TROUT IN THE CLASSROOM

MANUAL

Complete instructions for trout tank set-up, installation and maintenance for raising trout from eggs to fingerlings

TROUT IN THE CLASSROOM
Proudly Sponsored by: Dr. David Jones, Orthodontist

DAN RIVER BASIN ASSOCIATION

50 YEARS TROUT UNLIMITED

History of Trout in the Classroom Southern Virginia

Trout in the Classroom (TIC) was established in Virginia in 2005 through the efforts of Dr. David Jones, Martinsville Orthodontist. Dr. Jones, an avid fly fisherman and conservationist, was looking for a way to engage the community in protecting the Smith River by connecting children to the outdoors and the preservation of trout through environmental education. He was introduced to Trout Unlimited's TIC program and his dedication to this purpose led him to personally sponsor and maintain 15 tanks the first year of the program. The TIC set-ups were placed in the Virginia Museum of Natural History and some local schools in Henry and Patrick counties.

The first year TIC was introduced to the schools, brown trout fry were obtained from the state hatchery and raised to fingerlings that were released into the Smith River by the students. The success of the pilot program was overwhelming and by the second season, Brian Williams had begun volunteering for the program and TIC obtained permission to secure brown trout eggs from the State Fish Hatchery in Wytheville. By starting with eggs, the students would be able to experience the life cycle from eggs to fingerlings. This also meant the program would span 6 months which helps create a lasting experience, culminating with the release of the trout into a local stream. In 2006, Dr. Jones partnered with Wayne Kirkpatrick of the Dan River Basin Association and the streamside "Tub-O-Bugs program was

incorporated into TIC. A grant from the Harvest Foundation allowed the program to continue with funding for a full time staff person from the Dan River Basin Association with responsibilities to include support of Trout in the Classroom. In 2008, Brian Williams was hired as DRBA's full time Education Outreach and Conservation Coordinator, supporting TIC. The program continued to grow throughout Virginia and DRBA staff and volunteers assisted other Trout Unlimited Chapters in building the program across Virginia.

Now, almost a decade into the largest Trout in the Classroom program in the country, the Dan River Basin Association's Education Outreach Coordinator, Krista Hodges, continues to grow and enhance the program. The students are exposed to conservation ethics, watersheds, pollution, habitats, ecosystem connectivity and personal responsibility through DRBA's programs, and SOL's are connected to increase the learning opportunities. Dr. David Jones said, "There is no subject that can't be related to Trout in the Classroom., from science, math and chemistry to art, conservation and writing. " And, that holds true to date with over 200 trout tanks in schools throughout Virginia. TIC programs are in schools throughout the entire United States and have spawned other programs aimed at teaching a conservation ethic.

the harvest foundation

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Information in this manual was obtained from the Trout in the Classroom website, Commonwealth of Virginia TIC coordinators, various books, and the personal knowledge and experience of many individuals. It is not represented to be the final authority on raising trout in Virginia, but is presented as a help guide. This manual is a working document to be updated or modified as new information or techniques are received. Your input is always appreciated.

Thank you, Brian Williams & Krista Hodges
Dan River Basin Association
www.danriver.org

Equipment

1. chiller
2. foam board
3. aquarium
4. table
5. filter
6. 5 gallon bucket
7. UV sterilizer
8. water pump
9. gravel vacuum
10. multi-outlet surge protector

11. scissors
12. pliers
13. flathead screwdriver
14. knife

*****NOTE ON SAFETY*****

No matter how careful, at some point, water will spill on the floor when working with the tank. Water on any floor is a slip hazard. Please take the proper precautions; *always keep a caution, wet floor sign* present when working on the tank. Please keep a large rubberized mat in front of the tank.

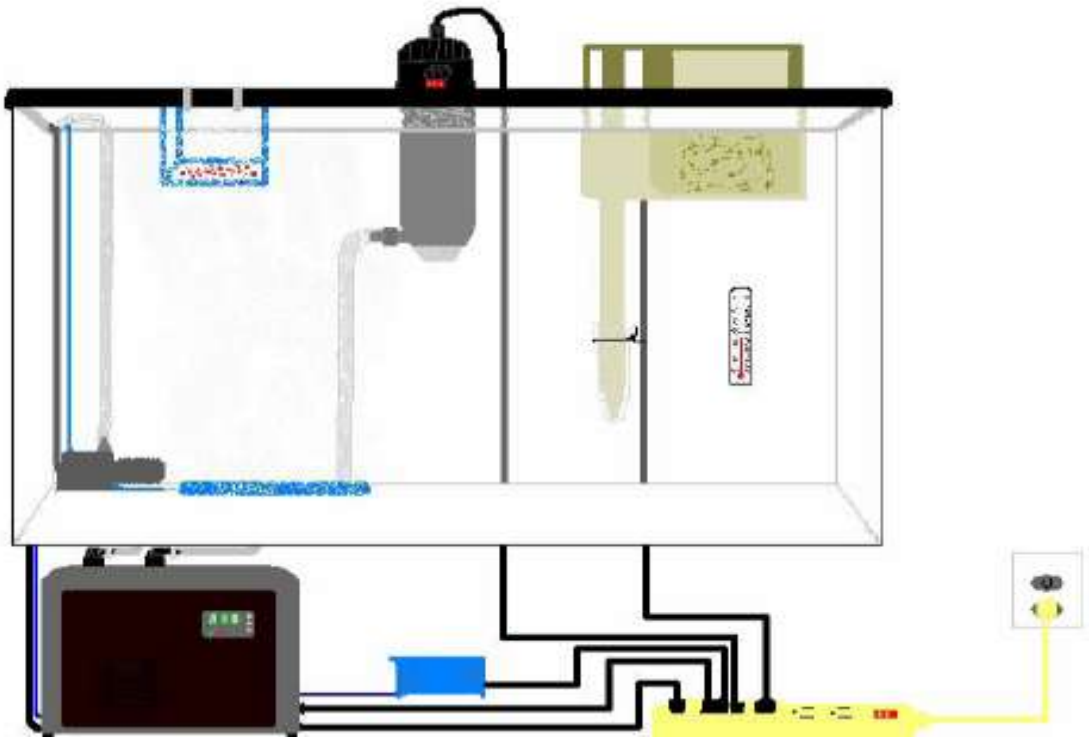
Set Up – Location, Location, Location!

Here are a few things to consider when choosing a location for the tank:

- Select an appropriate table, bench, counter or table able to support **400 lbs**. This is the combined weight of the equipment and aquarium filled with water. You will need a space about 6ft wide by 3ft in depth to accommodate the tank and equipment.
- Locate the tank near a source of water (i.e. a sink or a custodial closet). An electrical outlet must be near the tank. A multi-outlet power strip will be provided to plug in all equipment. Be sure the power strip is located in a safe place away from the tank to avoid water and electrical issues.
- Place the tank away from direct sunlight. Significant temperature changes increases the strain on the chiller, promotes the growth of algae and leads to additional tank cleaning.

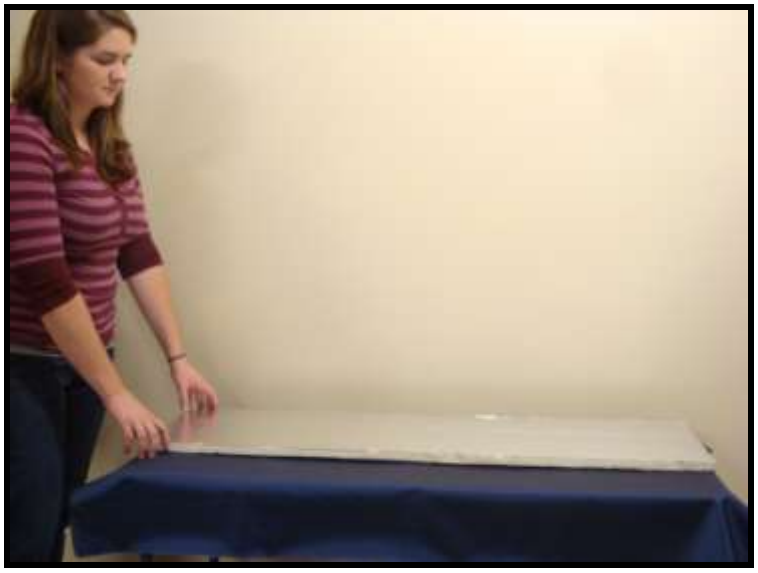
Once the location of the tank (in relation to the chiller) is worked out in advance, the following steps should be followed *before adding water to the tank.* ***It is impossible to move the aquarium once it is filled.***

The TIC Tank System



Step 1: **Placing Foam Board**

Place a vinyl tablecloth on the bench, counter or table. This is optional but advised as condensation will form during hot days and may cause damage to tables or counters made of wood. Obtain a piece of Styrofoam board from a local building supply (two types are the blue board and the foil backed). Trim the board to fit the bottom of the tank with about ½" extra on all sides and place it over the tablecloth.

