

# Trophic Levels Relay Race

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## Description:

This lesson is an active way for students to learn about trophic levels, energy transfer, and food chains within stream ecosystems. Students will participate in a relay race, moving from one end to another in order to retrieve each organism in a freshwater stream's food chain and place it on their self-drawn ecological pyramid.

## Objectives:

- Understand the concept of trophic levels
- Understand the relationship between producers and consumers and energy transfer between levels
- Learn how trophic levels apply to stream ecosystems and to trout
- Become familiar with the ecological pyramid

## Vocabulary:

Apex predator, autotroph, decomposer or detritivore, ecological pyramid, heterotroph, primary consumer, producer, secondary consumer, tertiary consumer, trophic level

## Materials:

- 3 large pieces of paper or posters
- 3 sets of organism cards
- 3 sharpies or thick pens
- Tape
- Three buckets
- Sample of ecological pyramid drawn on a large piece of paper or poster

## Background Information:

Trophic levels are the position of an organism within the food chain. There are two major

categories of organisms, autotrophs and heterotrophs. Autotrophs are able to produce their own sustenance from inorganic sources. Heterotrophs are not able to do this, and thus must feed on other organisms (organic sources). The trophic levels can be organized within an ecological pyramid, which shows the transfer of energy between these levels (from low to high). Only about 10% of the energy from the previous level is passed up the food chain, which is why the consumer levels are limited to four (primary, secondary, tertiary, and apex). At the bottom of the food chain are producers, then come primary consumers, secondary consumers, tertiary consumers, and finally, the apex predator. It is also important to note that there are consumers that can feed at multiple trophic levels. For example, humans often eat both producers (plants) and other consumers (animals). Thus, some consumers can be both predators and prey. In rare cases, producers can also be consumers (e.g. Venus fly trap). Detritivores, or decomposers, such as fungi or bacteria, work at all levels in the pyramid to break down dead organisms to add nutrients back into the food chain through producers.

## Methods:

- Set up the game outdoors or in a large indoor space such as a gym or cafeteria.
  - Place each sheet of paper in a line with a marker and tape.
  - Across from the papers, set up each bucket with a set of the organism cards loose in it.
  - Bucket should be at least 20 feet away from the paper, further if possible.
- Introduce the topic of trophic levels using a sample of an ecological pyramid portraying a

different ecosystem (not a freshwater stream ecosystem). Make sure to describe the interactions between each tier of the pyramid so that students understand the concept before embarking on the game.

- In a desert ecosystem, some example roles could include a cactus, a mouse, and a hawk. Ask students to determine where in the ecological pyramid each of these organisms fall.
- In an urban environment, example roles could be street trees, insects, birds and raptors. We also have found coyotes in NYC!
- Explain that energy is derived from the sun and moves up the ecological pyramid, but only 10% is retained between levels.
- Divide students into three to four groups of five to ten students and allow groups time to name their team.
- Explain the game:
  - First, each group has to draw their ecological pyramid.
  - Once that is complete, one at a time, students will travel (e.g. speed walk) to the bucket and retrieve an organism card at random. They will bring it back to the group and decide where to place it.
  - Once the card is placed, the next student can travel to the bucket to retrieve the next card.
  - This will continue until there are no cards left in the bucket and their ecological pyramid is complete. Each student in the group should participate in the relay race if possible.
  - The group that correctly completes their pyramid first wins the race.
  - Have each group show their ecological pyramid to the other two groups and explain why they placed each organism where they did. You can ask each group

to explain one trophic level and check in with the other groups to see if they agree.

### Discussion:

- Do organisms have to be only predators or prey? Can consumers be both? Can producers?
- Where would you place detritivores on your ecological pyramid?
- Can trophic levels be applied to our own consumption habits? How might we use the ecological pyramid to pursue more sustainable eating habits?
- Can trophic levels improve our understanding of and help us better manage fisheries? How?

