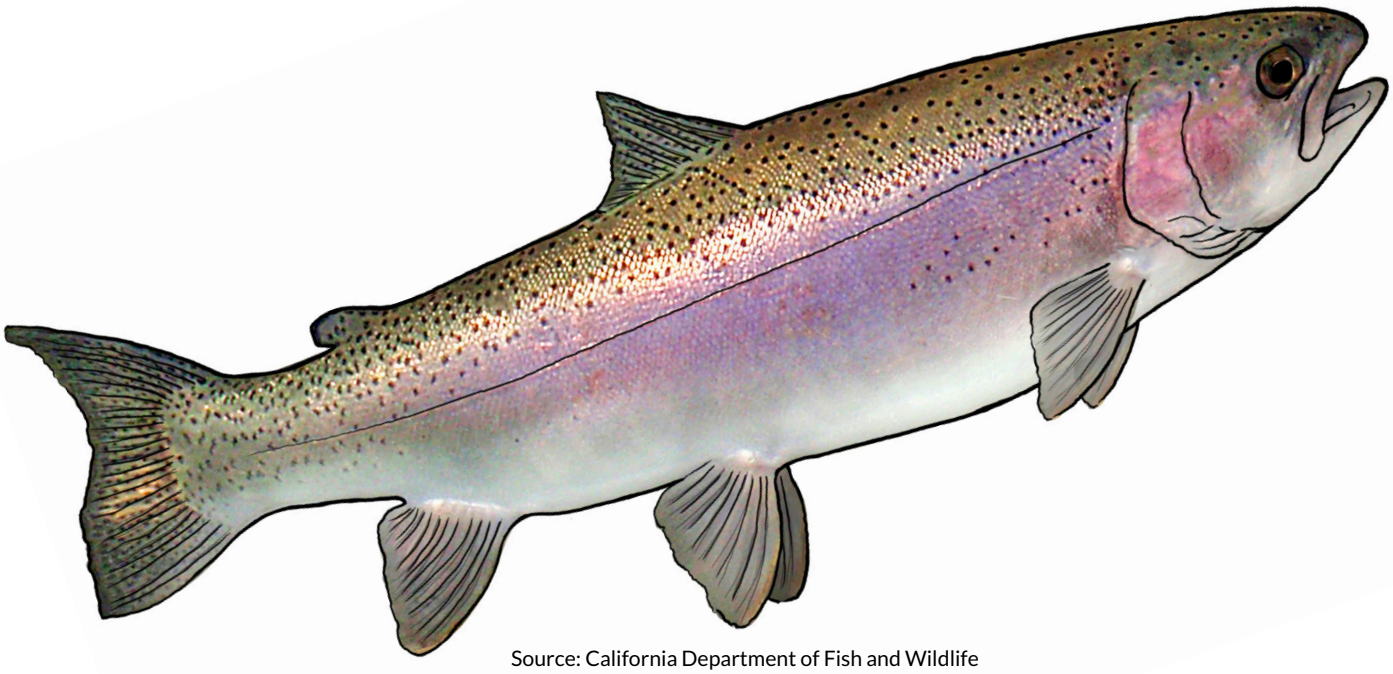
TROUT IN THE CLASSROOM (TIC)

A guide to Colorado's TIC Program



Source: California Department of Fish and Wildlife

Table of Contents

Table of Contents

Welcome to Colorado's Trout in the Classroom program! Colorado Trout Unlimited is pleased to have you join our family of educators and volunteer coordinators in working towards educating the next generation of scientists and environmental stewards. As you begin this wonderful journey, please be sure to familiarize yourself with this guide, reading through it at least once before beginning to piece together your program.

This program would not be possible without the work of our partners, including you and your educational institution, Colorado Parks and Wildlife, U.S. Fish and Wildlife Service, and CTU's 24 volunteer-led chapters throughout the state. This program has received funding from Suncor Energy and ConocoPhillips, and without their generous giving, we could not have the program that we have today. This guide would not be possible without the information provided on troutintheclassroom.com and the information from resources created by various Trout Unlimited volunteers and Trout Unlimited partners throughout the country.

Thank you,

Colorado Trout Unlimited

What is Colorado Trout Unlimited?

Founded in 1969, Colorado Trout Unlimited (CTU) is the state's leading non-profit, non-partisan organization providing a voice for Colorado's Rivers.

As Colorado's financially self-sustaining, grassroots arm of the national organization Trout Unlimited, Colorado TU is independently governed by a 44-member volunteer board including the presidents of our 24 local chapters across Colorado.

Colorado TU leverages the power of its 11,000 members who contribute approximately 44,000 volunteer hours annually to restoration, education and other local conservation projects, equivalent to the power of 22 full-time employees.

Our vision is simple – by the next generation, Colorado TU will ensure that robust populations of native and wild coldwater fish once again thrive within their original Colorado range so that our children can enjoy healthy fisheries in their home waters.

Our Mission

Colorado Trout Unlimited works to conserve, protect and restore Colorado's coldwater fisheries and their watersheds. As the grassroots arm of our parent organization, Trout Unlimited, we use cooperation, collaboration, advocacy and education to promote conservation.

Colorado TU Works To...

Protect
high quality habitat for native and wild cold-water fish and to maintain free flowing rivers

Reconnect
fragmented fish populations and habitats by restoring flows to dewatered rivers and re-opening fish passage

Restore
watersheds by working in collaboration with other conservation and governmental organizations, as well as private landowners, to preserve and improve the quality of habitats that support cold-water fish

Sustain
the efforts of our volunteers and supporters by inspiring a strong conservation ethic in the next generation of river stewards

What is Trout in the Classroom?

Trout in the Classroom (TIC) is a conservation-oriented, environmental education program for elementary, middle and high school students. Through the school year, students:

- Raise trout from eggs to fry;
- Monitor tank water quality;
- Engage in stream habitat study;
- Learn to appreciate water resources;
- Begin to foster a conservation ethic; and
- Grow to understand ecosystems.

Most programs end the year by releasing their trout in a state-approved stream near the school or within a nearby watershed.
During the year each teacher tailors the program to fit their curricular needs. Therefore, each program is unique. TIC has interdisciplinary applications in science, social studies, mathematics, language arts, fine arts and physical education.

Objectives and Model of TIC

Program Objectives

The objectives of the TIC program are to introduce a conservation education program into selected schools based on the life cycle of a member of the trout species and to foster increased student public knowledge of water quality issues and coldwater conservation. The TIC program curricula will include aquatic biology and ecology, watershed management and stewardship, disease awareness, aquarium maintenance, water quality, fish growth and behavior, health and regulatory concerns, and other topics relative to the TIC program objectives

Program Model

The TIC program will be primarily planned, led and implemented by the teacher/educator and learning institution. Local Trout Unlimited chapters and Colorado Trout Unlimited are available for financial and technical support, supplementary lessons, and release field trips.

Roles & Responsibilities

Colorado Trout Unlimited's Roles & Responsibilities

• Provide oversight responsibility for maintaining the continuity of the TIC program in conformity with TU guidelines
• Provide fertilized rainbow trout eggs and enough food to sustain the tank for an entire schools year
• Connect the educator/learning institution with a local TU chapter for financial, educational and technical support
• Ensure that the TIC program is implemented and conducted in compliance with all applicable regulations and CPW instructions for TIC fish health and testing
• Ensure that the educator and learning institution receives the annual Aquaculture Permit and Import license
• Help the educator/learning institution identify and obtain financial support to cover the costs of obtaining necessary materials and equipment
• Appoint a TIC Project Coordinator who will be responsible for maintaining routine oversight activities including fostering regular communication and coordination with CPW and the educator (s) conducting the TIC program
• Schedule, in coordination with CPW and the educator, the date and time of the release of the trout
• Obtain a stocking permit from CPW prior to release of the trout
• Conduct overall project administration including, without limitation, the development of a master TIC program schedule and the planning/scheduling of appropriate coordination meetings among the parties.

Roles & Responsibilities

Educator/Learning Institution Roles & Responsibilities

• If more than one educator is involved in the program, designate one person as the primary contact for the TIC program
• Develop, plan and implement a comprehensive TIC program curriculum
• Maintain on-site copy of Aquaculture Permit, Import License and Fish Health Inspection Certificate
• Ensure requests for inspections and required testing are coordinated with CPW and CTU with sufficient lead time
• Ensure timely coordination of issues with the designated CPW Fish Biologist or Fish Pathologist from the Aquatic Animal Health Lab
• Coordinate with CTU to obtain approval for fish release at the end of the TIC program
• Ensure compliance with all applicable CPW regulations and the CPW instructions for TIC fish health and testing set forth on "Instructions for TIC Fish Health and Testing" document on page 46 of this manual
• Provide CTU with copies of developed lesson plans, project photos, assessments and program summaries upon completion of the TIC program curriculum
• Obtain and put together TIC equipment and supplies listed in the manual with chapter funding, grant funding or school funding
• Maintain and clean tank, chiller and it's accessories with the help of students
• Plan for not being able to release fish as the culmination of the program

Roles & Responsibilities

Trout Unlimited Chapter Roles & Responsibilities

• Act as a liaison between the educator/learning institution an Colorado Trout Unlimited
• Provide financial, educational and technical support to the educator/learning institution when and if needed
• Assist the educator/learning institution in coordinating sampling and testing prior to releasing the fish
• Assist the educator/learning institution in finding a CPW approved waterway to release the fish
• Provide assistance, expertise and volunteers (if requested) in planning and executing a release field trip
• Attend TIC trainings/workshops that CTU offer for chapter volunteers

Student Roles & Responsibilities

• Carry out as many trout raising responsibilities as possible --
  -Water quality testing
  - Maintenance of water quality
  -Trout feeding and care
  -Tank maintenance
  -Partake in trout release
  -Year end equipment clean up

Teacher Information

Teacher Timeline

August-October

☐ Sign Memorandum of Understanding and return to CTU
☐ Get connected with local Trout Unlimited (TU) chapter
☐ Purchase TIC equipment or receive equipment via loan from local TU chapter
☐ Prepare tank for egg arrival
☐ Receive Aquaculture Permit from CTU and store with tank
☐ Receive Import License from CTU and store with tank
☐ Join Colorado TIC Google Group community
☐ Join National TIC Google Group
☐ Plan with local TU TIC volunteer for TU related supplemental lessons (fly tying, fly casting, macroinvertebrate sampling, water quality testing, dissecting, trout biology, fly fishing, fish hatchery, etc.)
☐ Plan out TIC lessons for the year
☐ Order eggs by the end of October

October-February

☐ Raise trout from egg to fry
☐ Have students monitor tank/water quality
☐ Provide TIC curriculum that fits your subject areas and curricular needs

March-April

☐ Contact local TU TIC volunteer or CTU staff member to begin fish testing process (at least 8 weeks before planned release field trip)
☐ Contact local TU TIC volunteer or CTU staff member to begin planning for release field trip
☐ Get field trip location approved by local biologist
☐ Have fish sampled and tested
☐ If fish are not going to be released, plan for what you are going to do with the fish and notify local TU TIC volunteer or CTU staff member

May

☐ Fish are released into pre-approved body of water
☐ Complete end of year report

Important Contacts

Bianca McGrath-Martinez
AmeriCorps VISTA Youth Program Development
bianca.mcgrathmartinez@tu.org
Work: 720-394-1017

Vicki Milano
Senior Fish Pathologist at the CPW Aquatic Animal Health Lab
vicki.milano@state.co.us

Local TU Chapter
Find your chapter

Colorado TIC Teachers
Find other teachers

Ordering Equipment

The majority of the equipment you will be using can be found at https://www.thatpetplace.com/trout-in-the-classroom. The remaining pieces of equipment can be found at local hardware stores, local pet stores or online. Below you will find a chart telling you which items will be purchased from That Pet Place and which items will be found from other sources. The chart will also indicate which items you will need to replace annually. You will find the item numbers from equipment pieces found at That Pet Place, just in case that you would need to replace individual items.

Ordering from That Pet Place

When ordering from That Pet Place, you will purchase either Kit #1 or Kit #3. The difference in the kit is the filter. In Kit #1, the filter that comes with it sits on the floor. In Kit #3, the filter that comes with it goes on the back of the tank. It really comes down to the preference of the teacher and what you want your set up to be like.

On the website for That Pet Place, you will find pricing for Kit #1 and #3, in addition to a replacement kit and variations of Kit #1 and #3. You will also find shipping information.

To Order:
Contact Stephanie Welsh
1-888-842-8738 ext. 1288
swelsh@thatpetplace.com

Note: Due to CPW testing requirements, it is recommended that classrooms establish two tanks in order to raise enough fish for testing and release. If only one tank is used, the site may not have enough fish to test and/or release at the end of the season. For more information, see testing/sampling section of this guide.