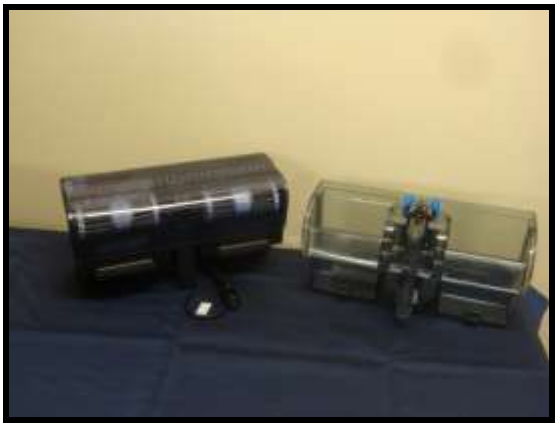


Step 2: **Placing Aquarium**

Gently place aquarium on foam board. Help may be required to lift the aquarium onto the foam board while keeping it in place. Make sure foam board is under all edges of the tank for support.

Step 3: Water Filter

The filter should be located on the other end of the tank from the chiller and UV to allow a constant water flow across the tank. Southern VA TIC tank set-ups use the Penguin or the Millennium dual compartment water filters. Both filter brands operate the same way, are located on the outside of the tank and perform the same function.



Penguin

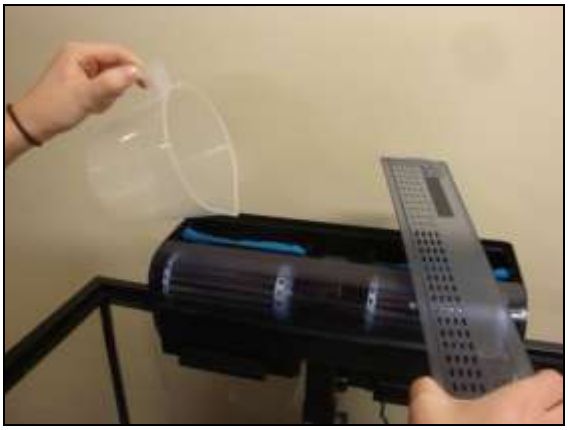
Millennium 3000

Step 4: Filter Installation

Rinse all the filter components under running water prior to placing them in the filter compartments. Install the pre-filter on the slotted part of the intake tube if available. This pre-filter will help keep the main filter clean – please refer to tank maintenance instructions regarding this filter.

Step 5: Intake tube pre-filter installation

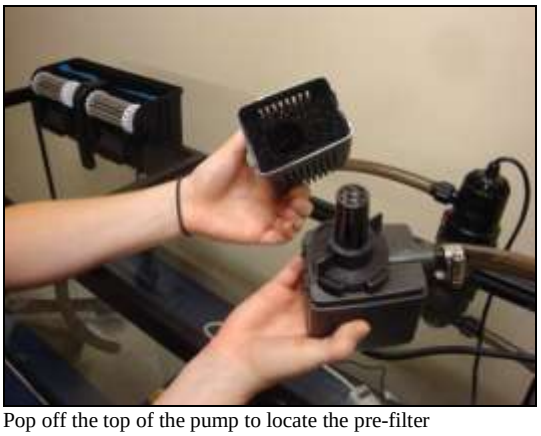
Do not plug in the filter until the tank is full of water. The water filter must be primed by pouring water into the compartments before plugging in the filter. Watch as the water column rises up the intake dip tube and into the filter compartments. If the water is not rising up the tube, prime the filter with more water.



Step 6: Water Pump

Remove the cover of the **submersible water pump** to insure the "pre-filter" is installed. Using a stainless steel (SS) hose clamp, attach the vinyl tubing to the hose barb fitting provided with the pump. Place the pump on the bottom of the tank.

This tubing will need to reach from the pump to the intake port on the chiller. *Be generous with length of tubing. It should reach without stress or kinks.* If using a single large coil of tubing that came with the Polar Bear Chiller, just attach one end to the pump and **do not** cut the tube until the chiller is positioned.



Pop off the top of the pump to locate the pre-filter

Attach vinyl tubing to the hose barb with a SS hose clamp

Step 7: Chiller and Vinyl Tubing

The chiller should be positioned as close to the tank as possible to minimize strain on the water pump and to allow easy access for maintenance and temperature adjustments. Out of the way of the tank, either off to one side or below the tank, works best. ***Do not place the chiller too close to a wall or inside a cabinet as it will overheat.*** Air should be allowed to freely circulate around all sides of the chiller for maximum efficiency.

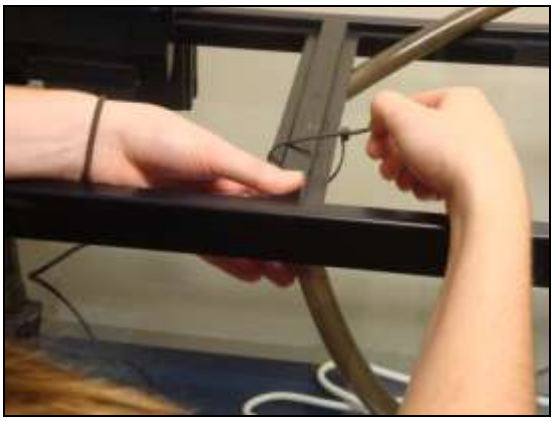
The vinyl tube from the water pump is connected to the chiller intake port by pushing it down onto the port inlets, lubricating the inlet barb helps. Push the tubing all the way onto the port and make sure it is well seated. A SS hose clamp is added for extra security. The tube should be cut to fit with some slack. Lay aside the remaining vinyl tubing for use in the next step. ***Do not plug in the chiller until the tank is filled with water.***

Step 8: UV sterilizer

Connect a separate length of tubing from the chiller outtake port to the **UV sterilizer (UVS)** intake (cut to fit, save remaining tubing). It is best to either lay the UVS on a table when connecting the tubing or support it carefully. The UVS canister has locknuts that operate similar to the chiller port barbs. Push vinyl tubing onto UVS barbs and turn the locknut counter clockwise to lock down the tubing. Intake and outtake ports are marked on Polar Bear Chillers.

For Aqua Chillers: The "IN" port is on the back left when facing the chiller. Attach tubing using SS clamps as necessary.

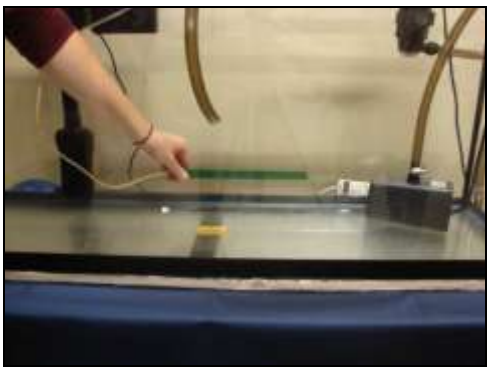
The UVS hangs on the outside of the tank, or can be placed behind the tank laying flat. **However, the clear bottom end should not be visible as the UVS will cause eye damage if viewed directly.** The direction of the intake and outtake ports may need to be changed depending on where the chiller is located. ***Do not plug in the UVS until the tank is filled with water and circulation has started.***



The last section of tubing returns the water to the tank. This section is attached to the outtake port of the UVS and then run directly into the tank. Use enough tube, about a 3-4 foot length, so it hangs across the back of the tank and can be tied down to the center support with a plastic zip tie to keep the tube in place (Otherwise, an empty tank and the floor covered in 55 gallons of water may result). The outflow tube should extend well below the surface of the water. Easy access to this tube allows checking for flow when trouble-shooting chiller or pump problems. Tighten all the tube connections. Install and tighten the SS clamps to prevent any of the tubes coming off accidentally.

Step 9: Air Pump Connection

Place the small air pump behind or beside the tank. Do not place it lower than the bottom of the tank, i.e., under the tank in a cabinet. Attach ¼" vinyl airline tubing from air pump to the air stone. Use caution when attaching the tubing as the air stone is quite fragile. Lubricate or use hot water to heat the tube to allow it to slide on the stem of the air stone. ***Do not plug in the air pump at this time.*** After filling the tank, allow the air stone to remain submerged for 10 minutes before plugging in air pump. This will allow the stone to become saturated and provide even airflow. After 10 minutes, plug in air pump and verify airflow to stone.



Step 10: Fill the tank with water

Fill tank completely full with clean water. Clean buckets (5 gallon or several 1 gallon milk jugs) are best used for this purpose. Using a hose from the sink is not recommended unless it is securely attached. Tap water can be used for the initial setup as there will be no fish put into the tank within the next few days. All chlorine and chloramines will dissipate in about 3 days. Please refer to tank maintenance instructions regarding the use of tap water beyond this point. Make sure all equipment is plugged in except UVS; before turning on equipment prime water filter first. Turn on equipment; make sure everything is running and there are no leaks.