### Extensions:

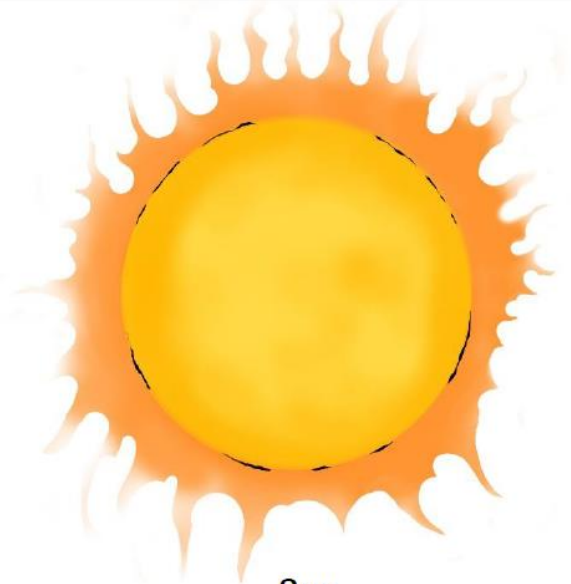
- Have students research how contaminants introduced into an ecosystem affect different trophic levels in an ecosystem of their choosing.
- Direct students to put together a skit in groups creating characters out of various organisms in each trophic level. Make sure that students are choosing characters that represent each tier of the pyramid, as well as the sun.
- Ask students to create a food web with the activity cards to demonstrate the complexity of interactions between organisms.
  - Students can additionally create a food chain to demonstrate the differences between food chain and food web diagrams. Students should add in organisms not portrayed in the cards.
  - Or, students can create another ecosystem's food web/chain of their choosing with hand-drawn or printed images.

# TROUT IN THE CLASSROOM

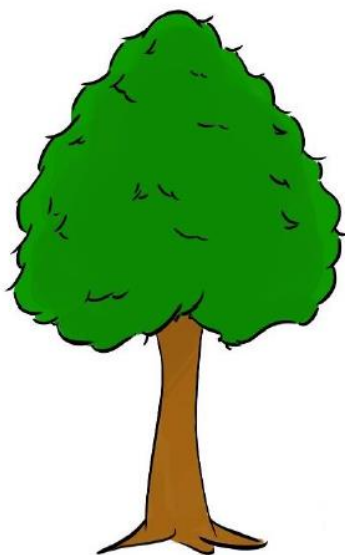


## Trophic Level Cards

*Illustrations by Aaron Lafond*



Sun



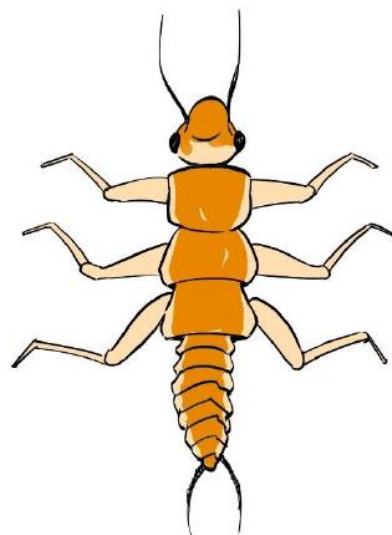
Tree



Algae



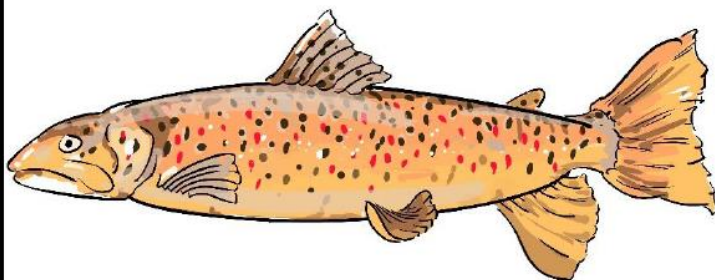
Mayfly Nymph



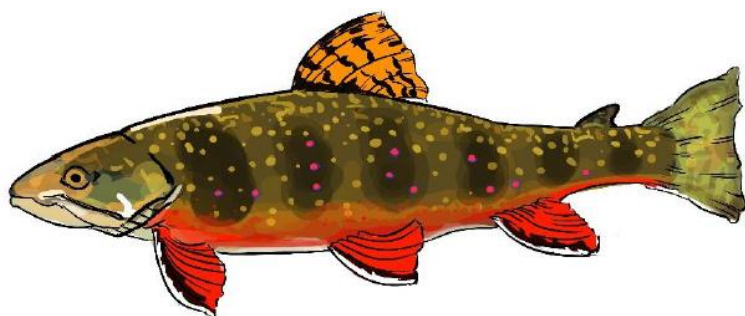
Stonefly Nymph



Caddisfly Larva



Brown Trout



Brook Trout



Great Blue Heron



Black Bear

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