Curriculum and Resource Guide

Partners
U.S. Fish & Wildlife Service
Environmental Protection Agency
Truckee River Fly Fishers
High Sierra Fly Casters
Carson City Fly Fishers
Carson Ranger District - BLM
Trout Unlimited

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Trout in the Classroom

Program Introduction

Trout in the Classroom (TIC) is an educational program tied to the curricula for 4th and 5th grades, to teach students about the science, art, recreation and other values of fish and aquatic life.

TIC was started in Nevada by Ron and Ann Privrasky, through the Truckee River Fly Fishers. This group of dedicated anglers, raised funds and worked with teachers and Nevada Department of Wildlife (NDOW) biologists to place tanks in 30 schools across northern Nevada. NDOW officially took over responsibility for the TIC program in January, 2001.

NDOW provides an aquarium-chiller combination (est. value, $1,000 per tank). You only need to apply once for the program, but must apply each year for rainbow trout eggs. Training is mandatory for new teachers, optional for second year and beyond. You may recruit a volunteer who will act as a “tank buddy,” or have one assigned at the training.

After the training, you will need to help the students set up and operate the tanks so that they are sure the incubator (aquarium-chiller), is set up and operating properly. This should be done at least two weeks prior to the delivery of eggs. If there are problems which can not be readily solved, contact the regional Angler Education Coordinator for help.

By mid-February, eggs arrive from the hatchery and are picked up by the tank buddies from a central point. Training and delivery dates vary for different parts of the state. Southern Nevada teachers may receive eggs in November. Check with your regional Angler Education coordinator, or the TIC web page in the Fisheries section of www.ndow.org, for delivery times and dates in your area.

When the eggs arrive, supervised students will put the eggs in the tank. For the next six weeks or so, students will make observations, adjustments and care for the incubator until the eggs hatch and fry are released. You may feed the fry, but fed fish create more waste and this creates the need for more regular water changes. Everything teachers need to know about the maintenance of the tank and the fish will be explained in the training and outlined in the following pages for their reference.

TIC is perfect for 5th grade. Activities include: science and art projects, journaling, measuring, math skills, visual and language arts. TIC crosses all scholastic disciplines and results in stronger understanding of math, science and social studies. The enthusiasm of students and teachers involved in TIC is manifest in the amazing variety and number of activities and projects. Not only are teachers using TIC in the classroom, sometimes whole schools and even communities turn out for the release. Some have made release day a “mini-Earth Day,” with educational booths, field projects, river cleanup and more. This curriculum guide has some of the basic projects and activities that teachers use in TIC. The TIC web page on www.ndow.org, has many more examples and links to other TIC sites that are just full of clever and innovative ideas.

The eggs and trout in TIC are not for stocking or restoration. The trout eggs and fish release are permitted only for educational purposes.
Fish Eggs-Fry

The Incubator

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Setting Up

Materials Provided:
- Ten gallon aquarium
- Under-gravel filter for 10 gallon aquarium
- "Power Head" pump (not air driven pump)
- Chiller (or other cooling system)
- Aquarium thermometer
- Aquarium dip net
- Turkey baster
- 2 five gallon buckets (plastic)
- Bottle of iodine-based disinfectant
- 2 lengths of 3/8"-1/2" plastic tubing
- 10 lbs. course aquarium gravel
- Washed 1/2-1 1/2" river gravel
- Large cardboard box

Setting up:
The aquarium incubator should be set up at least 1 week before the eggs arrive in your classroom. This will allow you to monitor and stabilize the water temperature and check for problems with the equipment.

1. **Gather River Gravel.** Soak pea gravel and river gravel in a bleach solution or boil 10 minutes if it has been used before. Rinse if new.

2. **Disinfect all equipment** that has been used before with a bleach. Soak all parts in a 1:10 Clorox solution for 24 hours. This includes: aquarium, under-gravel filter, air pump, thermometer, and baster, net, and buckets. Rinse thoroughly to remove all bleach residue.

3. **Assemble under-gravel filter and uplift tube.** Connect sections of under-gravel filter with the plastic bands provided. Decide on position for the air pump and punch the hole out of the under-gravel filter. **Punch only one hole.** Place filter inside aquarium. Fit the uplift tube for the air pump into the hole.