Step 11: Decorating or Covering the Tank (optional)

After filling the tank with water, gravel is an option that can be **gently** added to the tank. Adding gravel mimics the trout's natural stream habitat and also allows some desirable bacteria to build up in the tank. ***Please be careful when doing this because if dropped into the tank without water or too much at a time, it can crack the bottom of the tank!*** Do not place too much gravel in the tank, just enough to cover the bottom. Remember, what is placed in the tank has to be cleaned. ***Do not*** add wood, plants, snails or any other living creature to the tank. These can bring unwanted issues or even diseases that can harm the trout.

Foam board can be added to all sides except the front of the tank to help insulate and cool. This is more important in the warmer months when temperatures in tank could possibly rise with the temperatures in schools. A colorful background can be added between the foam board and tank if desired. This can be a fun project for the students!

Some tanks may be placed under a cabinet, so to avoid possibly damaging the cabinet from water splashing out of the tank when cleaning or bubbling up from the air stone, place a cover over the tank using the foam board or other non dissolving product like Styrofoam. This also helps prevent the loss of trout later in the season when the trout get larger – oft times they will jump out of the tank or splash water onto nearby objects.

~~ Checklist ~~

- ☐ Styrofoam is secure around all sides (except front) and bottom of the tank (this can be done when weather warms up – around March)
- ☐ Chiller is reconditioned and ready for the season
- ☐ All filters are clean and ready for use OR have new filters
- ☐ Protective piece is inside submersible water pump so filter will not collapse when in place
- ☐ All Filters are placed where needed (Pre-filter, filter in submersible pump, and filters in main water filter)
- ☐ Attention is given to the main water filter (Millennium or Penguin) -- the blue mesh part of filter is always facing back of tank and water is added to filter canister for "priming"
- ☐ UV bulb is in good shape and not blown or burnt out (Do NOT touch bulb & do NOT turn on when out of canister)
- ☐ UV bulb will not be turned on until the day before eggs are received
- ☐ All tubing is in good shape with no cracks
- ☐ Tubing orientation is confirmed -- the submersible pump is sucking water out of the tank **IN** to the chiller and **OUT** of the chiller to the bottom of the UV sterilizer and out from the top of the UV sterilizer to the tank where it is secured along the middle section with zip ties
- ☐ All clamps are in good shape and are able to be tightened or loosened if needed
- ☐ Hose on the top middle section of the tank is secure with zip tie
- ☐ Digital thermometer is reading temperature
- ☐ Ammonia & pH testing kits in supply
- ☐ Air stone is in good shape and tip is not broken
- ☐ Air line hose is attached to air stone and air pump (Do NOT turn on until submersed)
- ☐ Amquel – water de-chlorinator is in supply
- ☐ Five gallon bucket(s) for water exchanges/aging are available
- ☐ Baking soda and vinegar available to adjust water chemistry
- ☐ Frozen bottles of water available for emergency cool-downs

Getting Ready for the Eggs

Upon approval of project funding, all participants will receive information about TIC and equipment at the start of the school year.

The eggs will be picked up in early December from the Wytheville State Hatchery or the Paintbank State Hatchery. Teachers may be asked to pick up their own eggs if another method of distribution is unavailable. Contact the TIC coordinator for more information.

Those schools making a field trip to the hatchery with the students may pick up their own eggs; please inform the TIC coordinator for assistance prior to scheduling this event.

30 Days Before Eggs Are To Be Picked Up . . .

- Assemble all parts for aquarium setup and fill the tank with water.
- Turn on the filter; let water equilibrate.
- Turn on chiller and make sure it is working correctly

One Week Before Eggs Are To Be Picked Up . . .

- Set the chiller thermostat temperature to register around 54 degrees F. ***Please rely only on the digital thermometer when reading water temperature.***
- Test and record water parameters on the results worksheet; do not worry if the pH is around 8.

One Day Before Eggs Are To Be Picked Up . . .

- Turn on the UV light.
- Verify the water temperature is between 50-55°F
- Position the egg basket(s) in the tank. Locate it at the opposite end from the water flow and not directly over the air stone. There should not be a strong or direct flow of water on the egg basket(s).
- Placed the air stone near the egg basket(s), but not directly underneath.

Egg Arrival Day!

If Picking Up Your Own Eggs from Hatchery: (Otherwise your eggs will be delivered.)
Transport personnel should bring the following supplies:

1. a transport cooler large enough to handle items below
2. bag(s) of ice
3. a tray that fits into the bottom of the cooler
4. additional trays with holes in them to place eggs on and to place one on top for ice
5. several pieces of cheesecloth to bundle the eggs in (two per bundle)
6. a cloth to cover the eggs

At the pick-up site, the 200+/- eggs, will be in a mesh or cheese cloth bundle. The best way to keep the eggs moist is to put a cloth over the eggs and wet them down with the water from the hatchery.

Pack the eggs for transport in this order – ice in the bottom tray; egg bundles in trays and covered with a cloth; gently pour a small amount of hatchery water over cloth to keep eggs moist; tray on top with ice to create a drip onto the egg bundles

During transport, keep a close eye on the trout by making sure the eggs stay moist and the cooler does turn over.

Placing the eggs in the tank:
The eggs will need time to acclimate to the tank. Let the ***egg transport tray*** float in the tank. Add approximately ½ cup of tank water every 10 minutes to the tray. After 30 minutes, remove the eggs from the cheese cloth and pour the eggs into the hatching basket.

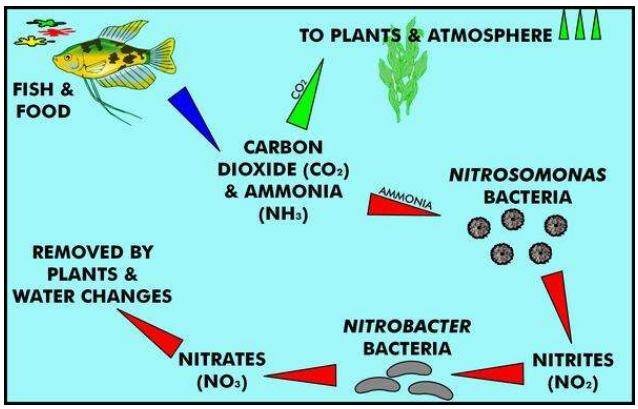
What to look for:
Movement during delivery of the eggs can weaken the outer layer of the shell. This can create weak spots or broken areas. These spots are vulnerable to fungal infection.

- Watch for any eggs with white spots. Using a turkey baster pick them out of the basket. The 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.
- Watch that the outer egg shell remain translucent. Uniform cloudiness can be okay, it might be just the trout development.
- An egg with any opaque spots (or fully opaque) will not develop and should be removed. This egg was possibly not fertilized to begin with.

General Tank Care

With the trout in place, keeping the tank system clean (and the tank bacterial colonies happy) is the most important job. That means regular water changes. Nitrifying bacteria in the tank change trout waste (ammonia) into nitrites and then further into nitrates. While ammonia and nitrites are fairly toxic to the fish, nitrates are not very toxic at all. Nitrifying bacteria are surface dwellers and live on all the surfaces of the tank and equipment, and especially on the gravel.

Nitrogen cycle:



If fish behave strangely or start dying in large numbers, poor water quality is often the issue. With a cleaner tank, the trout will have a much higher chance of survival!

To save time and energy, do a water change and at the same time clean the gravel and bottom of the tank.

Cleaning/Water Changes:

Bi-weekly water changes should be done with fresh clean water free of chlorine. Well water is suitable; however, in some areas tap water may be the only option. In the case of tap water, "aging" the water in clean one gallon milk jugs or buckets for at least two to three days will allow the chlorine to dissipate. Using a de-chlorinating solution allows immediate use of tap water.

1. Clean the sides of the tank; if algae growth is present on the walls of the tank, clean it off with a sponge on a long handle. Precipitate in the tank can be agitated and removed by the filter.
2. Prime and use the Gravel Vacuum according to the manufacturer's instructions. Make sure to have a large enough discharge bucket – a 5 gallon plastic bucket should suffice. Clean one side of the tank at the beginning of the week and the other side at the end of the week. Cleaning the tank twice a week will be more than sufficient and will remove about 5 gallons of water each time.
3. Refill the tank with new, aged water. Add the water slowly, trying not to create a disturbance.

Wring out the filters and pre-filters once a week in de-chlorinated water to remove the surface crud and waste. Once the trout are 2" or more in length, there will be increased waste produced; adjust the cleaning schedule to at least two to three times per week. It is important to record the water changes in the daily log.

