinse gravel/rocks well in water to remove dust and algae. Gently spread gravel to ½ inch to a full inch deep (notice gravel will not cover the entire bottom of your tank). Salmon eggs should **only** be placed where the gravel is.

TEMPERATURE: Install a suction-cup thermometer inside the tank as a backup to the readout on your chiller and so students can gain experience using a thermometer to monitor temperature.

WATER: Fill the tank with cold tap water. To avoid unwanted chemicals, **do not use** an old garden hose, a metal bucket, or a bucket that has ever contained a cleaning product or other chemicals. (A white RV hose for potable water is OK.) Fill to at least 3 inches from the top and use a Sharpie or weather-proofing tape to mark the fill line. Be sure you fill high enough for your type of filter to work. We strongly recommend the use of water conditioners to remove the toxicity of heavy metals and chlorine whenever you add water. Follow the dosage instructions on the product label. **Letting water sit and 'off gas' does not remove heavy metals.**

CHILLER: Blow all the dust-off condenser fins, screens, and motors. **Failure to remove dust may cause your chiller to overheat, resulting in costly repairs.** See the following cleaning instructions.

→**IMPORTANT:** After moving any chiller into place, always allow it to sit for a minimum of 30 minutes before powering up so internal fluids can resettle. 24 hours is ideal.

Setting Up Your Equipment:

Your partner organization and Salmon Ambassadors will be present to assist tank set-up.



CHILLER: Place your chiller in a ventilated place away from any heat source and make sure that the front and rear of the chiller have at least 1-foot clearance for air flow. It must have adequate air flow to function correctly. Do not place your chiller inside a fully enclosed tank stand!

Pre-rinse used hoses with hot water to remove any build-up. A small round ½" brush attached to a 16-gauge wire can be used to push /pull through hoses as well. Clean the intake foam screen on your pump with water and reinstall. **You will need to clean this intake pump sponge weekly.**

Attaching chiller hoses:

1. Dry measure lengths of hose before cutting anything; the inflow hose will be longer than the outflow.
 2. Attach the outflow hose to the chiller fitting and clamp it (softening with hot water helps hoses fit easier).
- NOTE:** only use metal clamps **outside** of the tank-**absolutely no metal in the aquarium!**
3. Attach the outflow diverter on the other end and place in a bucket for now (you will need to flush 2-3 gallons through the chiller before you can finish set up)
 4. Connect the intake hose to the water pump (this pump will be in the bottom of the tank). Leave enough hose to be able to pull the pump out of the water to service it.
 5. Connect the other end to the chiller fitting, using a hose clamp. Put the water pump in the bottom of the tank.
 6. Plug in just the water pump and check all fittings for leaks. Run the pump for a few minutes.
→At the same time, run 2-3 gallons through the chiller to remove any preservative chemicals (for new chillers) or old water (for used chillers) and into a bucket to then be dumped. You can secure the outflow diverter to the tank once the chiller has been flushed.
 7. Plug in the chiller and set the digital reading to 48-52°F.

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



AIR: Your air stone should be placed in the center of your tank. Install check valves on the pump side of hosing to prevent back-flow. Place the mechanical part of the air stone on top of the tank (or another stable location). Place gravel along the edges of the air stone to keep it weighted down. Make sure not to cover the airstone as it is necessary for adequate dissolved oxygen - which is VITAL for fish health.

WATER FILTER (canister filter):

You have been provided a Fluval 407 canister filter with all of the appropriate fixtures and materials. An additional

side mount filter will be provided **but this cannot be your primary filtration system**. It is helpful to wrap netting/mesh over the filter intake to prevent alevin from being sucked in. Always start the new season with fresh filter materials. Remove plastic packaging, always rinse new filter materials thoroughly ***in dechlorinated water***, and read manufacturer recommendations online.

INCLUDES



POWER-UP: Check to make sure everything is working properly- i.e. the chiller is cooling the water, the filter and pumps are running, and there are no leaks anywhere. 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 after two days; if your tank is not at/near 48 degrees, call your partner organization.** If everything is working properly, you may turn off the chiller until three days before your eggs arrive. Cycling will happen faster in room temperature water. Leave the air pump and water filter on to keep water circulating.