4. **Place pea gravel and river gravel in aquarium.** Gently pour enough pea gravel to completely cover the filter. The small gap between the filter and aquarium wall must be filed with gravel. Alevin can burrow, and if they get under the filter they will be sucked into the air pump. Carefully place the gravel in the front half of the aquarium. Leave the back half covered only with pea gravel. This will make cleaning easier. There will be small spaces between the rocks. This is where the eggs will be placed.

5. **Fill the tank with water** to about two inches from the top.

6. **Place the power head pump in the riser and attach it to the aquarium.** Adjust the air flow to accommodate the aquarium size.

7. **Put aquarium thermometer in the water,** on front wall.

For chillers: Follow manufacturer's instruction. Set temperatures to 50-55 degrees.
Monitoring the Incubator

Monitor the incubator every day. Alleviate potential problems with early detection. Follow the simple procedures below to insure that everything goes well in your classroom.

**Inspection**

Do a "walk around" inspection of the incubator and associated equipment at least twice daily - First thing in the morning and just before leaving at the end of the day.

Assign the inspection to an individual student or rotate the assignments among groups of students (see the job wheel, page  ).

Use this example incubator inspection record or make one of your own.

**Temperature Measurements**

Water temperature can indicate possible mechanical and biological problems.

Temperature also determines the rate of development which can help you estimate the hatch and release dates for your fry.

Measure and record the temperature at least once daily, or measure several times and average.

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**INCUBATOR INSPECTION RECORD**

<table>
<thead>
<tr>
<th>Date:</th>
<th>________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°F/°C):</td>
<td>________________</td>
</tr>
<tr>
<td>Thermal Units (TU's):</td>
<td>________________</td>
</tr>
</tbody>
</table>

- Chiller unit plugged in (or frozen water jugs exchanged)  
- Powerhead or air pump plugged in  
- Powerhead or air supply operating properly  
  - water at correct level  
  - even flow  
  - bubbles evident  
- Riser Tubes  
  - below water level  
- Water  
  - clean  
  - pH within acceptable range  
- Mortalities picked and recorded  

Inspector’s Signature:

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3
Caring for the Eggs and Fish

Trout need clean, cold water with plenty of oxygen. If you provide these conditions and keep the aquarium clean, you should have a successful experience.

Set up your incubator at least one week before you get your eggs. To make sure the system is working and you have a consistent cool temperature and so the bio-filter is working in your incubator.

Placing the eggs—Eggs will be transported in your aerated bait bucket. Put them in your aquarium as soon as they arrive in the classroom. Make sure everyone who is handling the fish has clean hands, washed in water only and free from lotions. Carefully place the eggs, a few at a time, into the spaces between the rocks. Put most of the eggs right next to the front of the aquarium so that the students can easily watch them develop and hatch.

Providing darkness—Eggs and alevin are harmed by light, especially fluorescent light. In fact, they can only take about 30 minutes or so of natural light without damage. A large cardboard box will be provided to cover the incubator and block the harmful light. You will need to cut holes for the chiller and cords, so that the box fits squarely down over the entire aquarium. You may also want to cut the front of the cardboard, leaving a flap in place, so it can be lifted for inspection of the eggs.

Removing dead eggs—Some eggs may die, even in good conditions. The fungus that quickly forms can infect live eggs too. Live eggs are pink to orange. Check the tank carefully every day and use the baster to remove dead eggs, which are white, milky eggs.

Hatching—The embryo produces and enzyme which dissolves the egg shell. You may notice a white foam on the surface at hatching time. This will not hurt the fish. Just after hatching, eggshells need to be removed to prevent fungus. Change half the water and use the baster to remove the shells.

Alevin—Little care is required at this stage. Check for dead fish and remove them immediately. The tiny alevin will remain in the gravel and avoid light. Keep the incubator in darkness and change half the water once a week.

Feeding—It is better for you and for the fish if you do not feed them. Once they swim out of the gravel, the fry will eat. Do not feed them before then. If you must, only feed them enough so that no food reaches the bottom. Feed several times a day, but no more than once an hour. Uneaten, decaying food will kill your fish. They can survive a 2-day weekend without food but no longer. Fed fish create more waste and will require more cleaning.
Caring for the Eggs and Fish

Cleaning the water—After hatching, the fish produce more waste (especially if you’re feeding). You will need to change the water at least once a week, perhaps more, depending on the pH, ammonia and clarity of the water (cloudy water indicates an increase in waste). New water must be the same temperature as the water in your aquarium so refrigerate the new, dechlorinated water before adding it to the aquarium. Use the tubing to siphon the dirty water into your large bucket. Do not siphon the water into a drain, since you will want to inspect the waste water for any fry that may have taken an unexpected trip. Use your dip net to replace any wandering fry. You will only be able to change half - 2/3 of the water in your tank at any given time. Work quickly as this process stresses the little fishies.