Equipment Costs

Initial Start-Up Costs (for one tank set up): ~$1,850

Breakdown:

Equipment from That Pet Place (not including shipping):
Note: the difference in Kit#1 and #3 is in the filter. One of the filters is drop in, one sits on the floor. This would be up to the educator/learning institution and what their classroom can accommodate.
Kit #1: $1,161.22
Kit #3: $1,053.13

Additional Equipment: ~$350

Eggs: ~$150 (shipping)

Disease Testing (every other year)**:** ~$150 (shipping)

Annual Costs (for one tank set up): ~$450

Breakdown:

Replacement Item Kit from That Pet Place (not including shipping): $103.22

Replacement eggs: ~$150 (shipping)

Disease Testing (every other year): ~$150

Trout food will be provided through Colorado Parks and Wildlife

Equipment List

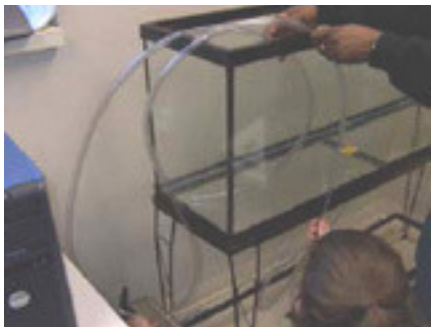
Equipment	Item Number	First Year	Replaced Annually
Items purchased from thatpetplace.com			
(1)Aqua Euro USA ¼ hp Chiller	253983	•	
(1)Fluval 406 Canister Filter	256342	•	
AquaClear 110 Power Filter	215378	•	
(1)Whisper 60 Air Pump	205754	•	
(1)10" Aqua Mist Add-a-Stone	212520	•	•
(1)8' Flexible Airline Tubing ST-8	212445	•	
(1)Fusion Check Valve 1 pk.	240195	•	•
(1)Net Breeder	204233	•	
(1)Battery Operated Digital Thermometer	209362	•	
(1)8" Net w/ Long Handle	212526	•	
(2)Micro-Lift Special Blend 16 oz.	243424	•	•
(2)Nite-Out II 16 oz.	243555	•	•
(1)NovAqua Plus Water Conditioner 16 oz.	214299	•	•
(1)Mag Drive Water Pump 700 GPH	206397	•	
(15')¾" Clear Flexible Tubing	204177	•	
(1)Reducing Bushing MPT x FPT - .75in. X .75in.	199448	•	
(1)Female insert Adapter FPT x Insert - .75 in. X .75 in.	278257	•	
(5)Stainless Steel Hose Clamp ½" to 1"	241595	•	
(1)Freshwater Master Test Kit	199591	•	•
(1)GH & KH Hardness Test Kit for FW	199678	•	•
(1)Lees Squeeze Bulb Ultra Gravel Vac. With on/off Valve	253080	•	
(2)Shallow Creek Pebbles 5 lb.	268724	•	
(1)Eshopps Return Jet for Output of Chiller Water	250869	•	
(1)Teflon Tape	199328	•	
(2)Chemi-Pure 5 oz. Filter Media (carbon)	196393	•	•
Items purchased from other sources			
(1)55 Gallon Tank and Stand		•	
Foam board for insulation (enough to cover all sides)		•	
Turkey Baster (to remove dead eggs or waste)		•	
Battery Operated Aerator (transportation of fish)		•	
Clean Ice Packs (chiller malfunction and transportation)		•	
Siphon Water Pump (water changes)		•	
(2) 5 Gallon Bucket with Lid		•	
Outlet Surge Protector		•	
Measuring Spoon set w/ ¼ tsp (feeding fish)		•	
Plastic Eye Dropper (measuring)		•	

Equipment Set Up

1. Unpack all materials and compare to shipping lists. Ensure that nothing is missing or broken. Check plastic pieces for cracks, particularly the filter components.

2. Place tank in a location away from heat, excessive light, and activity. If next to a window, make sure that the window shade is down until the fry are swimming around, or that there is some protection around the tank. Do not put the tank next to an active radiator. Because a filled tank will be top heavy, place it away from areas where students might accidentally bump into it. Clean out any dirt inside the tank with a wet paper towel. Do not use soap or any cleaning chemicals--the residue from these compounds can persist in the aquarium and harm your trout.

3. Locate the electrical outlet and plug in the power strip. This should be close enough to the tank that all electric devices can reach. Ideally, this should be right behind or underneath the tank. Turn the power strip off.



4. Place the chiller to the side of or below the tank with the front facing out. Please ensure that there are at least 4 inches on every side for airflow. For a flow-through chiller, open the plastic bag with chiller parts and remove two water nozzles. Screw these in place on the chiller, tighten them by hand. You may carefully tighten these further with pliers, but be mindful of the limitations of the plastic.

5. Measure a length of chiller tubing that will reach from the chiller to the bottom of the tank without stress or kinks, be generous with length because a tube can always be made shorter but not longer. Cut this length of tubing and slide one end over the chiller input nozzle. Measure a similar length of tubing for the output nozzle of the chiller and cut this piece. Attach this piece of tubing by sliding it over the chiller output nozzle. Tight tubing can be made more flexible by dipping it in very hot water. You may need to remove the nozzle, also. Depending on chiller design, there may not be any specific input or output side.

6. Next slide the metal clamp over the tube to the nozzle on the chiller. Screw the clamp in place over the end of the tube so that the outer edge of the clamp and the tube are matched. The clamp should be tight but not forced.

7. Remove the pump from its box and locate the plastic adapter nozzle for the pump. Screw this nozzle in place, and slide the other end of the input chiller tube over the nozzle on the pump. This connection does not need a clamp. Install the pump filter if one is included but not attached. Gently place the pump inside the tank, place the pump power cord near the power strip.

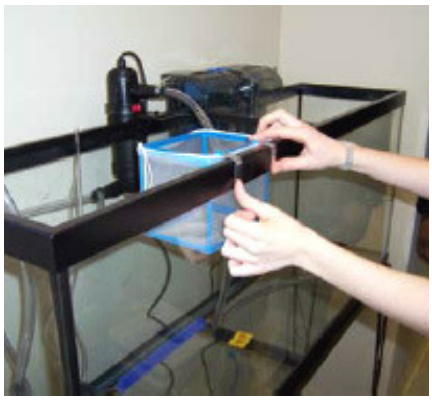
8. Rinse your pea-size gravel two or three times to remove all dust. Then layer it 1"-2" thick on the bottom of the aquarium. You can cover just part of the bottom, if you prefer to keep the gravel away from the pump and airstone.

9. Unpack and assemble the filter according to the included directions. If it is a hanging filter, place it on the back side of the tank. Make sure that the filter intake tube is as close to the tank bottom as possible. Cover the intake for your filter with some sort of mesh or net, that will keep the fry from getting sucked into your filter (plastic net bags and pantyhose are popular materials for this). Secure the mesh with an aquarium-safe method, such as a rubber band. Canister filters can be placed next to or underneath the tank, and they can be hooked in-line with a flow-through chiller. Place the filter power cord near the power strip.

10. Unpack the airstone, air pump, and airstone tube. Attach one end of the airstone tube to the airstone, and the other to the air pump. Place the air pump on the ground near the power strip. The rubber feet of the air pump should be on the ground to prevent excessive noise. Place the airstone in the tank, away from the filter intake tube. You may chose to use a check valve to prevent backflow of water in the airstone tube. To do this, make a cut in the air tubing and use the check valve to connect the two pieces back together. Air should push the flap and compress the spring inside the valve.

11. Assemble the hatching basket by stretching the net over the outside of the plastic frame, or carefully securing the net to the inside of the frame. Hang the basket on the tank wall by bending the metal clips. If you use a vibert box instead, it will be placed on the floor of your tank.

12. Fill the tank with tap water using any clean container or tubing. The water level should be no more than 2 inches from the top of the tank, but should not be so close that it might spill. Use a cup to fill the filter chamber with water until it overflows back into the tank.



13. Plug in all electric cords using the power strip, but keep the power off. Once everything is plugged in, stand back from the tank to double check all connections and ensure that everything is ready for operation. The output tube should be secure; a student can hold this tube in place. Have some paper towels on hand in the event of a leak.

14. Turn on the power strip and check for any leaks on the chiller. The bubbler should be creating a large volume of small bubbles. The chiller may beep, and is now warming up. Remove the output hose from the water carefully to ensure that there is good water flow. The filter should become much quieter after all the air is pushed out of the system.

15. Adjust the chiller temperature to the appropriate setting. You may have to wait a few minutes before the chiller begins to operate fully. You will probably hear the chiller fan or compressor operating in a few minutes.

16. You will need to allow any chlorine in your tap water to dissipate for the next 48 hours. Then, follow the bottle directions to add Stress Zyme to the tank at that time.Also note that it is helpful to keep the chiller temperature around 65 degrees during this time, as the warmer temperatures promote bacterial growth.

17. After all this setup, prepare for your trout eggs at least 24 hours in advance by turning the chiller temperature down to 50 degrees.

18. Now it is important to trout-proof your tank, by protecting your small fingerlings from the strong force of the water intakes for your filter and chiller. One method of covering the intakes is detailed in this PowerPoint slide show.

19. Insulation is CRUCIAL to maintaining a stable environment for your trout and minimizing wear on your chiller. Below you can see an image of a well-insulated tank that even has a special viewing window, so that students can see the developing trout. Many different materials can be used to insulate a tank; this one uses foam board.

Video Instructions

A video series made by a TIC teacher in Maryland

Part 1 Part 2 Part 3

Part 4 Part 5 Part 6

Start Up Timeline

30 Days Before Eggs are Received

- Assemble all parts for the aquarium set up
- Set up the bio-system in the tank (set temperature at 65°F or 18°C and start the nutrient cycle by adding Special Blend and Nite Out II or equivalent

10 Days Before Eggs are Received

- Place order for eggs

24 Hours Before Eggs Arrive

- Add water from your tank into a quart sized bottle, refrigerate overnight
- Bring tank temperature down to 50-52°F or 10-11°C

Placing Eggs in the Water

- As a rule of thumb, a tank can accommodate 100 eyed trout eggs for every 25 gallons of volume
- Put eggs into the tank as soon as you receive your package in the mail after tempering/acclimating them. See the next page for information on how to temper your eggs.

After your Eggs are in the Water

- Eggs should be placed into your net-type breeding basket
- Keep the tank shadowed with a dark and/or insulating cover.
- You can remove it for viewing or cut a viewing window. This cover gives darkness for the eggs and helps keep the temperature down

Source: troutintheclassroom.org

How to Temper your Eggs

Before introducing your eggs into the aquarium, they need to be tempered, gradually bringing the temperature of the eggs up to the incubation temperature of your tank. Follow the steps below very carefully:

1. The day before your eggs arrive, fill a container with water from your tank and refrigerate it over night. You will do this so that you do not have to use ice to cool your water, which is difficult to find unchlorinated.
2. Take the temperature of the eggs at arrival.
3. Fill a quart sized container with water from your tank.
4. Add your refrigerated water to the quart of tank water until the temperature of the water is two degrees warmer than the arrival temperature of the eggs.
5. Add the eggs to the container of water, waite 20-30 minutes and add warmer tank water
6. Keep warming the temperature of the eggs and water 2-3 degrees at a time in 20-30 minute intervals until they are within 2-3 degrees of the tank temperature, which should be at 52 degrees Farenheit.
7. Add the eggs to the egg basket in aquarium.

If tempering is done correctly, your eggs should be a dark, orangeish red with not much cloudiness at all. If they start to turn white after introduction to the tank, they have been shocked and are dying. If they are white after introduction, remove them immediately as they will begin to form fungus quickly.

Ordering Eggs/Food

Colorado Trout Unlimited sources their TIC eggs from the U.S. Fish and Wildlife Service, Ennis National Fish Hatchery. The fish hatchery donates rainbow trout eggs to our TIC program on a yearly basis. The hatchery ships out eggs overnight on Monday's, so schools will receive their eggs on a Tuesday.

To order eggs, contact CTU's Youth Education Coordinator a week in advance of the day that the eggs will be shipped. Provide the name that the package should be addressed to and the address you would like them to be sent to. Eggs need to be ordered by the end of October (ideally, September) to ensure that they are the correct size to be tested and released in May. You will receive around 250 eggs.

The trout food that our TIC program uses is donated by Colorado Parks and Wildlife. When you order your eggs, we will send you a pound of size 0, 1, 2 and 1/16. This will last you through the school year.

Egg Maintenance

- Eyed eggs are identifiable by their characteristic dark spots—each trout's two eyes
- Movement during delivery of the eggs can weaken the outer layer of the shell and cause weak spots or broken areas. These spots are vulnerable to fungal infection. Any eggs with white spots MUST be picked out.
- White spots are a fungus that spreads REALLY fast, pick out spotted eggs twice a day if possible—especially check last thing on Friday afternoon (Alaska Department of Fish and Game has a great explanation of what this fungus is).

  Link
- Outer shell must remain translucent, an egg with any opaque spots (or fully opaque) will not develop.
- Uniform cloudiness can be okay, it might be just the trout development. The TIC folks in southwestern Virginia have made a great video about how to do this carefully and effectively.

  Link

Hatching

- After receiving your eyed eggs, the trout will hatch within 4-7 days. Most trout will hatch within 2-3 days of the first egg hatching.
- Some eggs will not hatch properly and some alevin may not come all the way out of the egg. Any leftover eggs must be removed (or isolated—these likely will not hatch).
- The leftover shells float to the top of the tank or in the basket and fish enzymes will break down these shells and create foam—this is normal.
- Scrub the sides of the tank with an aquarium sponge to loosen this foam.
- During this alevin phase you may feel a jelly-like fungal growth around the inside tank surfaces and hatching basket. If you find this, wipe or scrape the surfaces with a sponge to send it through the sterilization and filtration system.
- When eggs hatch, alevin will lie on sides, with egg sack still attached…feeding from it.
- Soon they will "right" themselves, but remain low in the basket. As egg sac is consumed, they begin to rise. Please see Trout Feeding for instructions on when to begin, quantity, and frequency of feeding.
- Eventually, they will swim up over the basked edge into the larger area of the tank

Alevin (sac fry) - 1-3 Weeks

- Length of time at this stage depends on the water temperature; warmer water causes fry to develop faster. Use a digital thermometer daily to make sure in-tank temperature is 50-53 degrees. Chiller consoles are notoriously inaccurate.
- Look for your odd trout and heart development, etc.
- Some alevin don't survive, and this is perfectly normal.

Swim-up Stage - One week or less

- As yolk sacs disappear, some trout will start swimming around looking for food. When you see the first trout swim up in hatching basket or out of hatching basket, start feeding.
- This is the time that you can remove the darkening cover from your tank--at this point, UV light will not hurt the fish.
- Feed trout by spreading a miniscule amount of size 0 food near any swimming trout.
- Now is a good time to “boost” your tank’s nitrifying bacteria with a shot of Special Blend and Nite Out II which can be added once a week.
- Now is the moment to add a mesh or pantyhose around your filter intake, to make sure that your fry don't get sucked into your filter.
- Once all fry are swimming up and have been eating, unhook the basket and drop it to the bottom of the tank. Strong, adventurous fish will swim out and Timid, weaker fish will hide for a few more days, until they are stronger.
- Some fry don't survive or learn to feed properly for various reasons. This is perfectly normal.

Fry Stage - 6-8 Weeks

- Feed may vary, try to ensure all of the fish are eating, this may require feeding on two separate sides of the tank, in general feed tiny pinches 2-3 times per day.
- Every couple of days, carefully remove the mesh or pantyhose from your filter intake and shake out any debris collected (and let it get sucked up into the filter). This will keep your filter motor from having to work too hard, and minimizes guck.

- Some trout never learn to feed, and will die. Non-feeding fish are called "pinheads"—big heads, little bodies. These trout should be removed, as they will not develop.