BACKGROUND ON BIOLOGICAL FILTRATION

A biological filter is a population of beneficial bacteria that eat available waste products in the aquarium. Some bacteria consume salmon eggshells, uneaten food, and fish waste and produce ammonia (which can be very harmful with a high pH). Others (*Nitrosomonas*) consume ammonia and give off nitrite. Still others (*Nitrobacter* and *Nitrospira*) consume nitrite and produce nitrate (a harmless fertilizer unless levels get very high).

SECTION FOR ADDING ADDITIONAL DECORATIVE ITEMS

- If you choose to add aquarium wood or plants, keep to a Northwest theme; you aren't rearing tropical fish!
- Don't use driftwood or freshly cut wood as this can negatively affect water chemistry or color.

TANK MAINTENANCE & TROUBLESHOOTING

You can sometimes solve both mechanical and water-quality issues on your own 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 applicable section below to try to solve the problem yourself. If you conclude that you need help, call or email your partner organization. **Don't wait until the end of the day!** If you end up needing a chiller repair, contact Ryan Patterson at Tacoma Public Schools or Julia Berg at Foss Waterway Seaport.

CHILLER

A malfunctioning chiller is the most common mechanical problem. Check water temperature daily as your fish can die in as little as 24 hours in water that a broken chiller cannot keep cold enough.

If the temperature rises into the danger zone (above 55F) check for these things BEFORE calling your partner organization:

1. **Is there power to the chiller? It should be plugged in and turned on, with the temperature showing on the screen.**
2. **Is there power to the pump? It should be plugged in; check that the power strip is on.**
3. **Is the pump sponge clogged? Turn off the pump, remove the sponge filter and squeeze under running water until water runs clear, then replace and turn pump back on.**
4. **Is anything blocking the vent such as dust or is it too close to the wall?**
- 5.

- If your chiller still isn't doing its job, **call your partner organization immediately**

- Add frozen (lid on) water bottles to the tank to bring the temperature down below 55 degrees.

→**Note:** Commercial ice or ice made from city water has chlorine in it and this can harm your fish if it gets into tank water. **Even if your chiller is working fine, freeze dechlorinated water in clean water bottles or other sealable containers to use in your aquarium, if needed. Leave room at the top so freezing doesn't split the plastic bottle. Mark container "for salmon use only."**

WATER FILTER

Filtration is an essential part of fish rearing. An aquarium filter keeps water healthy for the fish, helps keep the tank looking nice, and can simplify maintenance. The best aquarium filters process three types of waste: biological, dissolved, and solid. Proper balance is needed to limit spikes in ammonia and nitrite, which are toxic to fish.

Mechanical filtration: The filter media will trap large particles and stop them from circulating the tank. This will help keep your tank looking clean. It also concentrates the filtered material in one place where it can be removed from the tank. Rinsing the debris regularly from your filter media will help maintain water quality. Rinse in cold water to avoid killing off beneficial nitrifying bacteria.

Biological Filtration: Nitrifying bacteria will convert fish waste and uneaten food particles to non toxic forms. Bacteria colonizes the filter media and lives within the gravel. As fish produce waste, it becomes ammonia. Ammonia is toxic to fish and will damage gill tissue and cause death quickly. This issue is compounded when the ammonia is so high it kills fish and their decomposing bodies create even more ammonia. Any dead eggs (cloudy, fuzzy, or discolored) and fry casualties should be scooped out. Bacteria won't remove the waste entirely, but can convert it to less toxic forms. Ammonia is converted to Nitrite.

Nitrite is also toxic to fish but less so than ammonia. Bacteria will convert nitrite to nitrate, which is the least toxic of them all. Removal of nitrates can only happen with water changes. Cycling a tank is the process of establishing colonies of nitrifying bacteria. This process can be sped up by the addition of commercially available bacteria colony additives.

Chemical filtration: Chemical filtration is accomplished with special media which is placed in the filters, or as a chemical additive to the tank. Activated charcoal is an effective chemical filtration element. Organic waste compounds, decaying tissue, and tap water contaminants can dissolve in aquarium water and cause odor and discoloration. Chemical-removal media can be the charcoal packs in the Fluval 407. Change these media monthly. (*Prime* chemically binds ammonia, leaving it available for the bacteria to consume.)