Imbalances in pH or ammonia excesses indicate that water changes should be increased. If an emergency water exchange is needed, do a large water change (about 20%). Do not allow the tank temperature to

fluctuate more than 5 degrees or so with this procedure, use floating frozen water containers to help maintain the temperature level. ***In an emergency, clean water is more important than temperature stability.***

The removal of dead fish is also very important. If some fish appear lethargic, have problems swimming or simply float around in the tank, then these fish are sick and they will never get better. Even one dead fish, if left too long, can spread disease to the other fish causing damage to the whole population.

Scheduled Tank Care

Daily Check List:

1. Monitor tank temperatures; an increase in temperature might indicate a chiller problem.
2. Feed hatched trout as needed.
3. Check for and remove any dead fish or other debris from the tank.
4. Test the water parameters (Ammonia & pH) and record the readings in a log. Also enter any water changes and other events into the log. (This can be done once a week until the fish get larger and produce more waste.)
5. Ensure that
    a. water is flowing from the chiller and the filter,
    b. the air stone is still working, and
    c. there are no leaks.

Weekly Check List:

1. Clean the gravel (do a water change at the same time) on both halves and wipe down all sides of the tank – usually Tuesdays and Fridays are good days and record the amount of water changed. ***As the fry grow, increase the cleaning schedule to at least two to three times per week.***
2. Remove and clean the pre-filters by squeezing them out in a bucket containing de-chlorinated water, reinsert.
3. Check all tube connections and tighten if any are loose.

Bi-Weekly Check List:

1. Once the fry are free swimming and eating, rinse out the filter components using de-chlorinated water, then reinsert.
2. Using a small vacuum cleaner, dusting cloth or soft bristle brush, remove dust and lint from the fins of the coolant tubing (those black thin metal slats on the side of the chiller).

Water Testing

Use the kits provided with the set-up. The test kits have solutions for testing ammonia and pH levels, the two key tests for monitoring tank water quality. All test results should be kept in a log on a regular basis for review as well as providing a data set for the students to graph.

pH:
Depending on the water source, pH readings will range from 5.0 to 8.0. In an ideal world of raising trout, strive for a pH reading of about 7.0. Tests done during TIC trout releases have shown that stream waters vary with a pH from 7.0 to 8.0. So, as long as the pH stays fairly constant, usually within .5 of the base reading taken when setting up the tank, the trout will be fine.

Use the HIGH pH test chemicals if the pH reading is 7.6 when using the lower pH chemical test solution as the reading may be at the upper limit. If the test result is a very unusual, "out of the ordinary" reading, run the test again just to double check. Sometimes the tests can be "goofed" very easily.

If the pH reading is above 8.3, contact the TIC coordinator quickly.

The following are instructions on how to naturally lower or raise the pH in the tank if the pH reads above 8.3 or below 6.5 without adding chemicals to the water.

- **If the water is too basic (above 7.5) --** slowly add some vinegar (by capful) to help bring pH back to neutral 7. If the vinegar does not stabilize the tank, contact the TIC Coordinator.

  If the water is too acidic (below 6.5), add a tablespoon full of baking soda to a 5 gallon bucket of "aged" water, mix, and pour into tank.
  If baking soda does not maintain the pH, usually adding a total of ½ cup of rinsed coral chips in a 55 gallon tank will raise and maintain a pH of about 7.0 depending on the existing water chemistry. Aquarium hobbyists have used coral chips for many years in lieu of chemicals that are on the market. As with anything that alters the chemistry of aquarium water, it must be done in slow steps in order not to adversely affect the fish. Divide the ½ cup of chips into 3 equal portions, spreading a portion every 3 or 4 days across the bottom of the tank over a 2 to 3 week period. At the end of the 3rd week, if the pH is still lower than required, add another 1/2 cup of rinsed coral chips over another 2 to 3 week period. Coral chips can be found in most pet stores.

Do not attempt to move the pH level more than .1 or .2 in a day.

To monitor level of pH after adding baking soda or vinegar, retest the water the next day to make sure it is maintaining the appropriate level and then continue to test on regular basis.

Ammonia:
Major water changes will be needed if the ammonia loads become consistently too high for the biological filtration to manage. This may occur when the fish are over fed, when the tank is not cleaned on the suggested schedule, or when there are too many fish in the tank and the bacteria colony has not been fully established.

One or more of three solutions may be necessary:

1. Remove some of the fish to reduce the daily level of waste (contact TIC Coordinator for this option),
2. Increase the number of weekly water changes to 3 or 4, and/or
3. Lower the feeding amount or number of feedings until ammonia problem stabilizes.

During the first few weeks after the young trout hatch, initial ammonia spikes from overfeeding are likely and water changes to remove the ammonia are the only solution. Ammonia readings will drop fairly quickly to 0.0 or 0.1 and stay there with regular cleaning of the gravel and weekly water changes.

Do not add any chemicals that claim to neutralize ammonia; it will also rob the good bacteria of the food it needs to grow.

Avoiding a Crisis

Post feeding instructions and tracking records at the tank. Every year, many schools enlist the assistance of security and maintenance staff to feed the fish on the weekends and holidays. These well meaning helpers, often become great fans of the fish, and are soon spending their break periods watching...and yes...feeding the fish. People with different schedules feed the fish unaware that others are doing the same.

Always have buckets or one gallon milk jugs waiting with tank-ready water. Remember, de-chlorinate by sitting 48+ hours or by using a de-chlorinating solution.

Have several frozen 2 liter jugs of water on hand. In the event of a power outage, float one or two of these at a time in the tank to keep temperature down**.**

If all fish in the tank are lethargic or unmoving at the bottom of the tank – do a 20% water change every day for 2 or 3 days.

If the fish do not respond to food – do a 20% water change every day for 2 or 3 days.

Always contact the TIC coordinator in an emergency or if unsure about how to handle a problem.

Other Helpful Notes

- All the water in tank must remain extremely clean. Everyone ***must*** rinse hands of all contaminates including lotions, soap, etc, before working with tank.
- If the chiller runs continuously, contact the TIC coordinator, as it may need more refrigerant or insulation.
- It is better to have slightly hungry fish than to over-feed the tank and have too much waste.
- All labels and glue should be removed from jugs before use. In an emergency, ice cubes in a zip lock type of bag can also be used. If using the ice in bags, add a capful of de-chlorinator just to be safe.

Egg Stages

Eyed eggs

- Identifiable by their characteristic dark spots – the trout's two eyes;
- Stage lasts about two weeks at this stage;
- Please count the number of eggs.

Hatching

- Eggs will hatch over a 2-3 day period from the first egg hatching to the last.
- Eggs that have not hatched properly should be removed after a couple of days.
- Alevin (sac fry) may not come all the way out of the egg; be patient.
- Any eggs remaining after 3 days must be removed or isolated—these likely will not hatch.
- Leftover shells float to the top of the tank or in the basket and break down creating a foam — this is normal. Loosen this foam by scrubbing the sides of the tank and remove with a paper towel.
- A jelly-like fungal growth may form around the inside tank surfaces or on the surfaces of the hatching basket. Wipe or scrape the surfaces with a sponge or other tool to loosen the growth, thereby sending it through the sterilization and filtration system.

Alevin (sac-fry)

- The length of time at this stage (usually 1 - 3 weeks) depends on the water temperature. In warmer water, fry develop faster.
- A digital thermometer is the most reliable method of checking the tank water temperature as ***the Chiller consoles are notoriously inaccurate***. ***Check the digital thermometer daily.***
- Look for any odd trout (two-head, three-head, etc.). This is a good lesson in survival of the fittest—these odd trout do not usually survive until release.

This growth stage provides an opportunity to observe organ development – heart, etc. Alevins can survive in a Petri dish under a microscope or hand lens for a short period of time (2 - 3 minutes) to allow for closer observation, if desired.

Swim-ups

As the yolk sacs disappear, some trout will start swimming around looking for food. These trout must have food immediately available to them.

- When the first trout swim up in hatching basket, lower the lip of basket(s) to about 4" below the water's surface.
- Start by spreading a miniscule amount of food near any swimming trout.
- Turn off the filter system for a few minutes when feeding the trout for the first couple of times. The lack of a strong current will make the food more visible and more likely the trout will begin to feed. ***Make sure to turn the filter back on!!!!!!***

Once all fry are swimming-up (about one week) and have been eating, it is time for the next step. Unhook the basket(s) and lower it gently to the bottom of the tank. Strong, adventurous fish will swim out. The more timid, weaker fish will hide for a few more days, until they are stronger. Once all trout have exited, remove the basket(s) for the year.

Fry

This stage will last about six to eight weeks. Feeding less more often is a better method for feeding. Some trout never learn to feed, and will die. These non-feeding fish are called "pinheads"—big heads, little bodies – and should be removed, as they will not develop. It is normal to see a mortality spike with the pinheads.