- Every TIC classroom sees this mortality spike with the pinheads—it is VERY normal.

- Any leftover food that collects in one area MUST be removed 5-10 minutes later.

- A turkey baster is a great way to vacuum up extra food and waste. Continued leftovers mean that you are overfeeding and overfeeding can cause problems with ammonia levels.

Crisis notes—READ BEFORE TROUT TRAGEDY OCCURS

- Treat all of the water with water conditioners, such as Amquel and Novaqua, when adding new water.

- If you come in and all fish are lethargic—WATER CHANGE.

- If you come in and all fish are not moving and collected at the bottom of the tank—WATER CHANGE.

- If you come in and your fish don't respond to food—WATER CHANGE.

- During the first few weeks, initial ammonia spikes from overfeeding are likely. Water changes and some water conditioners are the only solution.

- It is also good to "boost" your tank with Special Blend and Nite out II as often as once a week.

- If you change your filter media, only change one section at a time allowing the bacteria from the remaining section to colonize the new media. The ceramic media should not be changed.

PARR STAGE—(the rest of the time)

- Look for parr marks on the trout.

- Small water changes with a siphon can happen every day with a 20% change at the end of each week.

- Clean 15 minutes after feeding.

- Always keep track of your water chemistry—water testing can help you with this.

- If any levels seem high, do big water change (20% or more).

- Be careful to watch the temperature during water changes and don't let the tank temperature fluctuate more than 5 degrees or so.
- In an emergency, clean water is more important than temperature stability.
- Cannibalism can occur—the big fish do eat the little fish. If cannibalism is becoming an issue, then feed more often, so as to assuage hunger.
- Be sure to clean more often and do water changes, if you are feeding more often.

What if I come in to school and a lot of trout have died?

-See troubleshooting section for more detailed information-

- Remove healthy fish first and put healthy fish in a reserve water bucket (with treated water), no matter its temperature and use a battery-operated aerator or tank's airstone in the bucket.
- You may also add one small, clean ice pack to the bucket.
- Remove as much water from the tank as possible (80%).
- Leave pump and filter intake covered.
- Clean tank with clean scrub sponge, removing as much crud as possible and suck up gunk with turkey baster.
- Refill tank with water and treat with water conditioners (Stress Coat, Special Blend, Nite Out II, Tap Safe, etc.)
- Cool water with ice or freeze packs.
- Replace at least one charcoal filter.
- Replace fish in tank.
- The next day, add more Special Blend, Nite Out II and/or Stress Coat.

General Notes

- Once your trout have started eating, siphon-vacuum your gravel every 2-3 weeks. Be sure to carefully remove the detritus that accumulates underneath the gravel.
- In six months, fry will be ready to release! Find out from your TIC coordinator how to get the appropriate permits.

Trout and Tank Care

Daily Checklist

☐ Keep an eye on tank temperatures, an increase in temperature might indicate a chiller problem or a change in the tank insulation.

☐ Feed trout only as much food as they can eat in a few minutes (one pinch). Remove extra food. However, you may feed more than once a day (reference feeding section)

☐ Check the tank for any dead fish or debris. Remove dead fish immediately.

☐ Ensure that water is flowing from the chiller and the filter and that the bubbler is still working.

☐ Check ammonia, nitrite, nitrate, and pH levels with your aquarium testing kit (often, if not daily).

Weekly Checklist

☐ Vacuum gravel (this will often be how you remove water for your water change).

☐ Change water about once a week. Fewer big changes (but never more than 30%) are better at removing compounds from the tank. Small changes (around 10%) are better for routine maintenance, if you're not having water chemistry problems, because they stress the fish less. In either case, be careful of large temperature swings. Make sure the water you're putting in is cool and chlorine-free (treated with a tapwater safe-for-aquariums product).

☐ Add your bacterial boost mixes (Special Blend and Nite-Out II or one of the "-zyme" products).

☐ Clean off (shake out) any meshes or sponges that cover intakes, as these can get clogged with waste or debris. You may want to do this in a bucket of removed tank water, so as not to set the debris free in the tank.

Monthly Checklist

☐ Vacuum or otherwise clean the chiller's air filter. This may require removing the face of the chiller, but this step is VITAL to protecting the inner workings of your chiller and prolonging its life. Dust can seriously clog the fan, radiator, and other parts.

☐ Do any needed filter media changes, as per the manufacturer's instructions.

Notes

With the trout in place, keeping the tank bacterial colonies happy is the most important job. The nitrifying bacteria in the tank change trout waste (ammonia) into nitrites and then into nitrates. Nitrates are eventually converted to nitrogen gas. While ammonia and nitrites are fairly toxic to the fish, nitrates are not very toxic at all.

Most of the nitrifying bacteria are surface dwellers. They live on all the surfaces of the tank and equipment, and especially on all faces of the gravel. Vacuuming the gravel will remove debris that could eventually suffocate the good bacteria (or create other problems) if allowed to remain.

In vacuuming the gravel, you will also be removing water. This removal is usually a sufficient water change for your tank. Replace all the water you siphon out with tap water treated in a bucket with a TapSafe compound. As you add the new water to the tank, monitor the tank water temperature. You may need to add the new water in stages, so as to avoid wild swings in temperature (which will stress the fish).

The removal of dead and visibly sick fish is also important. Many fish start to get lethargic, or have problems swimming. Some never learn to eat. Eventually, they simply float around the tank. These fish are sick, and they will never get better. One dead fish body, if left too long, can spread the disease to the other fish causing damage to the whole population.

Trout should be given small amounts of food. Overfeeding the fish can pollute the tank environment. Give only one pinch of food at any time, and remove all the extra food particles. Trout do not need to be given food daily, but as long as the amount is small, up to 2-3 daily feedings are acceptable. The trout will seem “hungry” all the time; remember that they are wild animals, and their instinct is to eat any food presented to them, no matter how often. These trout can survive over a weekend without any food, but during vacations it is best for someone to check on the tank and provide a small amount of food on a regular basis.

Notes

Use your pH and ammonia test kits to check the water conditions regularly—at least once a week, but more often is better. Test should indicate a neutral or near-neutral pH (in the high 6s or near 7) or slightly alkaline (in the high 7s or low 8s). Water that is acidic (below pH 7) or VERY alkaline (above pH 8.5) can cause problems with fish health. Above all, the trout need a stable tank pH. Large changes in the pH can stress the fish.

Ammonia levels are best as close to zero as possible, though a small amount of ammonia is inevitable. You want ammonia and nitrite levels to remain consistently low (preferably under 2ppm, and definitely under 4ppm for ammonia, and not too much higher for nitrite), and that your nitrate levels will rise. This simply means that the bacteria are doing their job. Eventually nitrate should level off, also as the bacteria do their work to turn it into nitrogen gas and allow it to bubble away (you can read much more about ammonia in the ammonia section).

If you are not sure about your levels, watch your fish. Are they happy? Do they swim around, look for food, or hold a constant place in the tank? When you put food in the tank, do they respond enthusiastically? Some trout are adventurers, and others are homebodies, but as long as you have some of each, and they are spread throughout the water column (some at the top and some at the bottom), that is good. Eventually you will know what sorts of water chemistry your trout can handle--it is never the same for any two tanks.

If fish behave strangely or start dying in large numbers, poor water quality is often the root of the problem. This is where a large, gentle (slowly adding the new water in) water change would be called for.

Feeding Guidelines

Feeding trout can be a difficult job when you're first starting out. It's hard to know how much is too much, and how much is not enough. Furthermore, it's dangerous for the fish to both underfeed and overfeed. Underfeeding starves them so they cannot become strong, and overfeeding can lead to serious ammonia problems. At the end of the feeding, the small fry should have full bellies, and in general your trout should look strong and healthy.
There is a detailed set of guidelines below.

A summary is as follows:
• Swim up stage -.01 ounce of food per fish (times number of fish) (for How long? until most reach 1 inch in size)
• 1 inch or more in size -.05 ounce of food per fish - multiply by number of fish (switch to size 1)
• More than 1 1/2 inches - .12 ounce per fish - multiply by number of fish (switch to size 2)
• More than 2 1/2 inches - .38 ounces per fish - multiply by number of fish.

It is also important to clean up any leftover food after every feeding. If you see leftover food after about ten minutes or so, use a net or vacuum to take it out of your tank. Replace any water you've lost in the cleaning process.

source: troutintheclassroom.org

Trout Feeding Guidelines

By Scott Covert, Debruce Hatchery

Your food comes in three different sizes...smallest to largest, 0 to 2. Start feeding with the bag marked 0's, then 1's, then 2's. The food is perishable, so keep the bags sealed and in a cool, dark place, a refrigerator if possible.

First Feeding: Size 0 (meal)

Timing: Your hatchlings do not require feeding for 7 to 14 days after hatching. They will feed from their yolk sac as they stay low, at the bottom of the hatching basket. When you see the first hatchling begin to rise off the bottom of basket, you can start providing miniscule amounts of food. Much of this first food will go un-eaten, but by providing it to the developing fish, it will be there when they're hungry. This is important. Food must be available to fry when they first want to eat. However, you must also remember that at first they are feeding on microscopic organisms in the tank that we cannot see or detect. This will provide some of their early nutrition.

NOTE: There WILL be a small mortality rate as the fish start to feed...some hatchlings just never begin eating, and pass away.

When your fish reach about 1" in length, it is time to switch to Size 1.
When your fish reach about 1 1/2" in length, it is time to switch to Size 2.
NOTE: Because it is easy to run out of size 2 food at the end of the year, and because size 1 and size 2 are about the same, we recommend finishing size 1 before moving onto size 2.

Quantity: When born, your hatchlings are very small. Assuming you have 200 baby fish, feed them approximately the following amount of food each day--interpolate as needed:

- First feedings, fish still in hatch box: feed very little food.
- Fish just out of hatch box: 0.34 grams (0.01 oz) of food.
- Fish = approx. 1": 1.36 grams (0.05 oz) of food. (Switch to size 1 now).
- Fish = approx. 1 1/2": 3.4 grams (0.12 oz) of food (Switch to size 2 now).
- Fish = approx. 2 1/4": 10.9 grams (0.38 oz) of food (Fish ready for release).

Many teachers prefer to feed their trout very small amounts of food a few times a day. You can easily divide the daily amount over two or three feedings.

NOTE: You can calculate feeding amounts quite precisely, but this is unnecessary. The formula is below for those if you are interested.

The 0's and 1's need to be sunk down to the fish, because the oil added to the food will cause it to float. A small plastic paddle will work fine. When the food is introduced to the water directly above the fish a slight back and forth motion should get the food to sink. It is important NOT to overfeed your fish. Wasted food will degrade water quality. If you start to see clumps of dull yellow forming on the bottom or sides of your tank, gently remove it with your net. You can also use a small siphon, but use care not to suck up your "kids". When the fish get larger and you switch over to size 2, you will be able to see them actively feeding more than you will with sizes 0 and 1.

- Be sure to take out dead fish.
- Keep your food in a dark place out of direct sunlight (in a refrigerator, if possible).
- When you are about to run out of one size of food, mix a little of what's left into the next size larger before switching.
- It is better to feed less food, more often, than a lot of food all at once.

A Note About Enthusiastic Help:

Every year, many schools enlist the assistance of security and maintenance staff members to feed the fish on the weekends and holidays. They, as most of us, often become great fans of the fish, and are soon spending their breaks watching...and yes...feeding the children. People with different schedules, feed the fish unaware that others are doing the same. You might want to warn these fans about over-feeding and have a sheet of paper near the tank so they can track how often the fish have been fed.

Calculating Food Quantity:

The formula is simple.

1

-------- x 0.03 = weight of food needed to feed fish in POUNDS

(P/N)

Where

P = Number of fish per pound

N = Number of fish in tank

EXAMPLE: At birth, your fish will weigh about 8000 to the pound. If you started with 200 eggs, they will require only 0.012 ounces or 0.34 grams per day. They will reach about 1" before you need to move up to size 1, by then they will weigh about 2000 to the pound (bigger fish, less per pound), and will require about 0.048 ounces or 1.36 grams of food.

Approximate number of fish per pound...based on average length:

At Birth: 8000

At 1": 2000

At 1 1/2": 800

At 2 1/4": 250

Vacation Planning

Prepping for Short Vacations (3 or 4 day weekends)

☐ Feed less on Friday
☐ Do your water change as normal
☐ The fish will be fine

Prepping for Mid-Length Vacations (7 to 10 days)

☐ Trout are wild animals that can survive leaner times
☐ Trout do not need to be fed or visited during a 10-day vacation
☐ One week beforehand, you can replace your charcoal filter using a new, well-rinsed cartridge/bag of charcoal. Charcoal can help reduce ammonia and fresh charcoal will work well over the vacation.
☐ Continue with the normal feeding cycle in the days leading up to vacation.
☐ If anything feed a little less, so as to minimize ammonia discharge during holidays.
☐ Do a nice BIG water change right beforehand. Don't let the tank temperature fluctuate more than 5 degrees. In an emergency, clean water is more important than temperature stability, though.

Prepping for a LONG Vacation (11+ days)

Same prep as above.
☐ Plan to come in once to feed, if possible, about halfway through. If you can't come in, don't worry.
☐ Try to recruit someone in the school that can keep an eye on the trout.
☐ Trout are wild animals that can survive the lean times.

Ammonia and Trout

Excess ammonia causes many problems in fish. One significant effect is damage to the gills. Although the most obvious consequence of this is impaired respiration (breathing) this isn't the only problem. Gills are also important for acid-base balance (keeping the pH of the fish's blood correct to allow for normal processes to occur) and ion exchange (keeping the correct amount of important ions such as sodium and chloride in the blood). Thus, damage to the gills prevents a number of important processes from occurring. This leads to extra stresses on the fish as well as an increased potential for infection by bacteria and other invaders.

Ammonia also causes damage to skin, fins and the intestine. More chronic ammonia exposure can cause kidney damage, decreased growth and overall immune suppression. Ammonia also affects the nervous system, resulting in erratic swimming behavior.

What to watch for:

- gasping/ impaired respiration
- abnormal swimming/whirling
- bloody areas on the body
- increased mucus production
- bloody areas in the intestine
- acute death

What causes excess ammonia?