FILTER MAINTENANCE

- Avoid cleaning your entire biological filter at the same time. If you have several filter components, alternate cleaning/changing them. **Do not clean your biological filter with tap water because the chlorine in it can kill your valuable beneficial bacteria.**
- Once per week or if you experience reduced water flow through your filter, rinse the filter material in a bucket of **tank** water to remove slime and waste products, then reinstall. Check the sponge or screen on the uptake tube at the same time to see what may have sucked into the filter.
- Change out filters as recommended by the manufacturer; if you no longer have the information that came with your filter, search online for it.
- Follow the manufacturer's recommendations for cleaning interior pump parts (see below).

IN THE EVENT OF PUMP FAILURE

Although rare, the pump on your water filter may fail. Almost always, failure happens when the impeller that draws water into the pump has been damaged and becomes roughened. First, turn off the pump, remove it from the water and check to see that nothing is blocking the pump. If there is bacteria build up or something blocking the pump remove it and clean the pump with tank water. If none of that works, contact your Community Partner ASAP.

Maintaining water circulation is essential! Without proper circulation, the bottom of the tank will be depleted of oxygen and your eggs or fish could die. Use a portable aerator to create mini-currents that will mix oxygen-rich water from the top of the tank with oxygen-poor water near the bottom.

CLEANING, TESTING, AND WATER CHANGES

Cleaning your tank is one of the more time-consuming tasks while raising salmon, but it is critical to salmon health. Your Salmon Ambassadors will help you during the most intense cleaning and maintenance period (when you start feeding your salmon up until the release field trip). It is not their sole responsibility to care for your tank- your students should be as involved as possible in salmon care!

How often your tank needs cleaning depends on the number and size of fish, their food, how well your filtration system works, and the tank's chemical balance. In a chemically balanced tank, beneficial bacteria and proper filtration help break down ammonia and nitrite naturally and reduce the need to clean. The simplest way to know if you have a balanced tank is to **test water quality at least twice a week**. Have students use the freshwater test kits twice a week with the help of the Salmon Ambassador or teacher. The freshwater test kits are the most accurate way to help you understand the health of your tank system.

Here are guidelines for water changes:

- Eyed-egg stage - replace 5-10 gallons 1/wkly. Remove dead/white eggs daily.

- Hatching and alevin stage - replace 10 gallons 2/wkly and remove the foam from egg casings so protein doesn't build up.
 - As fry begin to feed - **siphon** the gravel to remove excess food and waste (this is a new step compared to earlier water changes!). You should be replacing 10 gallons 3 times a week with fresh **dechlorinated** water.
 - Test water quality once or twice a week to guide your actions.
 - Remove dead fish daily.
 - Keep count of losses to help you become aware of water-quality problems and to know how many fry your students may release.

Once you begin feeding your fry, organic material, called detritus, can build up in the tank. The detritus can cause an overgrowth of harmful bacteria which can cause negative changes to water chemistry. Spikes in ammonia, nitrite, and a drop in pH can indicate the tank needs to be cleaned. Detritus often has a foul odor as well. Stay on top of detritus by siphoning the gravel with each water change. If you don't test water quality, you may not know you have a problem until your fish begin to die.

WATER CHANGES AND CLEANING

Materials needed: (2) 5 gallon buckets, (1) siphon, appropriate chemicals, magnetic glass scraper

FIRST! : Turn off power to filter. (To restart after cleaning, take the pump on the top of the canister filter and pull up then push down. This will refill your filter with water.)

You will be removing 10 gallons worth of water AND detritus (organic material) that is hidden within your gravel bed.

