

Your Tank is an Ecosystem!

This lesson has been adapted from a lesson created by the [Watershed Agricultural Council](#).

Description:

In this lesson, students will closely observe their classroom tank to understand how it mimics a trout's natural environment. This will help students better understand what trout need for survival and the importance of tank maintenance.

and thrive. Trout are considered an indicator species, meaning the health of trout is indicative of the overall health of the ecosystem. In the classroom, the tank must mimic natural conditions as closely as possible to ensure the survival of trout from the egg to the fingerling stage.

Objectives:

- Examining the conditions that are necessary for trout growth and survival
- Understanding how a trout tank mimics a trout's natural environment
- Understanding the connections between biotic (living) and abiotic (non-living) things in an ecosystem

Vocabulary:

Abiotic, air pump, air stone, biotic, chiller, dissolved oxygen, ecosystem, filter, forest canopy, hatching basket, indicator species, macroinvertebrate, photosynthesis, redd (trout nest), riffle

Materials:

- Trout in the Classroom Tank
- Your Tank is an Ecosystem Presentation
- Your Tank is an Ecosystem Worksheet

Background Information:

An ecosystem is comprised of the interactions between biotic and abiotic components in a particular environment. The health of the ecosystem is critical to the survival of trout since they require specific conditions to grow

Methods:

Part I

- Begin by showing students this [Poetry of a Watershed Stream video](#) so that they can virtually experience a trout's native environment.
- Ask students what an ecosystem is.
 - An **ecosystem** consists of the interactions between all living organisms and non-living things in a particular environment. There are biotic (living) and abiotic (non-living) components in every ecosystem.
- Instruct students to complete a T-chart listing all of the biotic and abiotic components that they noticed in the video.
 - Pair and share or call on students to share out with the class.
- Have students identify the components of their tank. Compile a list on the board.
 - Hatching basket, air pump/air stone, chiller, trout food, filter, electrical outlet.
- Introduce the idea of an ecosystem function: how different parts of the ecosystem work together to maintain life.
- Hand out the "Your Tank is an Ecosystem!" Worksheet to students. Allow them to look over the worksheet prior to beginning the activity.

- Prompt them to examine the components of the tank – what do they think the forest or stream equivalent is of the tank component that they see?
- Allow students to work in small groups for 10 minutes to complete the worksheet. In their groups, they should discuss the ecosystem function the tank component is providing in the classroom, and what they think the forest/stream equivalent is.
- After this small group activity, come back together and work through the worksheet as a class. Allow students to share what their group discussed and the conclusions they made.
- Provide students with the correct ecosystem function and forest/stream equivalents.
 - Electrical Outlet
 - Ecosystem function: Powers the entire TIC tank.
 - Forest/stream equivalent: Sunlight and gravity power the stream ecosystem.
 - Hatching Basket
 - Ecosystem function: Necessary to protect small fish from getting sucked up by different equipment or injured by the currents in the tank. Also protects smaller fish from being eaten by larger fish (cannibalism).
 - Forest/stream equivalent: *Leaf litter, rocks, sediment, and woody debris*. Female trout build a *redd* and use these items to protect their eggs.
 - Air pump/air stone
 - Ecosystem function: Adds oxygen to the environment. Trout, like us, need oxygen to breathe. In the water, it's a different form of oxygen called dissolved oxygen.

While we use our lungs to breathe, trout use their gills.

- Forest/stream equivalent: *Tree roots, rocks, and stream flow* all help add oxygen to the water. A healthy stream will have steady flow, and as the flowing water hits rocks and tree roots, it creates *riffles* that bring oxygen into the water.
- Chiller
 - Ecosystem function: Maintains the water at a stable, cool temperature. Trout tanks should be between 50-55 degrees since trout are a cold-water species. They will not survive in temperatures above approximately 65 degrees.
 - Forest/stream equivalent: The *forest canopy* helps to shade the water, keeping temperatures cool. Another method of cooling comes from snow, which melts from mountain tops in late winter/early spring and slowly releases clean, cool water into the watershed throughout the warmer months.
- Trout Food
 - Ecosystem function: Nourishes trout as they grow and change life stages.
 - Forest/stream equivalent: *Benthic macroinvertebrates*, such as mayfly larva and crayfish, are food for trout in the stream.
- Filter
 - Ecosystem function: Helps keep the water clean and healthy.
 - Forest/stream equivalent: *Stream flow, macroinvertebrates, soil, tree roots, and rocks*.

Part II

- Use Trout Unlimited's [Brook Trout Atlas - Stream Temperature ArcGIS map](#). Explore

the map to see what stream temperatures are like near NYC's upstate watersheds.

- Discuss amongst classmates what this stream temperature might mean for the ecosystem around it.
 - What do you think affects the temperature of the stream?
 - Do you think trout will be able to survive at this temperature?
- Find the site where you will release your trout on the map.
 - What is the current stream temperature?
 - How do you think ecological conditions, like temperature, affect trout?

Discussion:

- Are any of the stream equivalents surprising? Why or why not?
- Why do we consider trout an indicator species?
- What steps can you take to ensure your tank ecosystem is healthy?
- Why is tank maintenance so important?
- Why do you think it's important for your TIC tank conditions to mimic forest/stream conditions?

- What is an ecosystem service? Do these stream equivalents we discussed also provide ecosystem services? (*i.e. benefits to human well-being*)

Extension:

- Ask students to draw a stream environment incorporating all of the necessary elements for trout.
- Ask students to draw and label their own tank.
- Teach students more about watershed health through the Watershed Health and Management presentation and the Creating a PSA for Stream Protection lesson.
- Lead a water quality testing lesson and ask students to relate findings to the different tank equipment (e.g. the dissolved oxygen level is high thanks to the air pump and air stone; the ammonia is low because the filter is working properly).

NYC Department of Environmental Protection

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Tank Equipment	Ecosystem Function <i>(Hint: Why is it important for trout?)</i>	Forest/Stream Ecosystem Equivalent
Electrical Outlet		
Hatching Basket		
Air Pump/ Air Stone		
Chiller		
Trout Food		
Filter		

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