- overfeeding
- excess leftover food in tank
- decaying food or animal matter trapped in filter
- die-off of healthy bacteria colony due to something like chlorine
- a tank that was not properly cycled yet and lacks the healthy bacteria needed for the nitrogen cycle

source: troutintheclassroom.org

How to decrease ammonia levels in a tank:

- 20% water change two to three times a week (siphon from the bottom of the tank)
- make sure you are not overfeeding
- clean decaying food or animal matter trapped in filter and in gravel
- add ammonia chips to filter (use only for a temporary emergency fix)
- use a water conditioner such as Amquel

Thanks to Chuck Dinkel, co-coordinator of the Maryland TIC program, and Lilli Genovesi, NY TIC Coordinator, for this information.

More on Ammonia – pH – Water Temperature

by Chuck Dinkel, MD TIC

When raising fish there is nothing worse than seeing your fish suddenly die without any apparent reason. Teachers sometimes remark that their perfectly good fish that were fine yesterday suddenly looked sick and died this morning.

One point that many people overlook in fish culture is the relationship between ammonia levels, water temperature and pH. If neglected or not understood their inter-relationships can lead to fish mortality

Ammonia

All fish give off ammonia. It comes off their gills and waste. Uneaten fish food turns into ammonia as it breaks down. If left to build up over time without nitrifying bacteria to convert it into nitrites and nitrates it will cripple your system and kill your fish. This is known as the Nitrogen Cycle. At the water temperatures we raise trout it can take six to eight weeks for a tank to fully cycle

Ammonia concentration in a new aquarium is a chemical that has to be watched closely to make sure the levels do not reach a point where they start killing fish. The death of many species of fish can start at as low as .6 **p**arts **p**er **m**illion (ppm). In established systems the ammonia level normally reads 0 ppm.

When you test for ammonia with your aquarium test kit, the reading you actually have is a combination of ammonium (NH_4^+ or ionized ammonia) and ammonia (NH_3 or unionized ammonia) known as **T**otal **A**mmonia **N**itrogen (TAN). Ammonia is the toxic part of the TAN. Ammonium even at high concentrations does not cause mortality in fish. Understanding the difference between the two is crucial to figuring out how much toxic ammonia you really have in your system. How much of the TAN you have that is toxic is greatly related to the pH of the water, and to a much lesser extent the temperature. The higher the pH the greater amount of the TAN is ammonia. Water with a temperature of 82° F (28° C), a pH of 7.0, and a TAN of 5 ppm has only .03 ppm ammonia. . At a pH of 6.0, and 10 ppm of TAN, the ammonia is only .007 ppm. Above a pH of 8.0 the toxicity of TAN rapidly rises!

The pH of Ammonia

Pure ammonia actually has a basic or alkaline pH. In theory, ammonia should raise the pH of an aquarium. However, virtually all processes in the aquarium that produce ammonia, as well as the breakdown of ammonia, produce hydrogen cations. Since pH is the negative log of hydrogen cation concentration, increasing this lowers the pH, negating the mildly basic pH of ammonia. While ammonia has a basic pH, the processes that create it in an aquarium produce enough hydrogen ions to overcome this and lower the pH.

Sources of Ammonia

Ammonia comes from several biological processes in the aquarium. Most of these processes come down to breaking down proteins. In a fish's metabolism, they break down proteins from the food they eat and produce toxic ammonia as a byproduct. This releases ammonia, and hydrogen ions. Since ammonia is a weak base, the hydrogen ions have a stronger effect on pH, so this process ultimately lowers the pH. Rotting plant and animal matter, as well decaying fish food, also undergo a similar process that produces ammonia and hydrogen ions.

The Ammonia Cycle

In a healthy aquarium, bacteria break ammonia down into less toxic forms. A first set of bacteria break ammonia down into nitrite. A second group of bacteria turn the nitrite into nitrate. The various bacteria also release even more hydrogen ions throughout this process which lowers pH. The process typically takes several weeks to a month to establish in new aquariums. Without this process, toxic ammonia would continue to build up until the water became toxic to fish.

How pH Effects Ammonia

While the processes that create ammonia affect pH, the aquarium's pH can also influence the ammonia. In an acidic aquarium, ammonia actually becomes less toxic to fish. It is never good to have ammonia in an aquarium, but it is "less bad" in an acidic situation. In water with alkaline or basic pH, ammonia is more toxic.

How Temperature and pH Effect Ammonia

Ammonia varies in toxicity at different pH and temperature of the water. For example, ammonia (NH_3) continually changes to ammonium (NH_4^+) and vice versa, with the relative concentrations of each depending on the water's temperature and pH.. At higher temperatures and higher pH, more of the nitrogen is in the toxic ammonia form than at lower pH.

At what point should you get concerned about ammonia levels becoming a threat to your fish given that ammonia is constantly being produced? The answer to this question will depend on the temperature and pH of your tank water, how many fish are in your tank and how much uneaten fish food remains in the system.

source: troutintheclassroom.org

Total Ammonia Nitrogen (TAN) - ppm *Use this table to find out when ammonia levels will start to become toxic to your fish*											
Temp (°C)	pH										
	6.0	6.4	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2	8.4
4	200	67	29	18	11	7.1	4.4	2.8	1.8	1.1	0.68
8	100	50	20	13	8.0	5.1	3.2	2.0	1.3	0.83	0.5
12	100	40	14	9.5	5.9	3.7	2.4	1.5	0.95	.61	0.36
16	67	29	11	6.9	4.4	2.7	1.8	1.1	0.71	0.45	0.27
20	50	20	8.0	5.1	3.2	2.1	1.3	0.83	0.53	0.34	0.21
24	40	15	6.1	3.9	2.4	1.5	0.98	0.63	0.4	0.26	0.16
28	29	12	4.7	2.9	1.8	1.2	0.75	0.48	0.31	0.2	0.12
32	22	8.7	3.5	2.2	1.4	0.89	0.57	0.37	0.24	0.16	0.1

This chart identifies the level of ammonia you can tolerate in your fish tank before it affects the fish. You will notice that at very warm water temperatures a small amount of ammonia can be toxic to your fish. At the opposite end of the spectrum in very cold water, the opposite is true. Fish can tolerate higher levels of ammonia the cooler the water. This is also true for dissolved oxygen. Cold water can store more dissolved oxygen than the same volume of warm water. The good news is that the water temperatures and pH levels at which our trout are raised tend to reduce the effect of harmful ammonia. If you encounter an ammonia spike that is causing fish mortality you may try lowering the water temperature 2-4 degrees to see if the fish start to recover.

Understanding the relationship between ammonia, pH and water temperature will help you control and manage your system and avert fish loss.

Note: The Total Ammonia Nitrogen table is printed by permission of Frank Gapinski of Eco Films, an independent production house based in Queensland's Sunshine Coast, Australia. Ph: 07 54749893 email inquiries: frank@ecofilms.com.au

source: troutintheclassroom.org

Chiller Maintenance

This section has been prepared by John Nordstedt, who works with the NJ TIC program
(There are many documents for download at the very bottom of this section. Also, please carefully check your warranty before performing these tasks.)

Importance of Sizing a Chiller Correctly

Aquarium chillers are primarily designed for tropical fish applications where water temperatures are around 70 degrees F. Trout need water temperatures of 52 – 55 degrees F. Most applications – home and offices – have well controlled room temperatures between 68 and 72 degrees F.

In school applications, the room temperatures run much higher – many times as high as 80 – 85 degrees F. In most instances the room temperature is not within the control of the teacher.

Both of these conditions mean the chiller has to work a lot harder than it was designed to work. While a 1/6 HP chiller may be good for a 55 gallon tank of tropical fish in a home, it is not good for trout in a classroom. NJ uses a 1/3 HP chiller so that the chiller does not have to work as hard to cool the water.

Finally, the atmosphere in a classroom is dusty and dirty. As the dust gets into the chiller it quickly becomes less efficient. The less efficient it is, the harder it has to work. This is why you need to have your chiller at least 24 inches off the floor with a 10 inch clearance on all sides.

Avoiding Early Failures/Annual Maintenance

The chiller must be positioned well off the floor – like on a milk crate – and have at least ten inches of free air space all around it.

Every day someone should compare the temperature shown on the controller with the temperature of a good thermometer placed in the tank.

The Aqua Chill, Oceanic, and Prime chillers have easily removable front panels behind which are mesh filters. During the school year, these filters should be vacuumed or brushed weekly (Also, see foam filter instructions below.)

Every chiller should be thoroughly cleaned at the end of the year. A compressor with a blow off nozzle is required. Most schools are equipped with a small compressor. The annual maintenance does not require a HVAC person. Anyone who can handle a screwdriver can do it.

Specific instructions below for Aqua Euro 1/4 HP Chiller
Link to instruction manual
Generic preventative maintenance information

Filter Cleaning

John's Technical Tip: Fluval Cleaning -- Note: The Colorado TIC program now uses the Fluval 406

The middle of the school year is a great time to check and clean your filter media. Please check your filter's manual for detailed instructions.

For the Fluval 405 filters, you must first raise the shut off valve (gray/black pedal) and make sure that the output hose is not circulating water, THEN unplug the filter and remove the top.

The foam media should be removed and thoroughly rinsed. The ceramic and charcoal media should remain submerged and not disrupted, these media support the living bacteria responsible for stabilizing your tanks nitrogen cycle.

If you notice living or dead trout in your filter or in the media remove them immediately, live trout can be placed into the tank. Extra precautions must be made to prevent trout from being suctioned into the filter system. The filter intake must be covered with a filter foam or mesh material on all sides, top and bottom. This cover will likely accumulate waste material and will need to be removed and cleaned each week. Make sure to raise the shut off valve before removing the filter intake cover to prevent fish from being taken in during a cleaning.

source: troutintheclassroom.org

John Fischer recommends using the AquaClear 110 filter foam block (found at most pet stores) to prevent young trout from being suctioned into the Fluval 405 filter intake. The foam block is made of a porous spongy material. To fit the foam on the filter intake, cut the foam block in half and make crossing slits on the top with a small pair of scissors, when you squeeze the block you should be able to see the opening where the filter intake fits. Be sure NOT to cut all the way through to the bottom (see pictures below).

Treat all of the tank water with water conditioners (such as Amquel and Novaqua) to remove any chlorines, chloramines, ammonia or metals that may have contaminated the filter media during cleaning. Also remember to clean your hands of lotions, soaps and oils prior to handling filter and aquarium equipment.

To start the Fluval 405 filter back again, replace all media and covers, lower the shut off valve (gray/black pedals) to open circulation. Prime the 405 Fluval Canister filter by pumping (raise and lower) the silver "start" knob. Keep pumping the water through until the chambers are filled with water and air has been expelled, and then plug in the filter. You should see water come out of the output hose. If the water is not circulating, and the filter is making noise, try priming or unplug and check to make sure the system is set up properly.
Fluval 406 Filter Manual
Aqua Clear 110 Power Filter Manual

Nitrogen Cycle

by Emily Gates, Pennsylvania Council of Trout Unlimited
in consultation with this reference

Every new aquarium set-up goes through a process of establishing beneficial bacterial colonies. This process is generally known as the nitrogen cycle, but is also called nitrification, the start-up cycle and/or the break-in cycle. As you know, your aquarium is a closed environment so all of the waste excreted from your fish and uneaten food accumulates in your aquarium. The nitrogen cycle converts these wastes to safer by-products. The fluctuations you have noticed in your aquarium water quality recently are likely the result of this cycle.

Stage 1

The cycle begins when you add fish to the aquarium. All uneaten, decayed food and waste generated by the fish breaks down to form ionized or un-ionized ammonia. The ionized form, Ammonium (NH4), is present if the pH is below 7, and is not toxic to fish. The un-ionized form, Ammonia (NH3), is present if the pH is 7 or above, and is highly toxic to fish. These ammonia levels will increase for about 2 weeks until the second stage of the cycle begins. The Freshwater Master Test Kit's ammonia test gives a combined reading of Ammonium (NH4) and Ammonia (NH3).

Stage 2

During the second stage of the nitrogen cycle, aerobic bacteria called *nitrosomonas* grow to sufficient quantities in the filter to convert the ammonia to toxic nitrite (nitrite destroys the hemoglobin in the fish's blood and eventually prevents the blood from carrying oxygen). As this happens, the ammonia levels will quickly begin to drop as the nitrite levels slowly increase. These nitrite levels will continue to increase for about 2 weeks until aerobic bacteria called *nitrobacters* grow to sufficient quantities in the filter to convert the nitrite to less toxic nitrate. If your current water quality testing indicates high nitrites, the nitrobacters are still establishing themselves in your filter media, gravel and hydro-sponge.

Stage 3

The conversion of nitrites to nitrates is Stage 3 of the nitrogen cycle. Again, as the nitrite levels quickly decrease due to the work of nitrobacters, the nitrate levels will slowly increase. Once your tank has reached this point (about 5-6 weeks total), it is said to have "cycled". All you need to do now, is to perform your regular partial water changes in order to keep a moderately low nitrate level. If this practice is followed routinely, you should have no problems maintaining your biological filter.

Stage 4

Many TIC tanks now use MicrobeLift Special Blend, which further converts nitrates into nitrogen gas, which then bubbles out of the tank. Some water changes and vacuuming are still not advisable, but on the whole, nitrate levels are lower and more manageable with this product.

What not to do during the nitrogen cycle:

• Don't change the filter media - the beneficial bacteria are growing there. Don't disturb them until they have become well established (you may need to clear debris from the filter sponge once a week - do this in de-chlorinated water).

• Don't overfeed the fish - when in doubt underfeed your fish. Remember that anything going into the tank will produce waste one way or another

source: troutintheclassroom.org

Dissolved Oxygen

Dissolved oxygen (DO) is a crucial component of our trout tanks. Trout and other salmonids prefer cold water because they require high levels of dissolved oxygen, which cold water can provide.
DO is also a limiting factor for nitrifying bacteria - the more Oxygen available, the better your biofilter will do its job converting ammonia to nitrites then to nitrates.

Below are some thoughts about how to assess dissolved oxygen in your classroom tank.
From David Kline, PA TIC teacher
The temperature of the water affects how much dissolved oxygen (DO) can be held in the water, but it does not indicate how much DO is in the water. The only real way to test this is with:

- a DO Sensor/probe (like a Vernier Lab Pro unit - that is properly calibrated),
- with a Winkler Tititration method test kit, or
- a Chemetrics Vacuette colormetric test kit.