Regularly leftover food means over feeding. Over feeding can cause problems with ammonia levels. If in doubt, feed less until fairly certain the fish are eating everything.

Fingerling (Parr)

As they get older, some of the adult coloration will start to appear; look for parr marks (the vertical stripes) on the trout. At this stage, cannibalism can occur—the big fish eat the little fish. If cannibalism is becoming an issue, feed more often to assuage hunger.

As the trout grow, some will start jumping for the food. When this happens, it is suggested to put some type of cover over the tank so they do not jump out.

Feeding the Trout

Trout should be given small amounts of food per feeding. Over feeding the fish can pollute the tank's environment. Having said that, the trout should also have fat, round stomachs.

Divide the total daily amount of food and feed a portion 2-3 times per day. The trout will seem "hungry" all the time; they are wild animals and their instinct is to eat any food presented to them, no matter how often.

Food is adjusted as needed and usually comes in 3 different stages (from starter 0 to stages 1 & 2). As the trout grow to need the larger stages, make sure to mix some of the old stage with the new stage as some of the smaller babies will still need the old stage. As the trout grow, they may need to be fed up to 3 times a day in small increments.

Vacation Notes – If Not Using Weekend Feeder
These trout can survive over a weekend without any food, but during longer vacations it is best for someone to check on the tank, conduct water changes, and provide a small amount of food on a regular basis if not using a weekend feeder.

Prepping for short vacations (3-4 day weekends)

- Feed less on Friday.
- Do a water change as normal.
- They will be fine!

Prepping for mid-length vacations (7-10 days)

- Trout are wild animals that can survive leaner times; they do not need to be fed or visited during a 10-day vacation.
- In the days leading up to vacation, feed a little less to minimize ammonia discharge during holidays.
- Do a ***big*** water change on the last day. If possible, do one that morning and one that afternoon. Be careful and do not allow the tank temperature to fluctuate more than 5 degrees or so.

Prepping for LONG vacations (11+ days)

- Same prep as above.
- If not using an automatic feeder (see below), plan to come in once to feed about halfway through the vacation.

Weekend and Vacation Notes when using Weekend Feeder

- Follow the directions for loading the food into the system and setting the food dispensing time.
- Test the system to make sure it is dispensing the correct amount of food. Adjust as needed.
- Set the system to dispense only **1/2** the amount of daily food. This reduces the potential of uneaten food polluting the tank.

The Trout Release

Materials needed to transport and transfer the trout:

1. Sturdy cooler or bucket (clean cat litter buckets work well) with a loose-fitting lid.
2. Ice made with de-chlorinated water -- ice in one gallon Ziploc bags filled halfway or 2-liter bottle with labels removed. If water is not de-chlorinated, add a small capful to cooler.
3. Battery-powered pump with tubing and air stone(s) (optional if travel time/presentation time is not over 45 minutes.)
4. A net to transfer the fish from the cooler to bucket/cups.
5. Camera for pictures!

Fill a cooler or bucket half-full with water from the tank (remember, water is heavy!). At this point, the introduction of air into the water is more important than the depth of the water and the slight jostling of the water in the bucket/cooler will keep adding oxygen to the water.

Gently transfer fingerlings to cooler or bucket using a small net. Add de-chlorinated ice to the water -- monitor the temperature, do not allow it to drop too low. Insert and start air stone if needed.

Tips:

- Make sure the trout are not in the bucket or cooler longer than they have to be.
- Make sure to have enough water, but not so much that the cooler cannot be carried.
- Make sure the lid is on tight enough so that the fingerlings do not splash out, but do not seal them in and cut off the air supply.
- Coordinate any trout release with the TIC coordinator; state approval is required!
- Acclimate the fingerlings to the new environment prior to the release by monitoring the temperature of the cooler or bucket and slowly adding water from the new stream/tank, one or two cupfuls at a time every 10 minutes.
- Once the water temperature is within one or two degrees of the stream/tank temperature, remove the fingerlings to the release container. Lower the container into the stream/tank and gently tip it to allow the trout to swim out. A class friendly way is to transfer the trout individually into cups so each student has one to release in this manner.

End of Year Cleanup

At the end of the TIC season, it is important to clean the aquarium set-up. This improves equipment lifespan and helps to ensure another successful year will follow.

Aquarium Tank

1. Turn off the electrical pumps, chillers, filters, etc.
2. Empty the tank almost completely using the gravel cleaner to do this work; then remove the gravel.
3. Disconnect the tubing.
4. Using either a solution of 1 part Clorox unscented bleach with 10 parts water OR a solution of 1 part white vinegar to 5 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. For stubborn scale/algae, scrape carefully with a straight edged safety razor.
5. Use the same solution to clean out the tubing with long brushes (available at any pet shop).
6. Rinse the tank to remove any chlorine/vinegar and wipe dry with clean cloth, or let air-dry.
7. Wash and dry the gravel by laying out on a cloth or towel in the sun or a ventilated area. The gravel can also be sterilized with the Clorox/vinegar solution, but they also MUST be rinsed and dried completely.
8. Put the gravel inside the tank and store it in a safe place covering the top with any type of a dust-proof covering.

Aquarium Chiller

1. Discard pre-filter sponge on pump.
2. 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 farther to ensure it is fully drained.
3. Remove dust and lint from all vents on the chiller, using a small vacuum cleaner, dusting cloth, or soft bristle plastic dust brush.

Filter

1. Take apart the filter and scrub out the plastic parts with a 1:10 bleach solution or 1:5 vinegar solution.
2. Thoroughly rinse out all filter media (filter sponges, charcoal, ceramic cylinders, etc.) with regular water, and dry them in the sun or a well ventilated area.
3. Scrub the ceramic cylinders until free of all debris.
4. Thoroughly air-dry entire filter apparatus.
5. When all components are dry, re-assemble the filter and store inside the tank.

For the hang on type filters, it is recommended to buy new filter cartridges for the following year. Fluval filters do not need replacement parts – except for the pre-filter.

Frequently Asked Questions

Procedure for Obtaining an Emergency Replacement Chiller

First -- Contact the TIC Coordinator.
Second -- call Dr. Jones at both of the following numbers:
Cell: 276-634-8488 Office: 276-638-8888
Please provide:

1. Name, address, phone number, and TU chapter name; and
2. The shipping address for the chiller.

Dr. David Jones of Martinsville has graciously offered to maintain a supply of chillers in the event of an unexpected chiller failure. He is willing to overnight a chiller to keep the tank operating properly.

The school, if not supported by a TU chapter, will be responsible paying for the cost of the chiller and as well as the shipping. Dr. Jones has indicated that the chapter or school may take up to a year to repay him, by check, for the cost of the chiller and shipping. Contact Dr. Jones for details.

What happens if there is a power failure? How long before damage occurs to the fish?
It is important that the fish have 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, a long vacation) will likely be fatal to the fish.

What should be done 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 eggs or fish be kept in a household refrigerator?
No, 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 should be done with eggs or fish in an emergency?
In an emergency, eggs can be preserved by placing the hatching basket in a container of water and putting that in a cooler 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 with the labels removed, 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 they are in a Zip Lock type of bag--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 for every 20 fish 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.

What should be done if a serious leak occurs while away and the tank is nearly empty upon returning?
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, find and fix the leak. Unplug the filter system. Next, add a de-chlorinating solution to a container holding about 5 gallons of cold tap/well water (stir the tap water while adding a de-chlorinating solution; for well water this step is not necessary). This should be enough to get the chiller working again; if it isn't, add another 5 gallons of cold de-chlorinated/well water to the tank. Add this water slowly, and try to make this water around the same temperature as the tank water (which might be warmer by now). Make sure the air stone is working and putting bubbles into the water and that the UVS system is on. Once there is enough water for the chiller to run, allow the tank water to reach 50 degrees again. Open the filter, discard all the water from it and rinse the filter media. Because there was no water circulation, the filter will be full of dead bacteria that will kill the fish.

At this point, use a de-chlorinating solution to get as much tap water as possible (for well water this step is not necessary) in every clean container on hand. Put the emergency ice packs into the containers to start lowering the temperature. Once the de-chlorinated/well water has reached a temperature close to the tank's temperature, slowly add the water to the tank. If possible, 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. Open the filter, refill it and add a dose of BioZyme, reconnect the filter system, and plug it in. Once the tank is half full, add the aged water a few gallons a day. Continue to make new aged water as current supply is used until the tank is back up to normal levels. Then resume normal maintenance procedures including water changes.

The idea throughout this process is to make the changes for the trout as subtle as possible. Large swings in temperature and/or water quality can stress them and increase mortality.

How to inform custodians, or other teachers, about what to do if there is an emergency while class teacher is away?
It is a good idea to give custodians some basic information about the requirements of the tank. For example, it is important that custodians know that the 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. Prepare several frozen soda bottles of water to use in a chiller emergency, and then include the location of this ice and how to use it in an emergency procedure sheet.