1. **UNPLUG THE FILTERS**
2. Place the tube end of your siphon into the tank so that the tube is filled entirely with water (Make sure no fish swim into your tube). The tube should be about 1 inch above your gravel.
3. Put the hose end of your siphon into a 5-gallon bucket.
4. Squeeze the bulb of your siphon a few times until you see water flowing through the tube and into your 5 gallon bucket.
5. Once the water is flowing smoothly, push your siphon into the gravel so that it reaches the bottom of the tank. Gently “stab” the gravel so that it loosens up any detritus, then lift the siphon up a little to allow the gravel to fall back out of the tube. Watch the particulate detritus flow through the tube..
6. Move your siphon around the tank in a methodical manner, working your way around the tank. Move any pumps or aerators out of the way and be sure to clean under them.
7. Watch your bucket so it doesn't overflow, only fill about halfway so it can be easily dumped. Stop siphon while you dump the water, or have someone help you dump. Never leave a siphon unattended.
8. Refill your tank with **COLD** and **DECHLORINATED** water. Check that the temperature closely matches the tank using a thermometer. **IF YOU DO NOT DECHLORINATE YOUR WATER YOUR FISH WILL DIE.**
9. **RESTART FILTERS. The Fluval 407 will need to be primed before you plug it in.**

The more algae growing on the walls of your tank, the more problems you will have with keeping pH within range, plus it clouds the view. Scrape the glass with a magnetic cleaner scrubber or a clean sponge. If your tank is acrylic, make sure your scraper is safe for plastic.

Test your source water to see how its chemistry may affect results from testing of the water in your tank. If you get a high reading from tank water, re-test before taking corrective action. If the reading remains high, the best and fastest solution is to change out 15 gallons of water and add a double dose of *Prime*. Wait 24 hours, change out another 15 gallons, and test again.

MONITORING WATER QUALITY PARAMETERS

- Begin **weekly testing** of water for pH, ammonia, nitrite, and nitrate **before your eggs arrive**. You need to know if your aquarium has cycled (established enough nitrifying bacteria) before putting eggs in.
- In a balanced tank:
 - **pH** will be between 7.0 and 7.6
 - **Ammonia** will be 0 ppm (up to 0.25 ppm)
 - **Nitrite** will be 0 ppm (up to 0.5 ppm)
 - **Nitrate** will be between 0 ppm and 40 ppm
- If you find more than a trace of **ammonia** or **nitrite**, take the steps that follow to restore balance.
- Your fish will have adequate **dissolved oxygen** if your aerator is working properly.
- Your **temperature** should be between **49° F and 52° F**.

→**Test your source water** to see how its chemistry may affect results from testing of the water in your tank.

pH (acidity) - Goal: between 7.0 and 7.6. Pay close attention if it gets too extreme. You will mostly be using the regular pH test to get your readings. If your water tests at 7.6, use the high pH test as it will determine how toxic your ammonia reading may be. If you cannot keep pH within this range, contact your Partner Organization. **Do not change the pH more than 0.2 points within a 24-hour period.**

Your pH level greatly affects the toxicity of your ammonia readings. When you have test results of lower pH and higher ammonia, toxicity will be less.

Ammonia - Goal 0; keep it less than 0.25 ppm.

Ammonia results when not enough beneficial bacteria are present to break down egg casings, fish waste, and uneaten food. It isn't as toxic in acidic water (pH below 7.0) but becomes very harmful (corroding gill and fin tissue) when pH approaches 8.0. To be safe, keep pH below 7.6 **and** ammonia below 0.25 ppm. These articles explain the relationship of temperature, pH, ammonium, and ammonia: ▀

Follow these steps to bring down ammonia :

1. Do a one-third water change (half in the morning and half in the afternoon). Check your filter, clean it of any decaying material, and retest.
2. The next day, retest both ammonia and pH. Make sure pH is 7.6 or below. If necessary, do another one-third water change and retest.
3. Add beneficial bacteria to your tank (*Stability*) to help re-establish beneficial bacteria colonies.

Nitrite - Goal 0. Pay close attention if it gets up to 0.5 ppm.