If you have a bubbling airstone, and a working bulkhead with a little air mixed in, then you most likely have good dissolved oxygen levels. It is good to have a kit that tests DO for comparison with your local waterway that you are monitoring/releasing the trout into later.

Water Hardness

KH is a measurement of the total carbonate in the tank. Carbonate is found in materials such as limestone or seashells, as well as in baking soda (sodium bicarbonate). Carbonate stabilizes the pH of an aquarium, and also serves as a source of energy when oxidizing the waste ammonia in the tank.

GH is a measurement of the minerals, such as calcium and magnesium ions, in the tank. These enter the tank via tap water, and they remain when water evaporates from the tank. Luckily, water changes remove these minerals, so they tend not to build too much up in trout tanks.

Many teachers and students have taken to measuring KH and GH in their tanks, and adjusting the level of KH with baking soda (or a KH balance aquarium product) when necessary. Recommendations for KH and GH levels are between 50-100 ppm.

Especially when microbe tank additives are used, but the nitrogen cycle is not taking off as it should, low KH can be the culprit.

If you are interested in monitoring and adjusting your tank's GH and KH, please talk to your local program coordinator or the local/national TIC communities, who will be up to date on what you can try, and will know more about your local tap water and what it already provides to your tank.

The above information is drawn from MicrobeLift, Aquarium Pharmaceuticals, and input from Chuck Dinkel, the co-coordinator of the Maryland TIC program.

Sampling/Testing

Sampling Process

In order for your trout to be tested for various pathogens, a certain amount of your total population needs to be sampled. The sampling process needs to be done by a CPW certified sample collector. CTU has various people within their TIC network that are certified to do this. There may be opportunity to become certified yourself, so keep an eye out for that type of training.

The sampling process needs to begin 8 weeks before your planned release field trip. You can reach out to your local TIC coordinator and/or to the CTU Youth Education coordinator who will start the process and recruit a volunteer to come out to your school and do the sample collection.

Testing Requirements

According to state law, fish must be tested prior to release. The following guidelines, provided by CPW, outlines the testing requirements. Depending on the location of the release, fish may have to be tested for Whirling Disease (for all sites west of I-25). Sites must test a minimum of 35 fish in order to qualify for a release into waters with any connectivity to state waters. If the fish are released in Whirling Disease positive waters, no sampling is required for Whirling Disease, and you can use the lower confidence level of sampling if the area biologist is in agreement. If your total fish population would be highly impacted by testing, you may skip disease testing and release your fish into a private pond or lake with no connectivity to state waters. Testing results are good for up to 15 months on the same water supply, meaning that TIC sites will only need to test their fish once every two years (fish must be tested in the first year). Sites with multiple tanks will increase the chances of holding enough fish to test and release in the same year.

COLORADO PARKS AND WILDLIFE

INSTRUCTIONS FOR TIC FISH HEALTH AND TESTING

All eggs/fish in the TIC project must be obtained, held, disease tested, and released in accordance with State of Colorado regulations as set forth in Chapter O, Article VII.

1.	The CPW Aquatic Animal Health Lab must receive a signed and dated copy of "Trout in the Classroom" Summary of Relevant Program Details from each participating classroom prior to eggs being obtained, as well as a copy of the Aquaculture Permit.
2.	Transportation of eggs to the classroom must be accompanied by the Aquaculture Permit and a copy of the Fish Health Inspection Certificate from the source facility.
3.	A written request for a fish health inspection must be made to the CDOW Aquatic Animal Health Lab in a timely fashion in order to schedule the inspection. The inspection must be scheduled at least six (6) weeks prior to the anticipated release date to allow for testing and paperwork to be completed. A Fish Health Inspection Certification is required prior to release of the fish unless specifically exempted by the Director.
4.	A "lot" of fish is defined as a group of fish of the same species and age that share a common water supply and originate from a distinct spawning population. If there are more than one aquaria in a classroom, but all are on the same water supply and eggs are from the same source, they will all be considered one lot.
5.	An appropriate number of fish from each aquarium/lot will be required during the health inspection to result in confidence and prevalence levels required from other facilities within the state. The sample numbers are based upon a 5% prevalence level for a pathogen (the number of fish selected at random will give at least one positive 95 times out of 100). Examples for sample size are: If the aquarium holds 500 fish, 55 would be tested If the aquarium holds 250 fish, 50 will be tested If the aquarium holds 100 fish, 45 will be tested If the aquarium holds 50 fish, 35 will be tested, etc. TU and/or the schools will be responsible for the cost of the testing.
6.	Whirling Disease (*Myxobolus cerebralis*) testing – at the time of the annual inspection, fish to be released in salmonid habitat will be tested for whirling disease and the sample size will be 60 according to regulations. Because classroom trout will not have been held on the water supply for at least 10 months, the polymerase chain reaction (PCR) technique will be the method of testing. Fish must be on the water supply at least 4 months prior to testing. A positive finding in such instance shall be considered presumptive for the presence of *M. cerebralis*. Confirmation shall be determined by a second PCR conducted by a different laboratory. Cost for this testing is the responsibility of CTU and/or the school.
7.	Fish cannot be released until the Fish Health Inspection Certification has been issued. Fish transported for release will be accompanied by a copy of that certificate, as well as an appropriate stocking permit issued by the CPW.
8.	Fish health/disease issues arising during the school year will be discussed with a Fish Pathologist from the CPW Aquatic Animal Health Lab.

Trout Release/Alternate Options

Trout Transportation

Materials:

• Sturdy cooler or bucket with a loose-fitting lid.
• Ice made with dechlorinated water -- or -- ice in a Ziploc bag or 2-liter bottle.
• Battery-powered airstone

Instructions:

• Fill cooler or bucket with water from tank (be sure you can lift the cooler).
• Transfer trout fingerlings to cooler using a small net.
• Add ice to water -- but monitor the temperature, do not allow to dip too low.
• Insert and start airstone.

Hints:

• Make sure the trout aren't in the bucket or cooler longer than they have to be.
• Make sure to have enough water, but not so much that the cooler can't be carried.

If you are traveling a long distance or are so inclined to fit a cooler to exactly meet your needs, you can try this design, submitted by Joe Mark, a TIC teacher in Vermont. (PDF file)

NOTE: Whenever releasing fish into ANY body of water, you must have state approval to do so. If released into the wrong body of water, our small fingerlings can permanently alter an ecosystem. Please contact your coordinator for more information, or, if you do not have a state TIC coordinator, please contact your local state environmental, fishing, or wildlife agency.

Trout Release Techniques

Once you've arrived at the stream or second tank, it is important to slowly acclimate your fingerlings to their new environment. Monitoring the temperature of your cooler or bucket, slowly add water from their new stream or tank, one or two cupfuls at a time. The goal is to gently change the temperature of your cooler or bucket to near the temperature of the new water, allowing the temperature to change no more than a few degrees every ten minutes. Once the bucket/cooler temperature is within one or two degrees of the stream temperature, remove the fingerlings to their release container. To release the trout, lower their container into the stream and gently tip it to let them out.

Not Releasing your Trout?

If your program does not have enough Trout to sample, test and release, you have a few different options. The first option would be to release them into a private pond with the approval of a Colorado Parks and Wildlife Aquatic Biologist. This is an option only if this body of water has **no** connectivity to state waters. Another option is to donate the fish to a community tank (nature centers, fly shops, etc.). You can keep the fish over the summer to give your students a chance to see larger trout and potentially use them for a dissection lesson for that next year. This would require maintenance of the tank over the summer months. Lastly, you can use clove oil or similar techniques to euthanize the fish if none of the other options are viable.

source: troutintheclassroom.org

End of Year Clean-Up

At the end of the TIC season, it is important to clean your aquarium set-up in order to ensure a successful next year. If you take a few minutes to make sure everything is clean, your equipment will have a much longer life. Here are a few pointers for cleaning the various components of your chilled aquarium set-up:

Aquarium Tank

1. Empty the tank almost all the way, by your usual method--many people like to use the electric pump to do this work. Then turn off the electrical pumps, chillers, filters, etc.
2. Finish emptying the tank, disconnect tubing
3. Using a solution of 1 part Chlorine bleach (Clorox) and 100 parts water, wipe down the interior and exterior of the tank. A soft sponge (dedicated to this use only) can be used to scrub hard to remove scale and algae growth
4. You can use the 1:100 bleach solution for cleaning out the tubing (clean tubes using long brushes you can buy at any pet shop)
5. Rinse anything cleaned with the bleach solution thoroughly with fresh tap water. Let everything air-dry completely, preferably in bright sunlight
6. If you have any pebbles or gravel in the tank, they should be removed, washed, and dried by laying out on a cloth or towel in the sun or a ventilated area. They can also be sterilized with the Clorox solution, but they also MUST be completely dried

source: troutintheclassroom.org

Aquarium Chiller

Drop-in style chiller (Glacier)

Using bleach solution and a dedicated sponge, you can wipe off the stainless steel Freon tubing.

For hard-to-remove plaque, a small PLASTIC scrub brush can be used. NEVER USE A WIRE BRUSH ON THESE TUBES.

Remove dust and lint from the fins of the coolant tubing (those black thin metal slats on the side of the chiller). This can be accomplished using a small vacuum cleaner, dusting cloth or soft bristle plastic dust brush. Your chiller will run more efficiently if you clean the lint and dust from this side of it.

Flow-through style chiller (Arctica Titanium, AquaChill, Via Aqua, Polar Bear)

Rinse pre-filter sponge on pump thoroughly with water, and let air-dry.

Tip chiller and drain. Using pump or faucet hose, flush chiller with clean tap water in each outlet, to ensure any dirt is washed out of the cooling tank. Then tip further to ensure it is fully drained.

Remove dust and lint from all vents on the chiller, using a small vacuum cleaner, dusting cloth, or soft bristle plastic dust brush

Filter

Take apart your filter and scrub out the plastic parts with your 1:100 bleach solution. Thoroughly rinse out all filter cartridges (filter sponges, charcoal, etc.) with regular water, and dry them in the sun or a well ventilated area. For most filters, it is suggested that you buy new filter cartridges of charcoal and sponges for the following year. You can re-use bacterial growth media--such as clay pieces--that you rinsed out. Thoroughly air-dry entire filter apparatus.

FAQs

This FAQ was developed by Russell Tarragan

Are leaks a problem? How can I prevent leaks?

Once a chiller system is assembled, it is unlikely that a leak will develop. However, physical contact with the system could damage connections, particularly tugging on tubes. For this reason, students should not touch chiller hardware without supervision. A serious leak will pump the entire contents of the tank onto the ground within a very short time.

What should I do if my chiller system starts to leak?

If there is a leak in any external part such as the tubes for the chiller, turn off and unplug all electronic tank systems. A large volume of water may be contained in the chiller and chiller tubes, so it might help stop a leak if the tubes are removed from the tank and placed in a 5 gallon bucket. It is important that the leak be fixed as soon as possible so that the chiller can continue to keep the water cool.

Can I fix leaks on my own?

The assembly of the chiller system is straightforward, so fixing it is quite possible without assistance. Simply unscrew the connection, and make sure that it is not cracked or damaged in anyway. Next, reassemble the leaking connection carefully. You can use a tool to tighten any connection, but do not force any plastic parts as they will crack under excessive strain.

What happens if there is a power failure? How much time do I have?

It is important that the fish see as stable a water temperature as possible. Short downtimes, of an hour or two at a time, probably will not harm the fish or change tank temperatures by any great amount. However, lost power during the night or over a weekend (or worse still, a long vacation) will likely be fatal to the fish.

What should I do if the power must be turned off?

All individuals such as custodians, who may turn the power on and off, should be informed that the trout system needs constant power. If there is no way to prevent it, for construction for example, it would be best to cycle the power. This means running the chiller for two hours on, then two off. This is better than simply letting the tank sit all day without power.

Can I keep eggs or fish in a household refrigerator?

Refrigerators are not an acceptable substitute for the tank environment. Because most refrigerators operate between 35 and 40 degrees, they are far colder than the tank.

What do I do with my eggs or fish in an emergency?

In an emergency, eggs can be preserved by placing them in a cool dark place, with an ice pack and thermometer. Careful regulation in the amount of ice should make it possible to keep the eggs around 50 degrees. Do not add ice to the eggs directly; apply to the outside of the egg container. Ice water may be dirty, and the rapid melting from immersion would cause sudden temperature changes that might do more harm than good.

With fish, particularly large fish, the only option in an emergency is to add ice to the tank. The best way to do this is to freeze large plastic containers of water, such as soda bottles, and add them to the tank. When creating these, do not fill them to the top as the ice that forms takes up more space than the liquid. Clean ice packs can also work, or sealed plastic bags of regular ice. It is possible to regulate temperature by adding or taking away ice in this way. Do not add regular tap water ice cubes directly to the tank unless there is no other option--this ice likely has chlorine in it, which can harm the fish. Some teachers create tank-water ice cubes, in anticipation of an emergency.

A 5 gallon bucket would be a good choice for holding fish in an emergency, if there is a problem with the tank.

It is best to prevent any such problems and carefully maintain the tank environment. The priority in an emergency is getting the tank environment back to normal, no emergency procedure can replace the stability of a working tank.

Source: troutintheclassroom.org

What should I do if there is a serious leak while I am away, and the tank is almost empty when I return?

If there is a serious leak, during the night or weekend, almost all of the tank water may be pumped out. It is unlikely for the tank system to fail on its own, but it is important to be ready in the event of such an accident. If the fish are in very shallow water, and the chiller is no longer working because the pump is running dry, it is important to carefully repair the tank system environment. First, you should fix the leak. Next, add enough cold tap water (preferably treated with a tap-water-safe compound from a pet/aquarium store). This gets the chiller working again; you will probably need just a few gallons. Add this water slowly, and try to make this water around the same temperature as the tank water (which might be warmer by now).

Once there is enough water to have the chiller run, you should let the tank reach 50 degrees again. There may not be enough water for the filter to run, so it should be unplugged to prevent damage to the motor. The bubbler must be used during this process if possible.