Cleaning the gravel—Use the baster to blow air into the gravel to dislodge debris. Scoop up the debris with the dip net. You may also use a aquarium vacuum, but be sure to empty the dirty water into a bucket so you can rescue fry. Clean the gravel daily after hatching.

Releasing the fish—Finally! All your hard work and vigilance has paid off and you are ready to release the fish. This is a very stressful day for your fish (and sometimes for you and your students). But, it can a delightful day for herons, cormorants, kingfishers and the large fish in the area. To keep immediate predation to a minimum, your fry should be quickly moved into calm water that has an immediate outlet to cover.

Drain half the water from the aquarium and scoop the fish into a disinfected 5-gallon plastic bucket or cooler. It will take 45-60 minutes to transfer the fish, depending on your reflexes and skill. If you are traveling some distance, you will need to keep the water cool and oxygenated. A battery operated bait aerator or bicycle pump will keep oxygen in the water. Or you can scoop water out and pour it back in from a height of about six inches. To keep the water cool, take along small blocks of ice or ice cubes made from aquarium water, and drop them in as needed. Or, carry ice in re-sealable plastic bags and dip them in the water as necessary. Be sure to use your thermometer to keep the water temperature as consistent as possible.

At the release site, gradually bring the water in the bucket to the temperature of the water where the fish will be released. This may take a little time, so have something planned to occupy your small charges while you are acclimating the fish. See “Farewell Finny Friends” page 35, or the website www.ndow.org, for more information on fry releases.
Storing the Incubator

The fish have swum away on their life of danger and excitement. Now, you have an empty tank and you’re going to clean it and put it away in happy anticipation of next year’s crop of eggs and fry. Cleaning is much more effective if it’s done while the incubator is still wet.

1. **Empty the aquarium and remove the gravel**

2. **Clean the aquarium, powerhead, riser tubes, hoses and filter plates with a mild detergent and a soft cloth.** If desired, disinfect with a weak (1:400) bleach solution, but air drying should be sufficient, especially if the equipment won’t be used for several months. Rinse thoroughly with large amounts of water to remove any detergent of bleach residue. Use a soft cloth and a baking soda paste for stubborn areas. **Rinse! Rinse! Rinse!**

3. **Vigorously wash aquarium gravel and other rocks and gravel with clean water only.** You may boil the gravel in a large pot for 10-15 minutes. Spread the gravel in thin layers to speed the drying process, to prevent mold growth.

5. **Thoroughly dry, reassemble and store the equipment in a clean, dry place.** Remove all dust from the chiller fins.

**Key Points to Remember**

- Record daily temperatures to predict hatch and button-up times.
- **Check water clarity, dissolved oxygen, pH and ammonia levels daily**
- Remove dead eggs and fry promptly and record mortalities.
- Treat eggs and fry with care.
- **Release fry 5-7 days after “button-up” (when the belly seam is one mm or less), only at approved sites.**
- **This program is not part of a stocking or restoration program. Eggs are provided and fish released only as part of an educational program.**

[Graphic courtesy of Canada Department of Fisheries and Oceans, Public Involvement Program, Salmonids in the Classroom — Stream Study and Fry Release, Intermediate.]
Troubleshooting the Incubator

Dissolved Oxygen Problems-
Clue: fry gasping at surface

Newly buttoned-up fry will come to the surface to gulp air and fill the swim bladder, but after that, they should remain about mid-aquarium. If you see your fry all gathering at the surface, check the oxygen concentration and consider gradually decreasing the water temperature (one degree per hour).

Eggs also use an amazing amount of oxygen. Check dissolved oxygen levels daily to make sure make sure they don’t fall below 7 ppm. If they do, promptly check the powerheads and replace them if you need a larger unit or your powerhead isn’t working properly. Also, make sure the entire system, including lines and filter, is free of obstructions and is allowing full air passage. Releasing some of the fish to reduce the population may also increase oxygen levels.

pH Problems-
Clue: discolored eggs, eggs with eyes extending outside the shell.