An example can be found on the next page.

Tank Emergency Procedure

In the event of a
power outage,
leak,
refrigeration system failure, or
any other tank problem

Primary contact: _____ **Phone: _____**

Alternate Phone: _____

Secondary Contact: _____ **Phone: _____**

Alternate Phone: _____

Immediately Begin Tank Rescue Procedures below:

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. ***Please find an alternate source of electricity immediately!***

Otherwise, please place a frozen soda bottle of ice in the tank to help keep it cool. The bottle is located:

_____

Even with the ice, the tank needs electricity as soon as possible.

In the event of a serious leak:
Turn off all electrical parts of the tank system by unplugging them; leaking tubes should be placed back in the tank or in a bucket.
After all the water is cleaned up, locate the source of the leak -- this will probably be loose tubes or tubes which fell out of the tank; please make every effort to repair the leak.
If there is more than 4 inches of water left in the tank, the fish can survive. ***Please do not add any water to the tank.***
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 leaving.

Thank you!

Are goldfish necessary to start my nitrogen cycle?
It is no longer recommended that goldfish be used to help "break in" the tank system. All systems should be installed with additives such as BioZyme or 'seeded' filters which help create a suitable water environment.

Can species of trout be mixed?
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 mixing species.

What is a normal death rate?
Death rates are different from one stage to the next. With eyed eggs, a higher survival rate is expected. The loss of most of the 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 and water changes may be needed more often.

What do I do if many of the trout suddenly die?
- Remove healthy fish first by putting them into in a reserve water bucket with the emergency ice blocks, no matter its temperature.
- Put a battery-operated aerator or the tank's air stone in the bucket.
- Remove as much water from the tank as possible (80%).
- Leave pump and filter intake covered.
- Clean tank with clean scrub sponge and gravel cleaner. Remove as much crud as possible.
- Refill tank with any water available (if using chlorinated tap, use a de-chlorinating product).
- Cool water with ice or freeze packs.
- Drain and clean the filter and pre-filter and turn it back on. ***Do not turn on the UVS if using.***
- Return the healthy fish to the tank.

Why are so many of the eggs or fish dying?
Death is a natural part of fish development; it should be expected 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.

Most of the 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. While the UVS will help with any fungus issues, 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.

Why are the 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 or well 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. Daily water testing will reveal ongoing high ammonia concentrations. Dealing with ammonia spikes is covered a little further on.

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 temperature (between 50-55 degrees F). 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.

What is an ammonia spike? What can be done 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.

Can ammonia removal grains be utilized to prevent ammonia spikes?
They may be used only in a dire emergency, if a large water change did not reduce the ammonia. These chemicals tie up the ammonia in the water rendering it harmless to the fish. **However**, by tying up the ammonia, it deprives the biological filter (the "good" bacteria) of the food it needs to live and grow. So in the long run, while reducing ammonia, the result is killing off the long-term ammonia reducer (the biological filter).

Trouble-Shooting

Common Tank Problems

Problem	Possible Cause	Correction
Water temperature is higher than 55 degrees Fahrenheit	1. Chiller without power? 2. Thermometer read-out inaccurate? 3. Lack of water circulation?	▪ plug in the chiller; ▪ use the digital thermometer for a more true reading; ▪ make sure the pump is operating efficiently If issue is not solved: ▪ continue circulation without the chiller if possible; ▪ float frozen water bottle in the tank; ▪ continue air stone or aerator function ▪ **contact TIC coordinator**
Water is overflowing the tank top filter	1. Filter is clogged 2. Filter is inserted incorrectly	▪ rinse filter as directed; ▪ double check directions for properly inserting the filter; ▪ replace filter if necessary
No water flowing into tank top filter	1. Lost prime 2. Pre-filter is clogged 3. Magnetic impeller is obstructed	▪ re-prime the pump as directed; ▪ rinse pre-filter as directed; ▪ check/clear the impeller of any obstructions, etc.; OR ▪ contact TIC coordinator for replacement filter pump tube
The tank water looks oddly colored or cloudy	1. Water quality 2. UVS lamp malfunction 3. Tank exposed to natural light 4. Dirty filter 5. Over feeding	▪ see below for correcting water quality, test and adjust as required; ▪ check the plug/bulb of the UVS unit; surround the tank in foam board to block UV light; ▪ clean/change the filters; ▪ reduce the amount of food given at each feeding – feed less more often, remove excess food after 10 minutes.

The tank is coated with a green slime. . .
Green films or slime may indicate algal growth. This will not necessarily hurt the trout, and some 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.

The water in the tank is cloudy. . .
Cloudy water probably indicates an excess in decaying matter. This may be from dead fish, leftover food, or a problem with the filtration. Doing regular water changes, as well as cleaning the tank of all solid material, is the best way to fight this.

The tap water is discolored . . .
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.

Potential National Funding Sources

Toshiba America Foundation Grants
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
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.

Best Buy Support For Interactive Technology
The Best Buy (http://www.BestBuy.com/) te@ch program recognizes creative uses of interactive technology in K-12 classrooms. The purpose of te@ch is to reward schools for successful interactive programs they have launched using available technology. This program has deadlines; check the website to find them. To apply, educators must first register as an applicant and identify a Best Buy store within a fifty-mile radius of the school.

Toyota Tapestry Grants For Teachers
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
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.

Virginia Environmental Endowment: Virginia Mini-Grant Program
The Virginia Mini-Grant Program supports community-based efforts to strengthen environmental education and to promote stewardship of Virginia's waterways. These are intended to be one-time, start-up grants, and preference is given to modest local projects. Public and private schools (K-12) and nongovernmental, nonprofit community organizations in Virginia are eligible to apply for one-year awards up to $5,000. Local, state, and federal government agencies and programs are not eligible. http://www.vanaturally.com/classroomgrants.html.

Outdoor Classroom Grant Program
Lowe's Charitable and Educational Foundation, International Paper and the *National Geographic Explorer!* Magazines have teamed up to create an outdoor classroom grant program (TIC can be framed with stream study and release trips). The program focus is to engage students in hands-on natural science experiences and allow enrichment across the core curriculum. All K-12 public schools in the US are welcome to apply.

Target Field Trip Grants
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.

***** **Sample Grant Proposal** *****

Dear Staunton Augusta County Chapter of the Isaac Walton League,

My name is XXXXXXX and I am a XXXXXXXXX at XXXXXXXXXX School in XXXXXXX County. One of my goals as a 7th grade Life Science teacher is to capture student interest in the outdoors; which I believe many students have lost. In order to achieve this goal I am trying to implement the Trout in the Classroom Program from Trout Unlimited. This program will entail having a 55 gallon freshwater tank set up in the classroom. It will be equipped with the proper gear to incubate brook, rainbow, or brown trout eggs and raise the fry to maturity. In the spring, with the cooperation of the Department of Game and Inland Fisheries, students will release the trout in a nearby stream, as well as, perform on site water quality and macroinvertebrate tests.

I envision using Trout in the Classroom to touch on subjects across the curriculum. In science, students will learn about habitats, ecosystems, and watersheds. This also provides students a Meaningful Watershed Educational Experience (MWEE) as intended by the Chesapeake Bay Educational Program and the Virginia Standards of Learning. Students will use math concepts such as graphing, measurement, and computation. Students will incorporate Language Arts, by learning new vocabulary, writing about their observations in their science journals, and creating essays centered on conservation issues. In order to connect to Social Studies, students will learn about the different topography of Virginia and the popular land uses throughout the Commonwealth. Through this study, students can address the shrinking native trout waters throughout the state and the land uses that contribute to this habitat degradation.

Unfortunately, Trout Unlimited does not provide funding for this program, and teachers are left to seek funding on their own. The total cost of the project is around $1,000 dollars. The most vital part of the Trout in the Classroom system is the chiller, which costs around $500 dollars. Without the chiller, the trout cannot survive. I am asking if your chapter would be willing to donate the funds necessary to purchase this chiller. However, any funding that you can provide will be helpful. Thank you for considering this request in order for students to make a connection with their community, recreational facilities, rivers/streams, and to learn how their actions in the Shenandoah Valley can impact their future.

This sample grant proposal was graciously provided by Courtney Rodgers, a Middle School Teacher at Wilson Middle School in Augusta County, who has participated in the TIC program for two years. She was successful in obtaining her grant.

TIC Resources

A current list of local TIC Coordinators will be provided.