At this point, begin to age as much tap water as possible in every clean container you might have. Starting the next morning (the fish should be fine in 4 inches of water for the night provided the chiller works), slowly add the aged tap water. If you can, it would be best to add only a few cups at a time, many times during the day. Continue to do this until the tank is about half full. Once the tank is half full, you can add the aged water a few gallons a day. Continue to make new aged water as you use it, and because this is an emergency situation you only have to age the water 24 hours if 48 hours is too hard. Do this until the tank is back up to normal levels. Don't forget to reconnect the system filter, and resume normal maintenance procedures including water changes.

The idea throughout this process is to make the changes for the trout as subtle as possible, once they're back at 50 degrees. Large swings in temperature and/or water quality can stress them out and increase mortality.

How can I inform custodians, or other teachers, about what to do if there is an emergency while I am away?

It is a good idea to give custodians some basic information about the requirements of your tank. For example, it is important that custodians know that your tank always needs electricity. It would be most helpful to place a sheet of paper (in a visible location) describing emergency procedures. This might include contact numbers, and basic advice on what to do to stabilize the tank if there is a chiller failure, leak, or power outage. You might want to prepare a frozen soda bottle of water to use in a chiller emergency, and then include the location of this ice and how to use it in your emergency procedure sheet. An example is below:

Tank Emergency Procedure:

In the event of a power outage, leak, or refrigeration system failure, or any other tank problem, please contact me:_____
Phone number:_____

If you cannot reach me, please try calling:
Contact:_____
Phone number:_____

Then,
In the event of a power outage: The trout in this tank need cold water to survive, and the chiller next to/under the tank maintains their temperature. If possible, the electricity to this tank should be turned on again. If the electricity must be off because of maintenance or construction for more than a few hours, please contact me as soon as possible. If I cannot be contacted in time, please place the frozen soda bottle of ice, located _____ _____, in the tank to help keep it cool. Even with the ice, the tank needs electricity as soon as possible.

In the event of a serious leak: A serious leak can be stopped by turning off all electrical parts of the tank system, or unplugging them. Any leaking tubes should be placed back in the tank or in a bucket. After all the water is cleaned up, the source of the leak can be fixed. This will probably be loose tubes or tubes which fell out of the tank. If there are more than 4 inches of water left in the tank, the fish can survive. Please do not add any water to the tank if this is the case. Lots of tap water, or water that is too warm, can kill the fish. If there is very little water in the tank, please add only enough cold tap water to let the pump work again. If the leak is fixed, please turn on all devices before you leave.

Thank you!

Do I need goldfish to start my nitrogen cycle? If I start late, should I use more goldfish?

At this time, it is no longer recommended that educators use goldfish to help "break in" the tank system. All systems should be installed with additives such as Biozyme or Stress Zyme which help create a suitable water environment.

Can I mix species of trout?

No, the different trout species may not be compatible. The risk of cannibalism among young fish (under ½ year of age) is greatly increased with species mixing.

Why are so many of my eggs or fish dying?

Death is a natural part of fish development. Everyone should expect to lose eggs and fish. The exact survival rate is highly variable and based on many factors. A sudden spike in mortality can indicate a tank problem. It is also worth noting that there are two naturally high-mortality periods, first during the egg stage and then again when the trout first learn to feed. Some fish never learn to feed and simply starve.

What is a normal death rate?

Death rates are different from one stage to the next. With green eggs, a large percentage are expected to die. With eyed eggs, a higher survival rate is expected. The loss of most of your eyed eggs does suggest a problem. As the fish hatch, and age further, survival rates should improve. By the time fish are free swimming and have learned to eat, death should be an uncommon event. Losing many free swimming fish, above all else, is a sign that the tank environment is not healthy. As they grow, fish produce more waste, so cleaning may be needed more often.

Most of my fish died in the first month, is this common?

One of the most common times for massive fish death is in the first month. Because eggs and young fish are more easily stressed, there is a high risk for death as a result of fungus, changes in water quality, or large swings in temperature. It is important that water changes and cleaning be practiced before the fish arrive, and that this process is maintained on schedule. Most catastrophic die offs seem to start with a missed cleaning day or weekend. By the time cleaning resumes, the damage may have already been done.

source: troutintheclassroom.org

What do I do with dead fish or dead eggs?

It is very important that dead eggs, dead fish, and decaying waste matter (discarded food for example) are removed as soon as possible. This should be done at least once a day, and even more often during critical periods or as needed. This process alone is very important in keeping the remaining fish alive. Poor cleaning is very often the root cause of excessive fish death.

Why are my fish or eggs dying at an abnormally high rate?

Poor water quality, as a result of insufficient cleaning or water changes is among the most serious threats to fish health. It is essential that water changes of 10-20% per week (more as the trout get older and bigger) be maintained, with aged tap water. Other causes of fish death might be temperature fluctuations, lack of aeration, and chemical exposure. High ammonia concentrations can result in sudden fish death.

How sensitive are the fish to temperature changes?

For best results, the trout should be exposed to the most stable temperature possible, as close as possible to the ideal. Fish can handle small fluctuations of one or two degrees, but sudden changes of almost any scale will be stressful. Changes of 5 degrees or more are a serious threat to trout survival particularly if they are sudden.

How can I help keep a stable tank temperature?

It is important that the chiller always be on and set to the appropriate temperature. Also, because water changes introduce warmer water into the tank, please limit these changes to 10% of your tank volume at any one time. The best way to change water is to change a small amount (2% of the tank volume) every day of the school week, plus a large (10%) water change once a week. 1 gallon plastic jugs (used for bottled water) would work great for this. An assembly line of 5 jugs would allow water to be aged first (with the caps removed), then used every 5 days. The use of insulation will help the chiller maintain a stable temperature, but may not be needed. Larger tanks will also help protect fish because they have more water to buffer any changes.

Why is the airstone needed?

Aeration of the tank is an important part of simulating a stream environment. The stream environment is not only cold, but constantly moving and constantly mixed with air. Because of this, it is important that filters, air-stones, and the chiller pump all operate well. The filter on the chiller pump, the intake on the tank filter, and the surface of the air-stones should all be clean and free of debris.

Should students wash hands before touching tank water?

Students may wish to clean their hands before working in or around the tank without using soap. Simply use warm tap water for this, and for cleaning of other objects like nets and the bucket. This will help keep chemicals and dirt from getting into the tank. Moisturizers and other skincare products might also harm fish. It is very important that no soap enter the tank environment, because soap may harm or kill fish even in small concentrations.

Some of my hatched fish are not eating - Some of my fish are deformed. Is this normal?

Yes. During the growth process, some fish will die. Some fish may survive initially only to die later because they never begin to eat. Other fish will be deformed, and very often will also die as a result of this. This is a natural part of fish reproduction. It is not normal, however, for very many or most of the fish to die. If this is the case, there may be a problem with the tank environment.

My fish have hatched, what should I do with the eggs?

The discarded egg shells will decompose naturally in time. If they appear to be hosting fungal growth, they should be removed and disposed of. Just as with living eggs, they might turn opaque white, or may take on a fuzzy appearance. If this is the case, please remove them.

When should the trout be allowed out of the hatching basket?

It is generally agreed that trout should remain in the basket as long as possible, even after some start to jump out on their own. Once the trout are all able to swim freely, and are strong enough to navigate the currents of the tank, you can release them into the tank. After the trout have been actively feeding for a week or two, they should be nearly strong enough.

How do I let the trout out of the basket when it is time?

You can gently remove the basket from the sides of the tank and slowly lower it to the bottom of the tank. You can let the trout swim out from here. This allows some trout to remain in the protection of the basket for a few days. You may also gently tip the basket as well to remove them, but it is best to be as gentle as possible. Please make sure that the basket is empty before removing it from the tank. Don't forget to cover the filter intake and pump intake to protect small fish from the powerful suction these tank components generate.

My alevin are very active, and are pushing other fish into the corners of the basket. What does this behavior suggest? Should I be feeding these fish more?

This type of activity is normal in trout. In this stage, young trout prefer dark corners. It may be helpful to put some screen material over the basket to reduce the amount of light these fish are exposed to. UV light can be harmful to eggs and alevin. Fish at this age do not need food at all. When beginning to feed, at the end of the alevin stage, please start with small amounts.

Trout are being sucked into the filter, how can I prevent this?

Young fish might be small enough to get pulled into the tank filter, or be hurt by the suction it creates. If possible, please place some material like plastic netting, panty hose, or cheesecloth over the filter intake using rubber bands. This cover will catch a lot of debris and will need to be rinsed often. It can be removed once the fish are large and active enough to avoid the filter.

source: troutintheclassroom.org

What is an ammonia spike? What can I do about it?

An ammonia spike is one example of a chemical imbalance in the tank environment. These are serious threats to fish health. The tank filter and its bacterial population help reduce problems like this, but they cannot work alone. The best way to prevent any chemical imbalances in the tank is to regularly clean the tank, and change the water. All debris such as food, waste, and dead fish should be removed as soon as possible. Water changes of 10-20% per week are required and should not be skipped. There is no replacement for regular cleaning and water changes.

One strategy for dealing with climbing ammonia levels is to turn off the filter and add a pro-bacterial product such as StressZyme. AFTER TWO HOURS, turn the filter back on, and proceed as normal. Test the water in the coming days to ensure that the ammonia is converting to nitrates. Continue with water changes as planned.

Can I use ammonia removal grains to prevent ammonia spikes?

While they are not needed, you may chose to use ammonia removal grains to help regulate ammonia levels in the tank. If you do so, please follow the directions on the container, and always err on the side of too few rather than too many. Ammonia grains are, however, not a replacement for regular water changes and cleaning of the tank. Even with the use of grains, a 10-20% per week water change must be maintained.

I am using the same tank system I had last year, what do I need to do to make it ready this year?

At the beginning of each year, to prepare for the next set of trout, you should clean all parts of the tank system with warm water. Please do not use soap on any part of the tank. You should also replace any disposable filter parts, and install a new UV bulb. See the End-of-Year Cleanup section for more information.

My tank is coated with a green slime. What is this? What should I do?

Green films or slime may indicate algal growth. This will not necessarily hurt your trout, and some teachers leave it growing. Many, however, choose to remove algal growth. It can be mechanically cleaned by using an aquarium (or soap free) sponge or similar tool. Also, to prevent further algal growth, it is best to limit the amount of light entering the tank. The use of foam or paper to cover the sides of the tank will help. The tank should never be in direct sunlight at any time. This may also indicate that the UV sterilizer is not functioning properly. Please be sure to change the bulb every year. Even if an older bulb produces blue light, it may not be creating UV light anymore.

The water in my tank is cloudy. What should I do?

Cloudy water probably indicates an excess in decaying matter. This may be from dead fish, leftover food, or a problem with the filtration. Carefully conducting regular water changes, as well as cleaning the tank of all solid material, is the best way to fight this. Make sure the filter is functioning properly, and that water is flowing out of it. Clean filter components if needed, but do not use soap or any chemical cleaners. Carbon filter packs should be replaced every year. If fish are not eating all provided food, you may reduce the amount given until they are able to eat it all. Excess food after 10 minutes should be removed and discarded.

How should I conduct water changes? What is the right amount of water to change?

Water changes are an important part of tank maintenance. Improper water changes can cause fish stress or even death. It is best to change about 10-20% of tank volume every week with tap water aged for more than 48 hours (so that the chlorine in the water has had time to dissipate).

While this might mean simply conducting one 5 gallon change a week for a 50 gallon tank, it would be far better to do 1 gallon changes every school day of the week in addition to the bigger change once a week. Five plastic milk or water jugs are perfect for this. If the top of each jug is cut off, this will aid chlorine dissipation. An assembly line of water can be made, where the jugs are aged several days before use and are then refilled and placed at the back of the line. This reduces the sudden change in tank temperature as room temperature water is added.

source: troutintheclassroom.org

What happens to the fish next?

The fish will be released into a watershed stream or river. Students can participate in the transportation of fish to their new habitat as well as the release process. It is hard to determine the survival rates for released trout, but full grown fish have been recovered and genetically linked to trout raised in the classroom. However, in general, TIC is not a stocking program, but rather an educational program. The true value of raising and releasing trout lies in the process.

How tight should plastic parts be?

Plastic parts need to be tightened by hand. They should be as tight as possible without risking damage.

Is it safe to use metal tools on plastic parts?

The use of metal tools is OK when great care is taken. It is more important that parts be screwed in place in the proper position; no amount of force can replace good alignment.

What tool should I use to tighten the worm gear clamps?

Some ring clamps come with thumb screws that allow tightening without tools. Others only require a screw driver. These should be tight, but should not be forced. It is possible that plastic parts could be broken with too much force.

Does it matter where I put the chiller?

Yes, the location of the chiller (above or below the tank) may alter the water pressure and flow rate in the system. While the pump can handle just about any arrangement, placing the chiller on the floor below an elevated tank will slightly reduce water flow and pressure. It is more important that tubes be free of kinks or excessive bends, so adding length to relax tubing is fine. The best place to put the chiller is directly below or to one side of the tank. It is best to put the chiller as close to level with the tank, but it is not required.

source: troutintheclassroom.org

My tap water is discolored, is this ok?

All water will have some color, most often a faint green or white color. Tap water that is not acceptable might appear very cloudy or may have a strong chemical smell. If this is the case, an alternate source of water should be considered.

How do I know if my water is safe for trout?

Most tap water will be acceptable for use in this tank system. After a break in period of at least one week, there will be plenty of time for chlorine to dissipate, and for particulate matter to be filtered out. Unless your water appears to be totally unacceptable, it is probably safe for trout. The break-in period is an important part of this, so being safe after a week does not mean that water directly from the tap would be safe for fish.

How should I assemble the hatching basket?

The hatching basket is designed to protect very young fish from physical harm. The plastic frame should be secure, and free of sharp edges or scrap plastic. The net is supposed to be placed loosely around the outside of the plastic frame. The net should be loose because this helps make the edges less prone to damage fish which become stuck. To avoid this problem entirely, some teachers prefer to place the net inside the frame and then secure it at each corner with needle and thread. Ensure that the net will not fall off, and is free from holes or damage.

Should the net be on the inside or outside of the hatching basket?

While the manufacturer designed this net to be placed around the outside of the plastic frame, it can be improved by placing the net on the inside. This makes for an even safer environment for the young fish. Monofilament or twist ties can help secure the net to the inside. The net can be loose, but should not float up as this could let the eggs fall out of the basket.

What tools are needed for tank installation?