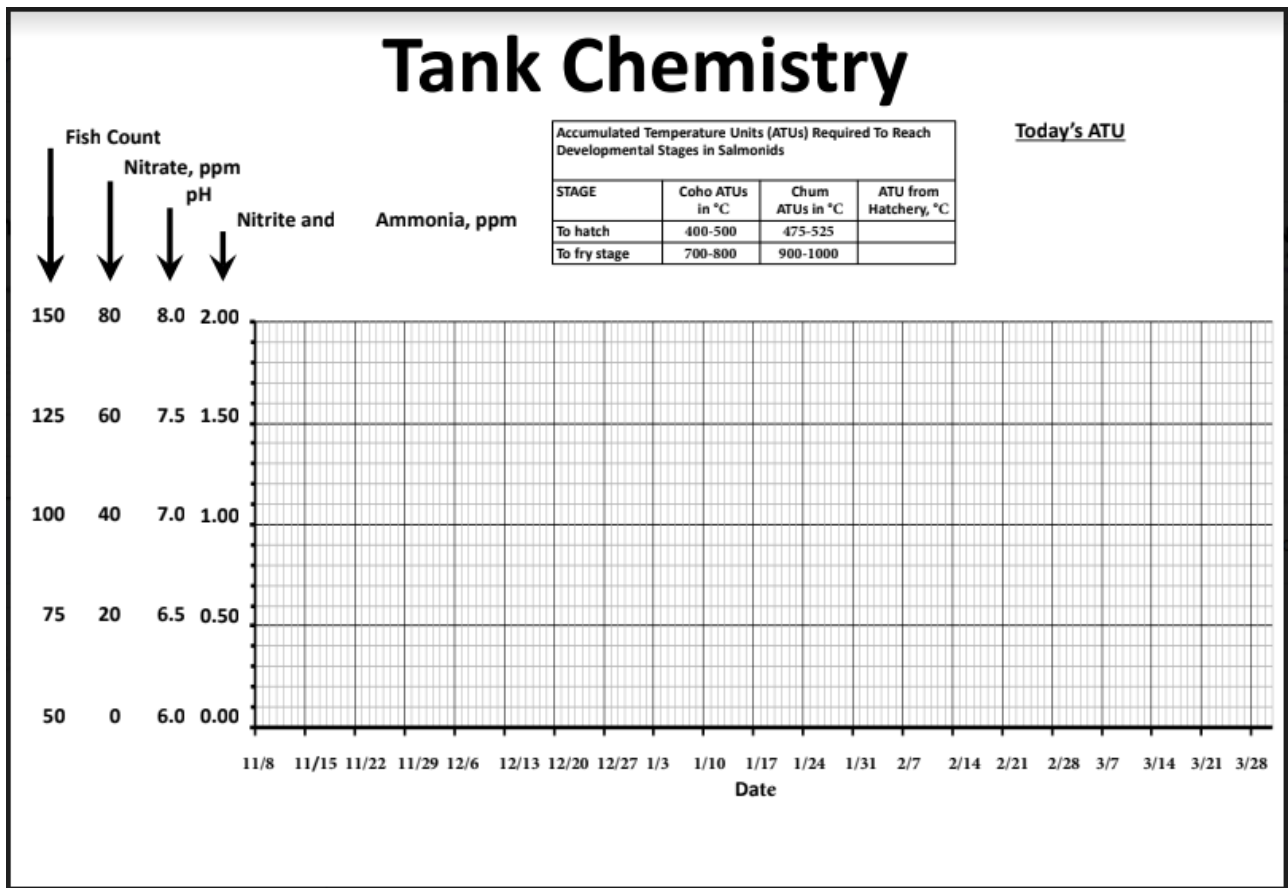
Nitrite results when other beneficial bacteria break down ammonia. It harms fish by inhibiting the uptake of oxygen and the release of carbon dioxide. Fish thus weakened are susceptible to infection.

1. Re-establish biological filtration by following the instructions about ammonia. Add beneficial bacteria and be patient; they will solve an ammonia problem faster than they will solve a nitrite problem.
2. If nitrite tests high (0.5 to 1 ppm), do partial water changes more frequently, even daily.
3. If neither technique works, find out what is interfering with production of beneficial bacteria. The

culprit could be colored gravel, volcanic rocks, toxic build-up, or inadequate cleaning. Or the culprit might be changing filter materials too often or changing both filter pads at the same time; you need to leave a little “gunk” behind so the bacteria can recolonize the clean media.