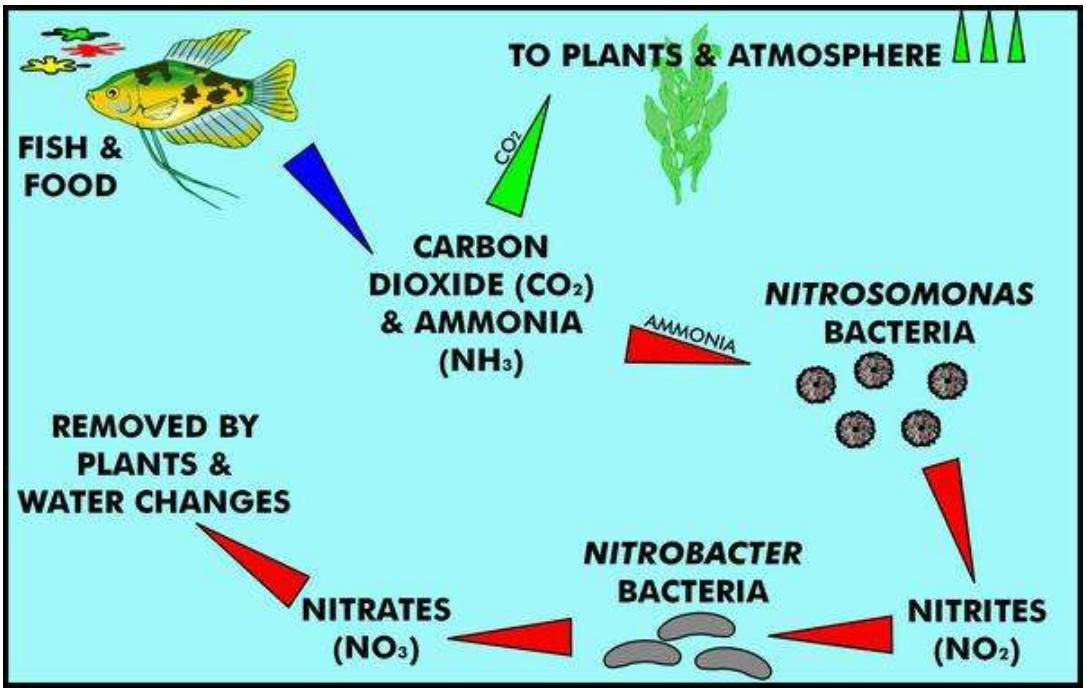
Trout Unlimited Chapter Coordinators

Angelo Biviano	abiviano@vt.edu	Floyd, VA	540-808-8436
Krista Hodges	khodges@danriver.org	Collinsville, VA	276-634-2592
Chris Mullens	ccmullens@suddenlink.net	Princeton, WV	304-425-7275
Dick Vipperman	dickvipp@aol.com	Roanoke VA	540-772-9470
Doug Stegura	stegura@comcast.net	Stuarts Draft, VA	540-337-2823
Gary Bobbitt	bobbittg@floyd.k12.va.us		
Howard Williams	hcwil1@hotmail.com	Blacksburg, VA	540-552-2254
Jamey Hutton	jamhut21@hotmail.com	Roanoke, VA	540-525-3853
Jason Hallacher	Jason.Hallacher@dgif.virginia.gov	Verona, VA	540-248-9385
Jeff Peake	jpeake@rockingham.k12.va.us	Harrisonburg, VA	540-574-4093
Jon Wilson	jon@roanoketu.org	Salem, VA	540-580-3731
Karen Sizelove	ecodesign@leaflover.com		703-975-7359
Karl Miller	knj_miller@MSN.com	Roanoke, VA	540-989-6549
Mark Zimmerman	mbzimmerman@comcast.net	Winchester, VA	540-722-4914
Richard Landreth	landrethcats@aol.com	Swoope, VA	540-885-4209
Tom Benzing	BENZINTR@CISAT.JMU.EDU	Waynesboro, VA	540-941-2414
Tommy Lawhorne	tslawhor@cfw.com	Waynesboro, VA	540-943-7250
William Heresniak	william@easterntropies.com	Alexandria City, VA	

Teaching Aids

Getting your students excited about TIC!

The Nitrogen Cycle



The graphic above illustrates the Nitrogen cycle. Its importance in the process of biological filtration and general health for the trout cannot be overstated. The nitrobacter & nitrosomonas species that are part of this cycle are the primary bacteria responsible for the consumption of excess ammonia that will be produced from the fish waste. Once the eggs develop into fry and they begin to consume food, the nitrogen cycle will begin due to the waste being produced. The bacterial growth will continue to increase on its own until the colony is sufficient to process the ammonia load. At that point the bacteria will maintain a fairly constant level.

The bacteria and the colony are invisible to the naked eye.

For more information and videos on trout egg care and help, check out our YouTube videos at:

http://www.youtube.com/watch?v=B2EjNPFcNnw or by searching:
Trout egg and alevin care (Video is by Brian Williams)

Classroom Activities

The following is a list of activities that TIC teachers use during the school year to help students understand water quality and conservation.

- Watershed studies using the CSI database
    - Comparing the release stream to others in the area
- Macroinvertebrate studies and identification
    - Discussing what the trout will eat when released
- Mapping of nutrient cycles
- Daily trout journals on tank activity
- Plotting nitrate and nitrite levels using different graph types
    - Cross education with Math Studies
- Trout dissection and anatomy
- Painting a background mural for the tank
- Trout life cycle
    - One class did a 9' Brook trout with the life cycle along the lateral line
- Participation in the Trout Tapestry
    - This year (2012-2013) both a Virginia and a South Eastern Region tapestry with Tennessee, North Carolina, and Georgia is planned
- Study of yolk development
- Oxygen absorption
- Acid Rain impacts
- Trout art
    - Conventional
        - Crayon, watercolor, markers, etc.
    - Non conventional
        - M & Ms
        - Spaghetti
        - Painted Plaster of Paris forms

More things to consider!

- Hydroponic gardening – how plants can utilize the nutrients from the tank water for growth. This can be done either with plants having their roots suspended in the water or by raising a garden using regular water and waste water to compare the differences.
- Using tank waste water to develop a waste treatment facility.
- **The TIC Coordinator or TIC volunteers are also available for classroom presentations. If a teacher has something specific or would like to discuss possibilities, please contact the coordinator for scheduling.**

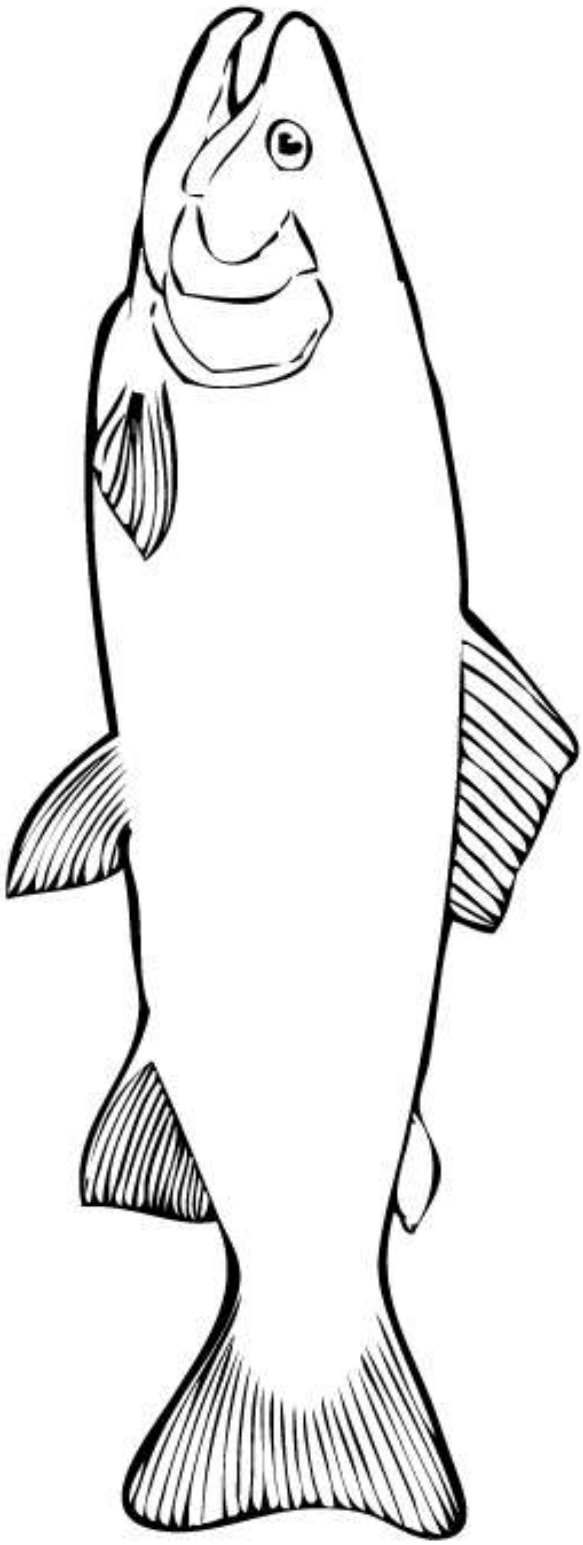
Don't forget to checkout www.troutintheclassroom.org for more classroom and program ideas.