The only tools needed for tank installation are a screwdriver, knife or pair of scissors, and pliers to tighten any connections if needed. You may also need a clean 5 gallon bucket to assist in filling the tank and water changes. This can be purchased at any hardware store. Please rinse the bucket first and then do not use this bucket for anything other than tank water.

Do I need to age tank water before first filling the system?

No, the break in period will age the water before fish are introduced.

The tubing is very hard to fit over the plastic tank parts, what should I do?

If tubing doesn't fit over parts, it might help to dip the end of the tub in hot water. Very hot water works best. Tubing can be carefully stretched by heating the ends, and then inserting a rigid object like a pair of scissors into the end. This applies pressure to the end and stretches it a small amount. Excessive force can break the tube end. Tight tubing generally will fit, but it might require some time and patience.

Should I get a lid for my tank?

Yes, it is better to cover the tank with some material which can prevent objects from falling in, and provide the reduced light levels that fish prefer. Foam, screen, and plastic have all been used as lid materials with success. Purchased lids for the tank can also work, but because many of these include lights, it is important that the light feature not be used.

Does my tank need insulation?

Many tank systems have worked without insulation. However, insulation will provide a darker, more stable environment for the fish. Insulation will reduce the amount of work needed to maintain the water temperature, saving electricity and limiting the amount of time the chiller will be operational. In addition, insulation will reduce condensation which could pose a problem in the summer.

What kind of insulation can I use?

There are many materials which can help insulate the tank. The most popular is foam sheet material, available at any home repair - industrial hardware store. Two layers of bubble wrap, the shipping material, also would make a good insulator. For best results, cover the bottom of the tank as well. Many other materials can work including plastic, wood, or cardboard

Where do I position the airstone?

The airstone aeration system produces a large volume of bubbles. These bubbles can interfere with the filter operation by filling the motor with air and causing it to “air lock” and fail. For this reason, there should be at least 4 inches between the airstone and the filter.

Lesson Plans

The following curricula and activity ideas belong to other organizations and have been used by TIC educators in their classrooms.

Many teachers have taught many concepts involving trout. Trout can be the focus of a lesson, an illustration of a concept, or just inspiration. Having trout in your classroom inspires students to think more broadly about everyday topics and skills. While there are some comprehensive trout lesson guides written, most teachers find it helpful to tailor lessons to their specific curricular requirements and tie in trout as appropriate for their classrooms.

The lesson plans and activity ideas on the above pages are all shared by TIC teachers for the benefit of TIC educators everywhere; please feel free to use these ideas in educational settings and modify them to suit your needs. If you would like to publish these plans and activities elsewhere, please credit Trout Unlimited, in addition to any credits already noted on each activity plan.

Have a lesson plan that you would like to share? Email Tara Granke, a Headwaters Youth Program Coordinator for Trout Unlimited at tgranke@tu.org

Science (links)

- Trout Food Chain -- based on Trout are Made of Trees
- Salmon Bracelet -- finding the way around a stream ecosystem
- Scavenger Hunt -- looking around the stream
- The Way of a Trout -- a conservation classic (movie)
- TIC Hydroponics -- understanding the nitrogen cycle
- What Trout Need -- components of a healthy habitat
- Dream Stream -- a perfect trout stream
- Catch the Critter -- a macroinvertebrate game
- Web of Life Game -- to see the many connections
- Mock Fly Tying -- mimic trout prey
- Match the Hatch -- the why of fly fishing
- Bye-Bye Trout Song -- a farewell
- Cut it Out -- trout habitat study and artwork
- Crayon Mural -- reveals the whole ecosystem
- SMART Board Presentation -- an intro to trout
- Trout Tag -- to explore food web relationships
- EnviroAtlas -- see EPA's mapping resource
- Drawing Water -- gravity's role in water delivery
- Follow the Water -- using maps to trace water's route
- 3-D Topographic Maps -- get a bird's eye view
- Trout Across America -- where all the trout live
- Crumpled Paper Watershed -- visualize a watershed and land forms
- Rainbow Trout Journal -- great booklet by Hope Cahill, NM TIC
- Water Rights -- the Prior Appropriation Game
- Concentrations -- understanding ppm
- Coldwater Conservation Education Guide -- a series of lessons
- Crumpled Watershed w/ Pollution -- visualize rainwater and runoff
- Watershed Computer and Board Games -- a compilation of online resources
- When Will they Hatch? -- development worksheet from Idaho
- Counting Trout -- using proportion to estimate population
- Trout Markings -- external features of a trout
- Trout Cookies -- edible external anatomy
- Paper Bag Trout -- external features focus
- Trout "Guts" Collage -- internal anatomy artwork
- Trout Length -- one strategy for measuring

- Trout Life Cycle Song -- "Once I Was a Baby Trout"
- Trout Dissection -- how to go about anatomy and function
- Trout Feeding Behavior -- some comparisons
- Water Quality Probes -- using Vernier
- Trout Journals -- a year long study of trout
- Identify and Photograph Macros -- study morphology and learn about macroinvertebrates!
- Macroinvertebrate Collection -- seining and kick-netting
- Postcards from the Watershed -- observation and sharing
- Nitrogen Cycle Model -- students are bacteria!

Social Studies (links)

- Water Rights -- the Prior Appropriation Game
- Trout Hatchery Visit -- see where your trout come from
- Visit from an Angler -- hear stories of fishing, connect with your local TU chapter
- Animals' Origins -- comparing trout to other well-known species
- Trout Across America -- all the species in the U.S.
- Drawing Water -- collaborative water system building
- Drawing Water -- an alternative procedure
- 3-D Topographic Maps -- get a bird's eye view
- Mock Congress -- deciding a water issue
- Mock Trial -- defending a stream
- Write to a representative -- express an opinion
- Clean a Stream -- help keep trout habitat pristine with a service project
- Roots & Shoots -- four step method to completing a successful stewardship project. a Jane Gooddall program
- Love Letters to Trout -- expressing appreciation
- Bye-Bye Trout Song -- a farewell
- Postcards from the Watershed -- observation and sharing

Language Arts

- Love Letters to Trout -- expressing appreciation
- Trout Haiku -- and other short poems
- Nature Poetry -- inspired by the outdoors
- Bye-Bye Trout Song -- a farewell
- Trout Life Cycle Song -- "Once I Was a Baby Trout"
- Trout Comics -- by Sandy Cunnigham, NY TIC
- Trout Across America -- report on N. American species
- Postcards from the Watershed -- observation and sharing
- Trout Play -- write and perform a drama
- Trout Release Scrapbook -- photos and captions
- Trout Life Cycle Comic -- speech bubbles to fill in
- Expanding Imaginations -- writing from other perspectives (trout, macroinvertebrate, water droplet, stream
- Read Trout Stories -- choose from the TU library
- TIC Documentaries -- a creative account of your year
- Journal Prompts -- by Sandy Cunnigham, NY TIC
- Trout Release Worksheet -- one way to record
- Trout Journals -- a yearlong study of trout
- Journal page -- one option from Todd Burleson in IL

  -What are you looking forward to about having trout in the classroom?
  -What would you like to do with the trout, while they are with us?
  -What do the trout eggs look like? Be very descriptive. What do you see inside?
  -What would you like to say to the trout, to welcome them to our classroom?
  -What was hatching like? How did you feel?
  -Observe one fish closely for one minute. Follow it with your eyes. What does it do?
  -How do the trout act in the morning? The afternoon?
  -How do the trout act when it's dark? Light?
  -How do the trout act before feeding? After?
  -How do the trout act in the cold weather? Warm weather?
  -What is your favorite trout job? Why?
  -What is your least favorite trout job? Why?
  -What happens when we feed the trout? Why do you think that is?
  -Are there any special trout in your tank? Why are they special?
  -What do you think the trout see when they look out of the tank? What are they thinking?
  -How have the trout changed over the past few months? What is the same?
  -How do you feel about our upcoming release of trout? Why?
  -What advice would you give our trout on their way to their new home?
  -What did you see while releasing our trout? How did they behave?
  -How did you feel about releasing our trout? Why?
  -What was the most important thing you learned from raising trout?

source: troutintheclassroom.org

Mathematics

- Teaching Volume -- by Sandy Cunnigham (.pptx), NY TIC
- 3-D Topographic Maps -- get a bird's eye view
- Water Quality Probes -- using Vernier
- Concentrations -- understanding ppm
- Trout Length -- one strategy for measuring
- Water Quality Graph -- plotted by tie or population
- Stream flow -- velocity and volume
- Counting Trout -- using proportion to estimate population

Fine Arts

- TIC Documentaries -- a creative account of your year
- Love Letters to Trout -- expressing appreciation
- Trout Poetry -- haiku and other forms
- Nature Poetry -- inspired by the outdoors
- Songwriting -- rewrite lyrics to a favorite song
- Bye-Bye Trout Song -- a farewell
- Trout Life Cycle Song -- "Once I Was a Baby Trout"
- Singing "Happy Free Day" -- to the tune of "Happy Birthday"
- Expanding Imagination -- writing from other perspectives (trout, macroinvertebrate, water droplet, stream)
- River Habitat Collage -- "Trout Neighbors" collage for pre-K through 3
- Trout Comics -- by Sandy Cunningham, NY TIC
- Trout Food Chain -- based on Trout are Made of Trees
- Cut it Out -- trout habitat study and watercolor
- Wooden Silhouettes -- large, decorated trout!
- Journal Page -- one option from Todd Burleson in IL
- Shades of Green -- observation, from C&NN
- Crayon Mural -- watercolor reveals the whole ecosystem
- Love Letters to Trout -- expressing appreciation
- Paper Bag Trout -- external features focus
- Drawing Water -- collaborative water system building
- Drawing Water -- an alternative procedure
- Trout Markings -- watercolor work
- Trout Coloring Book -- trout and human impact themed

- Sketch Trout -- from your tank
- Sketch a Stream -- on a field day
- Mock Fly Tying -- mimic trout prey
- Dream Stream -- a perfect trout stream
- Trout Habitat Mural -- paint one at your school
- Trout "Guts" Collage -- internal anatomy artwork
- Trout Cookies -- external anatomy you can eat
- Trout Fashion Show -- design for everyone
- Postcards from the Watershed -- observation and sharing
- Trout Release Scrapbook -- photos and captions
- Trout Cards -- for Mother's and Father's days
- Make Trout T-shirts -- to wear in the field
- Tabletop Museum Book -- PowerPoint showing how to make a museum book that can have themes focusing on watersheds, trout, or stream ecosystem theme
- Make a Rainstorm -- the more, the merrier!
- Trout Play -- write and perform a drama

Physical Education

- Match the Hatch -- the whys of fly fishing
- Go fly fishing -- partner with your local TU chapter
- Casting Lessons -- partner with your local TU chapter
- Mock Fly Tying -- mimic trout prey
- FISHO -- bingo about fishing!
- Hiking - hike along a stream to examine trout habitat
- Trout Tag -- to explore food web relationships

Field Day Ideas

- Tips -- good things to remember
- Three Station Rotation -- one idea for your day
- EPA Streamwalk -- in the field stream assessment with instructions from the EPA
- Macroinvertebrate Sampling and Water Quality Assessment Wksht
- Macroinvertebrate Key
- How to make and use seine for sampling

Technology & Engineering

- EnviroAtlas -- see EPA's mapping resource
- SeaPerch -- learn how to make AUV (autonomous underwater vehicles) and use these robot to explore the underwater world
- Skype Tips -- video chat with another class!
- Create a blog -- for your classroom project
- Visual Communications & Photography -- Students identify and photograph macroinvertebrates using different techniques
- Water Quality Portal -- see EPA's mapping resource
- GLOBE Protocols -- have access to worldwide data
- My Waterway -- waterway health database

Colorado Lesson Plans

These lesson plans were created by volunteers, teachers and coordinators who participate in TIC in Colorado

Estes Park Elementary - 3rd Grade - Created by Joe Bottoms

Link to lesson plans

Complementary Programs

Environmental Education Guides

Link to website

The Pacific Education Institute, in partnership with the Association of Fish and Wildlife Agencies and other partners, developed a series of guides that lead educators through developing excellent field programs. Guides include landscape investigation, project-based learning, using technology out of doors, and many others. Their guides are based on theoretical and practical research, and offer sample lesson plans as well as guides for creating your own lessons.

Leaf Pack

Link to website

The Leaf Pack Network® is a network of teachers and students investigating their local stream ecosystems. The investigation uses the Leaf Pack Experiment Kit from the LaMotte Company. After conducting their own leaf pack experiment, schools share data through the network. These data shed light on the important connection between streamside forests and the ecology of rivers and streams. The Leaf Pack experiment involves creating an artifical leaf pack (dry leaves in a mesh bag), placing it in the stream for three to four weeks, examining the packs in the classroom and discovering different types of aquatic insects that are used as indicators of stream health.

Leopold Education Project

Link to website

The Leopold Education Project (LEP) is an innovative, interdisciplinary, critical thinking, conservation and environmental education curriculum based on the classic writings of the renowned conservationist, Aldo Leopold. The Leopold Education Project teaches the public about humanity's ties to the natural environment in the effort to conserve and protect the earth's natural resources.

Project Learning Tree

Link to website

Project Learning Tree® is an award winning, multi-disciplinary environmental education program for educators and students in PreK-grade 12. PLT, a program of the American Forest Foundation, is one of the most widely used environmental education programs in the United States and abroad. PLT uses the forest as a "window" on the world to increase students' understanding of our environment; stimulate students' critical and creative thinking; develop students' ability to make informed decisions on environmental issues; and instill in students the commitment to take responsible action on behalf of the environment.

Project WET (Water Education for Teachers)

Link to website

The centerpiece of the Project WET program is the Project WET Curriculum and Activity Guide. This 561-page guide is a collection of multidisciplinary water-related activities for ages 5 through 18 that are hands-on, easy to use, and fun! The lessons incorporate a variety of formats, such as large and small group learning, whole-body activities, laboratory investigations, discussion of local and global topics, and community service projects. The guide also features cross-reference and planning charts, a glossary, and background material on activity development and field-testing.

Project WILD

Link to website

(in addition to Basic WILD, they offer Aquatic WILD and Flying WILD)
Project WILD is one of the most widely-used conservation and environmental education programs among educators of students in kindergarten through high school. It is based on the premise that young people and educators have a vital interest in learning about our natural world. Emphasizing wildlife because of its intrinsic value, Project WILD addresses the need for human beings to develop as responsible citizens of our planet.