4. If high nitrite persists, call your Partner Organization.

Keep a chart by the tank to monitor for changes. Students can update this chart each time they test the water. Following is an example of a comprehensive chart that uses colored dots to show multiple parameters. There will also be a QR Code posted on your tank for Salmon Ambassadors and your students to electronically fill out water quality readings to keep track of trends.



EGG PICK-UP/DELIVERY

Pick-up/delivery of eyed coho eggs will happen in **early December 2022**. 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 stable for transport. Our eggs come from Diru Creek Hatchery, owned and operated by the Puyallup Tribe.

Each school will receive 150 eggs, and starter food for the fry. Your partner organization will notify you of dates and times for delivery or pick up of eggs. For most schools, your Salmon Ambassadors will pick up your eggs and help introduce them to your tank.

Your tank MUST be ready or no eggs!

Egg and Alevin Stage

Eggs generally hatch during their second week in the tank but may hatch earlier or later depending on their development at the time they left the hatchery. Ask your students to record hatch observations in their journal. During hatching, egg casings will appear as foam on top of the water, make sure to remove this foam as it appears.

If you haven't already, begin weekly water testing. Use testing values to determine if water changes are needed. Check daily for dead eggs and alevin and record any on your monitoring chart. Also start checking your filter screens for build-up and clean as needed in **dechlorinated** water.

Watch the alevin as they bounce on their big bellies and bury their heads in the gravel. Then, during the first month you may notice that they have all disappeared! Don't be alarmed; they are under the gravel and will emerge when they are ready, just as they would in the wild. Be sure to check your filters for any that went astray!

→NOTE: Don't disturb your gravel or rocks while cleaning as eggs and alevin are very fragile! Don't start vacuuming the gravel until all fry are able to swim out of the way.

FEEDING YOUR FRY

After your salmon have emerged from their egg casings you will notice they have a large orange "belly". This belly is their yolk sac and it provides all of the baby salmon's food and nutrients. It will take about a month for the alevin to fully absorb their yolk sacs. **Do not feed your fish until they have ALL absorbed their yolk sacs ("buttoned up")**. You should not see even a little pink line.



Your fish should closest resemble the #5 fish.

Your fish will look very skinny and you may think they are starved but DO NOT feed them until 99% have buttoned up. If you start feeding too early it can cause the fish to become very sick.

IMPORTANT NOTES ABOUT FEEDING

Salmon feed at the top and bottom of the tank and feed better with some daylight on the tank.

- The bigger your fish are when released, the better their chance of survival in the wild. That said, however, try to feed them just to capacity as overfeeding will cause ammonia to spike. Slowly feed only as much as your fish will eat in one to two minutes.
- At each feeding, observe the fish for 5 minutes. If you find uneaten food on the bottom of the tank, feed more slowly next time. If your fish still doesn't eat it all, reduce the amount. .
- Your fish will survive over a weekend (even a 3-day weekend) without food; simply feed at the end of day on Friday and start of day on Monday. For longer periods, contact your Partner Organization.

After the salmon have fully buttoned up:

WEEK 1 - TEASE FEEDING: Wait until nearly all (99%) of your alevin are free-swimming fry before "tease feeding" so they will learn to eat. Sprinkle a finger pinch of hatchery food on the water a few times a day. **The fish may spit it out but, after a week, they will begin to eat normally.**

WEEKS 2 - 3: Use a 1/4 teaspoon measuring spoon to dip out hatchery food and gently sprinkle the food over the surface of the water. Slow feeding will give small fish a chance to get their share and prevent food from going straight to the bottom. **Increase the amount each week as you see that they are consuming all the food.** Typically, you should feed 2-3 times a day.

WEEKS 4 through RELEASE: Continue feeding at least 2-3 times a day. **Test water chemistry twice weekly.**

PINHEADS: Some fish ("pinheads") have difficulty learning to eat, most often when feeding begins too early. They hang out on the bottom of the tank and may starve to death. Some may not even absorb the last of their yolk sacs. If you have buttoned-up fish that "fail to thrive," try transferring them to a small, aerated container where they don't need to compete with more aggressive feeders, then try hand feeding them hatchery food or bloodworms with an eye dropper or pipette. Fish require several weeks to starve, so be patient and keep trying. In fact, a fish that is not eager to rise to the top of the water may survive better when released into a natural environment.