And --- http://www.youtube.com/watch?v=Qtu_wpD3BDY

Release Day Activities

The following are some activities that TIC teachers are available to conduct. The list is meant to share some ideas of what can be done. Work with the local TIC Coordinator to finds ways to put together a program.

- Water quality testing
- Macroinvertebrate collection and study
- Stream Walk
- Fly fishing demonstration
- Fly tying demonstration
- Tree identification
- Family day activities
- Student reunion at release day for previous students who participated in the TIC program
- Teacher reunion at release day for previous teachers who participated in the TIC program
- Plan a picnic, hike or visit at a local park after a trout release
- Family trout release cook-out



Color A Trout

ONCE I WAS A BABY TROUT

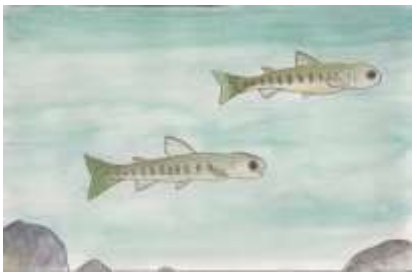
1. First I was a GREEN EGG sitting in my redd.

2. Then I was an EYED EGG, my eyes were on my head.

3. When I started HATCHING; the egg shell left my back.

4. Then I was an ALEVIN with a big yolk sac.

5. When I had to USE YOLK; I watched my belly shrink and



6. Then I was a LITTLE FRY—I wanted food, I think?

7. So I looked for BUGS TO EAT and I swam and swam around, and

8. Soon I had my PARR MARKS, so I could not be found.

Brown Trout

Brook Trout

Rainbow Trout

Sample Water Chemistry Log

Use this form, or one similar, to record the water chemistry readings. Additionally, record the amount of water removed (nearest gallon is fine) during each cleaning/water change.

For accurate records at year-end, record the number of eggs and dead fish removed (sample data sheet on page 48). Doing it as it occurs will enable a more accurate yearend report.
Note: Please send any egg/fish mortality and hatch data to the coordinator.

School Name and Grade

	All Water Chemistry Reading are in ppm									
Test Date	pH	Ammonia (NH3)	Nitrite (NO2)	Nitrate (NO4)	Temp (˚F)	# Dead Fry	Water In/Out	Tank Cleaning	Live Alevin / Fry	Special Notes
10/06/08	7.4	0 ppm	4.0 ppm	0 ppm	50.8	2			259	
10/07/08	7.4									
10/08/08	7.4	0 ppm	took 3 different readings	0 ppm	51.3	1	2 changes	2/3 tank cleaned	258	
10/09/08	7.4	0 ppm	2.0 ppm	0 ppm	51.5	1	7 gal. exchanged	Bacteria added @ 9 am	257	
10/10/08	7.4	0 ppm	4.0 ppm	0 ppm	52.3	2	10 gal. exchanged		255	
10/13/08	7.8	0 ppm	4.0 ppm	0 ppm	50.2	-	2 changes			
10/14/08	7.8	0 ppm	4.0 ppm	0 ppm	52.1	2			253	
10/15/08	7.4	0 ppm	8.0 ppm	0 ppm	52.3	2	26 gal. exchanged	tank cleaned	251	

TROUT IN THE CLASSROOM EGG MORTALITY AND HATCH DATA

Tank Location	
Number of Eggs Received	
Date Eggs Received	
Date of Hatch (# > 10)	
Date of Swim-ups (# >10)	
Date of First Feeding	

Date	Number of dead eggs/fish removed

Number of fingerlings on release day	

Vocabulary Words

ACID RAIN: a rain or any other form of precipitation that is unusually acidic, meaning that it possesses elevated levels of hydrogen ions (low pH). It can have harmful effects on plants, aquatic animals, humans and infrastructure. Acid rain is caused by emissions of sulfur dioxide and nitrogen oxide, which react with the water molecules in the atmosphere to produce acids.

ALEVIN: (sac fry) a young fish; especially: a newly hatched salmon when still attached to the yolk sac.

AMMONIA: an "invisible assassin." Its only acceptable level in tanks is zero. It enters via three methods. Its least likely source is improperly treated tap water. Decomposing organic matter such as dead fish or too much fish food cause ammonia levels to rise. Since ammonia is excreted from fishes' gills, overcrowded aquariums facilitate high ammonia levels. Because ammonia is colorless and water soluble, clear, sparkling tanks aren't indicative of ammonia-free environments.

ANATOMY: is the study of the body plan of animals.

BAKING SODA: sodium bicarbonate - or **sodium hydrogen carbonate** is the chemical compound with the formula $NaHCO_3$. Sodium bicarbonate is a white solid that is crystalline but often appears as a fine powder. It has a slightly salty, alkaline taste resembling that of washing soda (sodium carbonate).

BIOLOGICAL FILTRATION: is the removal of harmful waste chemicals by beneficial bacteria that is produced by fish waste and uneaten food in the aquarium. These waste products cause the rise of ammonia in the water.

CAMOUFLAGE: is the use of any combination of materials, coloration or illumination for concealment, either by making animals or objects hard to see (crypsis), or by disguising them as something else (mimesis).

CONTAMINATION: is the presence of a minor and unwanted constituent (contaminant) in a material, in a physical body, in the natural environment, etc.

DISSECTION: (also called anatomization) is the process of disassembling and observing something to determine its internal structure and as an aid to discerning the functions and relationships of its components.

FINGERLING: A young or small fish – about the size of a finger.

ENVIRONMENT: (biophysical) the physical and biological factors along with their chemical interactions that affect an organism.

EYED EGG: An egg in the developmental process that has the trout's eyes visible (black spots).

SWIM UPS: In the life cycle of the trout, swim ups are the young trout that have completely lost their yolk sac and are able to begin swimming around looking for food.

IDEAL TEMPERATURE: the temperature at which the trout survive the best – ideal temperature is between 50-55 degrees Fahrenheit.

LATERAL LINE: is a system of sense organs found in aquatic vertebrates, chiefly fish, used to detect movement and vibration in the surrounding water.

LIFE CYCLE: In biology, **life cycle** is the series of changes that an organism undergoes from its inception by means of reproduction, whether through asexual reproduction or sexual reproduction, to the inception of the following generation in that same phase of the cycle.

MACROINVERTEBRATE: Streams, rivers, wetlands and lakes are home for many small animals calledmacroinvertebrates. These animals generally include insects, crustaceans,molluscs, arachnids and annelids. The term macroinvertebrate describes thoseanimals that have no backbone and can be seen with the naked eye.

NITRIFYING BACTERIA: bacteria that grow by consuming inorganic nitrogen compounds or waste.

NUTRIENT CYCLE: (or **ecological recycling**) is the movement and exchange of organic and inorganic matter back into the production of living matter.

PARR: young fish with camouflaging vertical stripes.

PH: is a measure of the acidity or basicity of an aqueous solution.

SPAWNING: The process by which an organism produces others of its kind: breeding.

SPECIES: In biology, a species is one of the basic units of biological classification and a taxonomic rank.

STREAM WALK: when the students come to the river to release their trout, they can walk in or along the stream to view the life in the stream and become acquainted with the habitat of the trout.

TIC: Trout in the Classroom

VINEGAR: is a liquid consisting mainly of acetic acid (CH_3COOH) and water – most easily available acid.

WATERSHED: is the area of land where all of the water that is under it or drains off of it goes into the same place.

YOLK SAC: is a membranous sac attached to an embryo, providing early nourishment in the form of yolk in bony fishes, sharks, reptiles, birds, and primitive mammals.

Resources used in the development of this manual

Tomelleri. New York: The Free Press, 2002.

Prosek, James. *Go Fish: A Fishing Journal*. New York: Stewart, Tabori & Chang, 2000.

_____. *Trout: An Illustrated History*. New York: Alfred A. Knopf, 1997.

_____. *Trout of the World.* New York: Stewart, Tabori & Chang, 2003.

James Prosek's website is www.troutsite.com.

1. Print on cardstock.
2. Cut out life cycle wheels.
3. Cut out window for top piece along dashes.
4. Place top piece over bottom piece to prepare for push pin.
5. Place push pin in center of wheels.
6. Rotate push pin to allow for circular/wheel motion.


Adult
The trout are now extremely territorial, face upstream, and catch invertebrates as they drift past.
Egg
The female trout digs a nest to lay her eggs and the male will later fertilize them. After a few weeks the eggs will hatch.
Alevin
Once the eggs have hatched the alevin stay in the gravel for 2-3 weeks and feed off their yolk sac.
Fingerling
Once the yolk sac is absorbed the young trout are now free swimming and start to eat tiny insects.