Project E-Trout

Link to website

Engage your students in citizen science with this virtual reality trout program

source: troutintheclassroom.org

Web Resources

Stream Explorers

Link to website

Trout Unlimited's site for youth

Trout Unlimited

Link to website

Trout Unlimited is an organization known for many years of trout and salmon conservation

The Water Cycle

Link to website

A great poster from USGS!

Water Calculator

Link to website

What's your water footprint?

Macroinvertebrate Booklet

Link to website

Another great resource from the University of Wisconsin

University of Wisconsin Resources

Link to website

A number of great resources from the University of Wisconsin, including VERY popular Key to Macroinvertebrate Life in the River

Macroinvertebrate Key

Link to website

An awesome online dichotomous key for aquatic macroinvertebrates

The Water Page

Link to website

A collection of resources devoted to the hows and whys of water conservation (a BIG thanks to the students at Brighter Futures Charter School for recommending this one to us!

Stroud Water Research Center

Link to website

The creators of the LeafPack network, as well as other great resources for water-centered teachers

River and Stream Links

Link to website

Another good collection of water-related links

Discover Water

Link to website

A Project WET-related website with interactive games and a virtual version of the always-popular Incredible Journey activity

Water is Life

Link to website

The website of Water is Life, and Infrastructure Makes it Happen, it includes many articles and resources regarding water supply systems

Water Footprint

Link to website

A site devoted to the explanation and exploration of societies' water consumptions. Includes an individual water footprint calculator

Water Sense

Link to website

Helping you make water efficient choices to protect resources for future generations

All About Water

Link to website

A collection of resources all about water properties and measurements

The Great Water Odyssey

Link to website

This site includes a water related game that your students can play

Carbon Footprint Calculator

Link to website

The website provides a carbon calculator and tips for reducing one's impact on the atmosphere

Prevent Aquatic Hitchhikers

Link to website

Library

This list is a compilation of available books regarding trout that may be useful for the classroom or for educators. This reference is provided as a service to parents and educators, and is in no way meant to endorse any authors or books contained herein.

Picture Books and Easy Chapter Books

- Campbell, Hugh. Lightning's Tale: The Story of a Wild Trout. Portland, Oregon: Frank Amato Publications, 1994.
- Ciardi, John. The Hopeful Trout and Other Limericks. Illustrated by Susan Meddaugh. Boston: Houghton Mifflin Company, 1989.
- Clark, Joan. Thomasina and the Trout Tree. Illustrated by Ingeborg Hiscox. Plattsburgh, New York: Tundra Books, 1971.
- Cole, Harold. A Few Thoughts on Trout. Illustrated by Betty Christensen. New York: Julian Messner, 1986.
- Cole, Joanna. The Magic School Bus at the Waterworks. Illustrated by Bruce Degen. New York: Scholastic, Inc., 1986.
- Cruz, Julianna. Tommy and Teresa Trout. Riverside, CA: Hatching Inspiration Publishing, 2008.
- Hertz, Ole. Tobias Catches Trout. Translation by Tobi Tobias. Minneapolis, Minnesota: Carolrhoda Books, Inc., 1984.
- Lucas, K. H. Fly-Fishing with Trout-tail: A Child's Journey. Trout-Tail LLC, 2002.
- Lumry, Amanda. The Adventures of Riley: Survival of the Salmon. Bellevue, WA: Eaglemont Press, 2006.
- Moisa, Ralph, Jr. Little Fish. Logan, Iowa: Perfection Learning Corporation, 1997.
- Norman, Howard. Who-Paddled-Backward-With-Trout. Art by Ed Young. Boston: Joy Street Books, 1987.
- Sayre, April Pulley. Trout, Trout, Trout! (A Fish Chant). Illustrated by Trip Park. New York: Scholastic Inc., 2004.
- Sayre, April Pulley. Trout are Made of Trees. Charlesbridge, 2008.
- Sloat, Teri. There Was an Old Lady Who Swallowed a Trout! Illustrated by Reynold Ruffins. New York: Henry Hold and Company, 1998

• Turnage, Sheila. Trout the Magnificent. Illustrated by Janet Stevens. San Diego: Harcourt Brace Jovnovich, Publishers: 1984.
• Werner, Kirk. Olive the Little Woolly Bugger. Johnson Books.
• Werner, Kirk. Olive and the Big Stream. Johnson Books.
• Werner, Kirk. Olive Goes for a Wild Ride. Johnson Books.

Chapter Books and YA Fiction

• Conly, Jane Leslie. Trout Summer. New York: Scholastic, Inc. 1995.
• George, Jean Craighead. The Case of the Missing Cutthroats. Originally published as Hook a Fish, Catch a Mountan, 1975. New York: Harper Trophy, 1999.
• Hyde, Dayton O. The Major, the Poacher, and the Wonderful One-Trout River. Honesdale, Pennsylvania: Boyds Mills Press, 1985.
• Jukes, Mavis. Blackberries in the Dark. New York: Alfred A. Knopf, 1994.
• Weddle, Linda Massey. T.J. and the Big Trout River Vandals. Schaumburg, Illinois: Regular Baptist Press, 1991.

Nonfiction and Reference Books for Children

• Burk, Sandy. Let the River Run Silver Again! Blacksburg, Virginia: The McDonald and Woodward Publishing Company, 2005.
• Burg, Anne E. E is for Empire: A New York State Alphabet. Illustrated by Maureen K. Brookfield. Chelsea, Michigan: Sleeping Bear Press, 2003.
• Cole, Joanna. A Fish Hatches. New York: HarperCollins, 1978.
• Pyers, Greg. Why am I a Fish? Chicago, Illinois: Raintree, 2006.
• Winner, Cherie. Trout. Minneapolis, Minnesota: Carolrhoda Books, Inc., 1998.

Reference Books

• Behnke, Robert J. Trout and Salmon of North America. Illustrated by Joseph R. Tomelleri. New York: The Free Press, 2002.
• Caduto, Michael J. Pond and Brook: A Guide to Nature in Freshwater Environments. Hanover, New Hampshire: University Press of New England, 1985.

• Martin, Patricia A. Fink. Rivers and Streams. New York: Franklin Watts, 1999.
• Prosek, James. Go Fish: A Fishing Journal. New York: Stewart, Tabori & Chang, 2000.
• Prosek, James. Trout: An Illustrated History. New York: Alfred A. Knopf, 1997.
• Prosek, James. Trout of the World. New York: Steward, Tabori & Chang, 2003.

Nonfiction for Adults

• Carrol, David M. Trout Reflections: A Natural History of the Trout and It's World. New York: St. Martin's Press, 1993.
• Louv, Richard. Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder. Chapel Hill, North Carolina: Algonquin Books of Chapel Hill, 2005.
• Prosek, James. Early Love and Brook Trout. New York: The Lyons Press, 2000.

State Resources (links)

- Arizona TIC Website
- California Classroom Aquarium Education Program Website
- Idaho TIC Manual
- Idaho TIC Glossary
- Portland Water District TroutKids Program (Maine)
- Maryland DNR TIC Lesson Plans and Curriculum
- Michigan DNR SIC Program
- Nebraska TIC Blog
- Nevada TIC Website
- New Hampshire TIC Manual
- New York TIC Resources
- North Carolina TIC Website
- Oregon State University SIC Program
- Oregon State University SIC Lesson Plan
- Pennsylvania TIC Website
- South Carolina DNR TIC Website
- Vermont TIC Website
- Wyoming Adopt-a-Trout Guide
- Trout Unlimited Coldwater Conservation Education Guide

Potential Funders

Trout Unlimited

A good way to begin your hunt for funding -- no matter where you are located -- is to contact your local chapter of Trout Unlimited.

Donors Choose

Link to website

If you are a public school teacher, DonorsChoose invites you to submit a project proposal for materials or experiences that would help your students learn. Please note that teachers do not receive any monies. If a donor funds your proposal, DonorsChoose will purchase and deliver what you requested.

Enhancing Student Mathematics Learning Through Use of Tools and Technology

Link to website

The purpose of this grant is to encourage the innovative use of technology and other tools to "help teachers and students visualize and concretize mathematics abstractions..." When used appropriately, they can enhance other effective teaching and promote meaningful learning opportunities for students. For 2016-17, grants with a maximum of $3,000 each will be awarded to persons currently teaching mathematics in grades Pre-K-12. Materials may include, but not be limited to, books, calculators, tablets, computers, or related equipment as well as professional development in the use of the designated tools and technology.

Physh Ed Grants - Future Fisherman Foundation

Link to website

Through their partnership with the Recreational Boating and Fishing Foundation, the Future Fisherman Foundation has developed the Physh Ed grants initiative which offers grants in the amount of $2,500 to certified teachers in public, private or charter schools. They offer grants, training, and other services to help prepare teachers to launch fishing and boating programs in schools across the country. TIC fits in their initiative if it is part of a cross-curricular program.

Toshiba America Foundation Grants

Link to website

Applications for grants under $5,000 are accepted year-round. Check the Web site for grades K-6 and 7-12 application rules. Deadline for grants over $5,000: February 1st or August 1st The Toshiba America Foundation encourages teacher-led, K-12 classroom-based programs, projects, and activities that have the potential to improve classroom experiences in science, mathematics, and technology.

Captain Planet Foundation

Link to website

The mission of the Captain Planet Foundation (CPF) is to support hands-on environmental projects for youth in grades K-12. Our objective is to encourage innovative activities that empower children around the world to work individually and collectively as environmental stewards. Through ongoing education, we believe that children can play a vital role in preserving our precious natural resources for future generations.

Toyota Tapestry Grants for Teachers

Link to website

Open to K-12 teachers of science residing in the United States or U.S. territories or possessions. All middle and high school science teachers and elementary teachers who teach some science in the classroom are eligible. This program has deadlines; check the website to find them. Proposals must describe a project including its potential impact on students, and a budget up to $10,000 (up to $2,500 for mini-grants). Environmental Education is one of their three target categories.

Kids in Need Teacher Grants

Link to website

Kids In Need Teacher Grants provide K-12 educators with funding to provide innovative learning opportunities for their students. The SHOPA Kids In Need Foundation helps to engage students in the learning process by supporting our most creative and important educational resource - our nation's teachers. Businesses work through KINF to sponsor classrooms.

Target Field Trip Grants

Link to website

Education professionals who are employed by an accredited K-12 public, private or charter school in the United States that maintain a 501(c)(3) or a 509(a)(1) tax exempt status can apply for up to $1,000 for a class field trip. Educators, teachers, principals, paraprofessionals or classified staff of these institutions must be willing and able to plan and execute a field trip that will provide a demonstrable learning experience for students.

Melinda Gray Ardia Environmental Foundation

Link to website

The Foundation seeks to facilitate the development and implementation of holistic environmental curricula that incorporate basic ecological principles and field environmental activities within a primary or secondary school setting. Accordingly, the Foundation is interested in contributing to the development, implementation and/or field testing of curricula that are consistent with the mission of the Foundation.

First Energy STEM Classroom Grants

Link to website

FirstEnergy proudly supports classroom projects and teacher professional-development initiatives focusing on science, technology, engineering and mathematics (STEM). One of the ways we support these activities is by offering science, technology, engineering and mathematics (STEM) education grants of up to $1,000 to educators at schools and youth groups in communities served by our electric operating companies, other areas where we have facilities, and where we do business.

Chapter Information

Chapter Timeline

August-October

☐ Assist educator/learning institution in purchasing and putting together equipment (if requested)
☐ Assist educator/learning institution in preparing tank for egg arrival
☐ Plan with educator/learning institution in how the chapter can assist and supplement the TIC program throughout the year
☐ Plan with educator/learning institution for sampling/testing starting in March
☐ Plan with educator/learning institution for release field trip or alternate options to releasing in May

October-February

☐ Supplement TIC program with trout related lessons

March-April

☐ Coordinate with educator/learning institution and CTU to do fish sampling and testing
☐ Begin planning with educator/learning institution for release field trip or alternate plan to releasing
☐ Work with educator/learning institution, CTU and CPW to get release field trip location approved

May-June

☐ Provide assistance, volunteers, and expertise at the educator/learning institution's release field trip
☐ Complete End of Year survey

How to Support a TIC Program

Program Funding

The most important thing that a chapter can do for a TIC program is to help provide funding for the tank. If the chapter is not able to provide the funding up front, they can assist the teacher in applying for grants or other sources of funding.

Program Planning/Set-up

Curriculum and program planning is primarily up to the educator/learning institution. The chapter should plan with the educator/learning institution at the beginning of the year how the chapter can support the program. That support can be fly casting lessons, fishing days, fly tying lessons, fish biology lessons, water quality lessons, service projects, etc. It is important to link the work they will do within TIC to the work that TU does. If the teacher requests, the chapter can help with purchasing and setting up the aquarium equipment. The chapter can also help with technical support and should familiarize themselves with all of the information provided under the "Teacher Information" section of this manual.

Fish Sampling and Testing

The educator/learning institution will need the help of the chapter to coordinate with CTU for the sampling and testing of their fish. CTU, with the help of volunteers, USFWS, and CPW, is in charge of coordinating this process. Sampling will be done by one of the few certified sample collectors in the state and testing is done by the Bozeman Fish Health Center. The teacher will contact the chapter and CTU Youth Coordinator 8 weeks in advance of wanting to do a release to get the process started. This process plan can start at the beginning of the year when planning how the chapter will be involved in the program throughout the year.

Release Field Trip

The chapter can provide assistance, expertise and volunteers for the planning and execution of a release field trip.

Program Resources

Outreach

- TU Youth Membership Brochure
- Customizable TIC Brochure with QR Code
- Generic TIC Slide Show (.ppt format)
- Sample Slide Show from New Jersey (.ppt format)
- Sample Outreach Video from Denver Trout Unlimited Release Field Trip

Program Management

- Planning a Meaningful Education Event (pdf format)
- Colorado MOU between Colorado Parks and Wildlife, Colorado Trout Unlimited and Learning Institution and/or Business (pdf format)
- CTU Photo Release Form
- TU Liability Waiver - Youth
- TU Liability Waiver - Adult
- Chapter Liaison "Job Description -- from VT
- Community Volunteer "Job" Description
- Colorado TIC Google Group Community
- National TIC/SIC Google Group