An important function of feeding at this stage is to nurture the biological filter so that it will be ready to handle the waste as they eat and create waste. **Test water twice weekly and increase water changes from now until release.** Add live beneficial bacteria to your tank after each tank cleaning to avoid spikes in ammonia or nitrite.

It is important to keep notes on when you are feeding, how often you are feeding, when you are cleaning & how often you are cleaning. Show students how to use the monitoring chart to record feeding sessions and, until a pattern is established, note in the "Comments" column how much food they dispensed. This record is your check that the fish were fed properly.

SALMON RELEASE

Releasing your fish is often the highlight of the experience of raising salmon! In the spring, your class will go on a half day field trip to Swan Creek to release your fish. If you do not have a fish for every student to release please contact your partner organization and they will make sure to bring enough fish for every student to be able to release.

2 days before the release: Charge your portable bubbler so that your fish will have adequate oxygen during the transfer. Have at least 3 frozen water bottles ready by your release day. The frozen water bottles will help keep the temperature down during transportation.

Day of Release: On the day of the release **do not feed your fish**, this will prevent unnecessary waste during transfer. Your Salmon Ambassadors will be at your school at least 1hr prior to your field trip start time to collect your fish.

EQUIPMENT NEEDED

- 1 or 2 clean 5-gallon buckets with handles and lids, preferably light colored so everyone can see the fish. A clean cooler can also work and will help keep fish at the correct temperature.
- Battery-operated portable aerator (these will be provided to you)
 - Extra batteries for the aerator
- 2-3 small aquarium fish nets

TRANSFERRING FRY FOR TRANSPORT * *For your information but the Interns will be handling this day of**

This process could take 30-60 minutes, depending on experience, but your Salmon Ambassadors will help you capture your fish. **If your water is dirty** and hard to see through, consider a water change the day before release. It is heartbreaking to find extra fry in the tank when you go to clean it.

1. **Catch fish as close to departure time as possible** so that the water in their bucket doesn't get too warm. You may use a frozen water bottle to keep the temperature down in your bucket. Make sure the bottle is floating- do not use it if it sinks to the bottom as this will crush your salmon.
2. Use the same **clean bucket** you have used for water changes.
3. Fill your bucket about **half full of water from the tank** (only half full because it will be heavy, and water will slosh out).
4. Put the bucket on a table or sturdy chair close to the tank so that you can quickly release the fry from your net into the bucket.
5. Attach a portable aerator to the rim of each bucket to keep the water in this temporary home oxygenated until your fry are released.
6. **Turn off all tank equipment except the tank aerator. Remove any large rocks and most of the water** to a level of about 6 inches so that catching the fry is easier. Don't worry about counting fish at this point as counting is easier as they are released.
7. Using a large, long-handled net, **gently** catch the fry and put them in the bucket. If you have particularly feisty fry, you may need to drain even more water from your tank to get the last few. Station a helper with another net on the opposite side of the tank to gently herd fish your way. **Be sure to check the corners of the tank and under large rocks for stragglers.**
8. If you are using a bucket lid, cut a finger-size hole in it, put the aerator tube through it, making sure the tube end is under water, and tape the aerator to the lid.

Never cover your bucket tightly with a solid lid or plastic! Beware though: If water can slosh out, so can your fry!!

END-OF-YEAR TANK CARE

Your Salmon Ambassadors will assist with de-commissioning your tank until next year. Here is what to do after your salmon are released:

- Carefully remove the chiller from your tank. Be gentle with the plastic fittings as you move things around. Set tank hoses down into a bucket before removing hoses from the chiller. Thoroughly rinse hoses in hot water and air dry. Consider replacing them if they have lots of residue on them.
- Empty remaining water and rinse the tank/gravel/rocks with clean water (no soap or chemicals) and a soft sponge (no abrasive materials) if needed. If the tank is still dirty and there is persistent residue, you can use baking soda or a strong salt solution to help with this. Then **rinse thoroughly** and air dry both the tank and gravel/rocks. Thoroughly blow (with a computer duster/air canister product) or vacuum the dust-off chiller vents.
- Thoroughly clean all filter pieces with warm, clean water, removing any tubing and impellers and brushing clean. **Keep coarse sponges and ceramic cubes.** Dispose of any used carbon/zeolite packs.
- Organize your equipment and inventory to know what you will need for next season. Plan to change out gravel/rocks every three years, more frequently if pH has been difficult to maintain.
- Clearly mark your equipment “**TSIC**” and add your contact numbers to keep it safe from possible disposal while in storage.

APPENDIX A: WEB RESOURCES

CURRICULUM RESOURCES AND REARING TIPS

Tacoma Salmon in the Classroom on Microsoft Teams

Salmon in the Schools-Seattle

sisseattle.org/

Columbia Springs (Vancouver, WA)

columbiasprings.org/salmon-in-the-classroom/sitc-teacher-resources/

Comprehensive learning resources, including materials for download

Fisheries and Oceans Canada

www.pac.dfo-mpo.gc.ca/education/index-eng.html “Stream to Sea” resources for K-12 environmental education

Alaska Department of Fish and Game - Salmon in the Classroom

adfg.alaska.gov/index.cfm?adfg=educators.salmonclassroom

A wide variety of resources

Trout Unlimited - Trout in the Classroom

troutintheclassroom.org

Lots of resources to connect students with their watershed

Franklin Conservation District, 53 videos

franklincd.org/salmon-in-the-classroom

MAINTENANCE REFERENCES

Salmon in the Schools-Seattle YouTube Channel

youtube.com/channel/UC085cm7IRydop6gqbgnsV3Q

Salmon rearing live video, maintenance, set-ups

Filters

Fluval 306 and 406: usa.hagen.com/File/b3378f42-51ae-42e9-8c10-44fdc858d921

Fluval 07 Series Canister Filters: https://www.fluvalaquatics.com/manuals/A440-50_07_Manual_INT_Mar4_19_WEB.pdf

Penn Plax Cascade: youtube.com/watch?v=H1Qlh5Mh8Nc; youtube.com/watch?v=XPZgrq4uBFc;
youtube.com/watch?v=T9Q8ucc4Fyc

Marineland/Penguin: marineland.com/customer-service/product-manuals.aspx

Hagen/Aqua Clear: usa.hagen.com/usefultools/instructionmanuals

Gravel Vacuum: youtube.com/watch?v=D6Re04cYJcY

Python Water changer: www.youtube.com/watch?v=d6OoPn0HAAI

Chillers

Aqua Euro: aquaeurousa.com/image/Chiller Manual for .25HP and .50HP.pdf;
[youtube.com/watch?v=uNNPegVpYYI](https://www.youtube.com/watch?v=uNNPegVpYYI)
 JBJ: marineandreef.com/v/vspfiles/pdf/DBE-200_manual.pdf

APPENDIX B: Sample monitoring sheet (for feeding)

Date		Feeding	Trash/ Systems	Mortality	Count
	AM	<input type="checkbox"/>	<input type="checkbox"/>		
	PM	<input type="checkbox"/>	<input type="checkbox"/>		
	AM	<input type="checkbox"/>	<input type="checkbox"/>		
	PM	<input type="checkbox"/>	<input type="checkbox"/>		
	AM	<input type="checkbox"/>	<input type="checkbox"/>		
	PM	<input type="checkbox"/>	<input type="checkbox"/>		
	AM	<input type="checkbox"/>	<input type="checkbox"/>		
	PM	<input type="checkbox"/>	<input type="checkbox"/>		
	AM	<input type="checkbox"/>	<input type="checkbox"/>		
	PM	<input type="checkbox"/>	<input type="checkbox"/>		
	AM	<input type="checkbox"/>	<input type="checkbox"/>		
	PM	<input type="checkbox"/>	<input type="checkbox"/>		
	AM	<input type="checkbox"/>	<input type="checkbox"/>		
	PM	<input type="checkbox"/>	<input type="checkbox"/>		