Check the pH level daily with an inexpensive pH test kit, which can be accurate to 0.2 and more useful than litmus paper. pH levels indicate the accumulation of hatching and fry waste. As the waste increases, pH levels drop, creating a more acidic condition. If the pH falls below 6.5, eggs and fry could die or be seriously damaged. To correct this, change at least half the water, using de-chlorinated water the same temperature as in the aquarium.

Adjust the pH with white vinegar if pH values are too high (7.5 and above), or baking soda if they are too low (below 6.5). You can use well-weathered oyster shell, crushed and hung in the tank inside a mesh bag, to add calcium carbonate to the incubator and increase the pH. When the pH reaches 7.5, remove the bag. CAUTION: Changing from one pH value to another is a 10-fold change in magnitude and may be more than eggs or fry can survive. If pH levels continue to be a problem, your water source may contain dissolved materials which may be causing the problem.

Ammonia Problems-
Clue: changes in pH, compression of fins on fry

An inexpensive, simple, but effective test kit is at most aquarium stores. If ammonia levels rise to dangerous levels, a partial water change (1/3-1/2 tank) is advised. Use de-chlorinated water, the same temperature as in the aquarium. A buffering product, which can be placed in the corner of the aquarium, is also available at supply stores.
Troubleshooting the Incubator

Disease Problems -
Clue: white cloudy eggs, purple eggs, white fuzz on eggs, fry swimming in circles, oily red spot in egg, discolored yolk, fry swimming on their sides
Diseases are transmitted from parent to egg (vertical transmission) or from other eggs and fry (horizontal transmission). The hatchery makes every effort to provide healthy eggs, so disease is rare in an uncrowded incubator. There’s not much you can do with diseased eggs or fry in your classroom. Consult your area biologist or hatchery personnel. NEVER release sick fry!
white cloudy eggs, purple eggs, they’re dead, remove them from the incubator immediately. White fuzz on eggs indicates fungus, remove infected eggs. If you have removed dead or diseased eggs promptly this is less likely to occur. fry swimming in circles are deformed or injured fry. Oily red spot in egg, shows an injured or ruptured egg sack caused by late shocking or jostling at the hatchery. Discolored yolk, fry swimming on their sides a coagulated yolk sack is fairly common in classroom incubators. Minimize handling, turbulence caused by water flow and light exposure.

Mechanical Problems -
Chillers: Most chillers are trouble-free and require little maintenance. But, as mechanical devices they can fail. Have a backup system, such as a refrigerator to put the aquarium in or liter soda bottles of frozen water to float in the tank. Be sure to completely remove labels and glue from the bottles before use, as they can ploute the water in the incubator.

Increasing, decreasing or inconsistent temperature - Check to be sure the chiller is plugged in. If it still isn’t running, check the outlet with other appliances to be sure it has power. If the outlet has power and the chiller is plugged in, try reducing the temperature setting. If this fails to trigger the compressor, then there is a more serious problem in the chiller. If the water is freezing, the thermostat may be defective. If the chiller runs constantly, but the coil is not cold, the refrigerant has probably leaked out. If any of these problems have occurred, use your backups system and get chiller in for repairs.

Water is not moving in the tank - If bubbles and flow are not coming from the powerhead, the unit may be defective or clogged. Make sure the powerhead is plugged in and getting power. If the pump is working, but not aerating, check lines for blockage. Remove the tube and blow through it. If the powerhead is not circulating, is it underwater? Is it air-locked in some fashion? Powerheads can clog with algae, slime and even adventuresome fry. Unplug and remove the pump. Check for blockage in the intake cone. If needed, disassemble the powerhead, clean the magnet and impeller. Have another powerhead, or an air pump and air stone, as backup.
Troubleshooting the Incubator

Miscellaneous Problems-
Deformities: (e.g. two heads) occur naturally

Sac fry laying on the gravel occurs naturally after hatching. Do not release fry at this stage

Power failure can occur any time. Have your chiller backup ready. Inform custodial staff and others who may be in the building on a weekend or break so they can take emergency measures if power goes out when school is not in session. Provide emergency numbers at the aquarium site in the event that a problem is discovered in your absence.

Warm classrooms often make it difficult to maintain a cool enough temperature in the incubator. This may be caused by too much flow through the powerhead. Reduce the flow through the powerhead to give it more time to cool during circulation and try to find a way to reduce the temperature of the room.
Trout in the Classroom
The Program
Answering the “Whys”

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Life Cycle and Habitats

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Answering the “Whys”

**Why does the water have to be this temperature?**

Water temperature determines how quickly the eggs develop and hatch and how quickly the fry grow to fish. The colder the water is, the slower the eggs develop and the fish grow. If the water is too warm the eggs and fish may become diseased or die. If the water is too cold development may stop and the fish may die.

**Why does the water have to move around?**

Eggs and fry need lots of dissolved oxygen, that’s oxygen that’s “mixed” in the water. Eggs use oxygen that they exchange from the water, through their egg shells. Fish don’t breathe the water, they actually “net” the air out of the water with their gills. That’s the white, feathery stuff inside the gill slits on the sides of their heads. Fish pull water in through their mouth and push it out through their gills and the gills “grab” the oxygen and carry it into the fish. The powerhead moves the water around in the tank and puts oxygen in the water.

**Why do we have to clean the water and gravel so much?**

In a natural stream, the water is always flowing by. The pump in the powerhead just moves the water around and puts oxygen in the water. Since the water never leaves the tank, the egg and fish waste accumulates in the tank and change the pH, ammonia levels and even choke the oxygen out of the water or spread disease in the eggs and fish.

**Why do we have two sizes of gravel?**

The smaller, aquarium gravel provides a base for the “nursery habitat” in the incubator and the larger gravel provides hatching and nursery cover for the eggs and alevin as they become fish.

**Why do we have to release the fish?**

Release dates are calculated to take best advantage of the developmental stages of the fish, avoid overcrowding in the incubator and provide the best chance for fry survival. Fish kept too long get too big for the tank, in large numbers, and are prone to disease, injury, deformities and eating each other.

Egg delivery, development, hatching and release are best timed to avoid keeping eggs and fish over long breaks, when no one is around to care for them. But, enough development time should be allowed to provide the fry with the best chance of survival.
**WILD TROUT LIFE CYCLE**

**Eggs** develop in the gravel and hatch into alevins.

**Spawning trout** lay eggs in redd in gravel stream bottoms. Trout often spawn several times in their lives.

**Alevins** stay in the gravel. They get food from their yolk sacs and grow bigger. After the yolk sac is used up, the tiny fish are fry. They swim out of the gravel to find food. They live in gentle water near the stream bank until they get bigger.

As the fry grow stronger, they take up positions in the main current of the stream. They eat insects and other small animals that live in, or fall into, the stream.

**Adults** often eat other fish, even smaller trout. Although they may live longer, trout usually do not grow as large as their salmon and steelhead relatives because they don't benefit from the ocean's abundant food supply.

Some trout live in lakes. They may live there all their lives, but often spawn in streams.

Adapted from original artwork by Gary Bloomfield, *Salmon and Trout Go To School. An Instruction Manual For Teaching Salmon and Trout Eggs In Classroom Aquarium-incubators* by Diane Higgins, California Department of Fish and Game and American Fisheries Society, Humboldt Chapter, 1996.
HATCHERY TROUT LIFE CYCLE

FINGERLINGS
Fingerlings are from 2 - 5 inches. Most hatchery trout are stocked into lakes at this size.

FRY
Feeding begins after the egg sac is absorbed.

SAC FRY
The young trout receive their food from the attached egg sac for 1 to 6 weeks after hatching. The yolk sac is absorbed into the belly providing nourishment until the young trout can feed.

Growth begins in a hatchery tray.

Fertilized eggs are placed in hatchery or streamside incubator trays.

One year-old hatchery trout are usually 8 - 10 inch "legals." Wild trout are usually several inches smaller.

Some hatchery trout are stocked as 10" legal-sized fish. These contribute little to future generations.

A few hatchery trout are held for future egg production. Relatively few fish are needed to support hatchery production compared to the numbers required to sustain wild populations.

Eggs are taken from brood trout reared in a hatchery or from wild fish trapped from a stream or lake.

Spawning for most trout begins at three years of age.

Trout and salmon need cold water to survive and grow. Snow melt from mountain peaks, and rainfall feed their stream and lake habitats. Healthy salmonid streams are usually shaded by trees. The tree roots make the stream banks stable and provide hiding places for the fish. Leaves from the trees fall into the stream and become food for insects, which are in turn eaten by salmon and trout.

As young salmon and trout grow larger, they move from shallow areas into deep pools. Pools are scoured when water plunges over or around boulders and logs. The "bubble curtain" is a favorite place for salmon and trout. They can’t be seen by predators above and there is plenty of oxygen. The current brings insects and other small food items. At the end of pools, where the stream narrows, the current picks up and washes the gravels clean, making them ideal for nests.

Some salmon and trout spend their lives in lakes, constantly moving about to find food. The surface of lakes may freeze in winter and the water underneath becomes quite cold. After spring thaw, salmonids feed around the edges of lakes. As the lake surface warms in summer, they retreat to the cold depths. They eat small animals called plankton, and insects that alight on the surface of the lake. As trout grow larger in lake environments, they often feed on small fish, such as minnows or even smaller trout.
TROUT ENVIRONMENTAL NEEDS

Spawning fish need:

________________________________________

________________________________________

________________________________________

Returning adults need:  

________________________________________  

________________________________________  

________________________________________  

Eggs need:

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________________________________________

________________________________________

Adults need:

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________________________________________

Fry need:

________________________________________

________________________________________

________________________________________

Fingerlings need:

________________________________________

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________________________________________
HOW YOUR AQUARIUM IMITATES NATURE

A Chiller or Refrigerator keeps water cold.
Real streams stay cold because they-
• receive water from melting snow
• are fed by underground streams
• are shaded by streamside trees and shrubs

The Filter helps clean the water.
In nature, water is cleaned by bacteria and scavengers that eat decaying matter.

The Air Pump adds oxygen.
In nature, stream water has lots of oxygen because-
• It tumbles over boulders and waterfalls, mixing with the air.
• It is cold - cold water holds more oxygen.

The water cycle provides fresh water.
Clean, fresh water is a precious resource.

Gravel protects salmon and trout eggs and alevin from predators in the wild. Rocks wash into streams from the watershed and are tumbled smooth. Aquatic insects also live in the gravel.
How Does Our Incubator Imitate Nature?

**HOW YOUR AQUARIUM IMITATES NATURE**

**A CHILLER OR REFRIGERATOR KEEPS WATER COLD.**
Real streams stay cold because they-
- receive water from melting snow
- are fed by underground streams
- are shaded by streamside trees and shrubs

**THE AIR PUMP adds oxygen.**
In nature, stream water has lots of oxygen because-
- It tumbles over boulders and waterfalls, mixing with the air.
- It is cold - cold water holds more oxygen.

**THE FILTER helps clean the water.**
In nature, water is cleaned by bacteria and scavengers that eat decaying matter.

**The water cycle provides fresh water.**
Clean, fresh water is a precious resource.

**GRAVEL protects salmon and trout eggs and alevin from predators in the wild.**
Rocks wash into streams from the watershed and are tumbled smooth. Aquatic insects also live in the gravel.
Trout in the Classroom
Development-Hatch-Fry

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Eggs! Eggs! Eggs!

Where Wild Fish Come From

The natural spawning process is complicated and uncertain. And, survival is definitely not in the cards for most of the eggs and fry.

Spawning begins as the season and light changes. The male begins producing milt and the female, her eggs. The fish swim upstream, spurred by the flow of the clear, cold water, until they find the spot where they hatched. The females find an area with adequate gravel and flow and create a redd by fanning their tail fin to rearrange and clear the gravel. On a second pass, they lay their eggs, which fall down into the larger gravel.

Males come in behind depositing the milt across the redd and slightly upstream so that the eggs will be covered with milt and fertilized. Chances are very good that fertilization might not be complete or that conditions in the water or gravel may not be just right. Eggs may die in the process of being laid. Whatever the reason. Many eggs never make it beyond the point of merely being dropped down into the cobble and gravel bottom of the river.

Life is dangerous for eggs and fry. The water may cool, or warm up. Natural and artificial pollutants may change chemicals in the water and poison the fish. Floods may bury the eggs in silt or wash them away. They may be eaten by insects, fish or amphibians scavenging along the bottom or birds, like the water ouzel (dipper) that search the bottom for eggs and insects.

If the eggs are lucky enough to hatch, a new set of dangers awaits them. Should they stray or be washed out of their nursery backwater, they may be overcome by the flow of the river. Insects, like dragonfly larvae, may eat the tiny fish. Sharp-eyed predators, like herons and mergansers or bigger fish, including trout, will be hunting the fry and fingerlings. As they grow larger the fish will encounter fish-eating (piscivorous) mammals as well, predators like raccoons, skunks, bobcats, bears and even people.
Only the Strong (and the Lucky) Survive!

Just like a giant “bio-funnel,” life for trout begins with thousands of eggs and ends up with one or two fish that survive. Describe how each of the factors pictured below affect the survival of trout eggs and fry.