# 4-H Grab and Go:
# *Exploring an Ecosystem*

**Concept:**
Recognize the importance of inter-relationships between the living and non-living elements in an eco-system.

**Age Level:**
Middle School: Grades 6-8

**Education Standard:**
NS.5-8.3 Life Science

**SET Ability:**
Build/Construct, Measure, Ob-serve

**Life Skill:**
Personal Safety, Teamwork

**Success Indicator:**
Using the terraqua column, de-scribe the biotic and abiotic com-ponents and how they relate to create an ecosystem.

**4-H Curriculum:**
Exploring Your Environment **(www.4-H.org/curriculum/environment)**

**PREPARATION**

**Time:** 60 Minutes
**Space:** Classroom
**Materials:**

- (1) 2-Liter Soda Bottle per 2 person team
- Very sharp utility knife
- Awl (a pointed instrument for piercing holes in leather, wood, etc.)
- Hammer
- Clear packing tape
- (4) Gallon Milk/Water bottles
- Duck weed and pond water*
- 2-3 Snails/2 person team**
- Potting soil
- Sand or Vermiculite or Gravel
- Pothos or Philodendron plant that needs cuttings taken from it.
- Clippers
- Rooting hormone
- Roll of cotton yarn (undyed)

## Background Information:

An **ecosystem** is a group of plants and animals found in the environment in which they live. An ecosystem has input and output from living and nonlivng things that are knit together in an organized way including **biotic**, all living organisms, and **abiotic**, all non-iving elements. Input can be energy and resources in the form of temperature, sunlight, soil, and wind. Outputs can be the ways the system produces (carbon dioxide, oxygen, and water - type, depth, contaminants. When we think of ecosystems, we often think of water-based systems such as wetland ecosystems, freshwater ecosystems, coastal ecosystems. (services such as food, fresh water, fuel, and fiber), 2) ***Regulating*** (services such as climate, water, and disease regulation and pollination), 3) ***Supporting*** (services such as soil formation and nutrient cycling), 4) ***Cultural*** *(*services such as educational, aesthetic, and cultural heritage values as well as recreation and tourism). Some of us live in a rural ecosystem, others in a suburban ecosystem and others in an urban ecosystem. Regardless of where we live, ecosystems provide services and our daily interactions with biotic and abiotic components of the ecosystem will have effects. In this activity youth will have an opportunity to create a water-based ecosystem located in their environment.

## Making a Terraqua Column

**Prepare Ahead**: Collect used 2-liter soda bottles; removed labels and wash thoroughly, allowing sufficient time to dry. Carefully, using a very sharp utility knife, poke into the bottle at the point the bottle stops curving down from the top and begins to create a straight cylindrical body. From this point, cut all the way around the bottle and return to where you began, removing the top. Remove the bottle cap and place it bottom down on a hard surface. Using an awl and hammer, create a 1 cm hole in the middle of the cap. Note: Keep all soda bottle parts (this makes up your soda bottle unit).

# Exploring an Ecosystem (Continued)

**YOUTH DEVELOPMENT TIP:**

***SAFETY***

No matter how responsible a middle school aged youth might be, it's important to weigh the risk of letting them use sharp tools versus what knowledge they can gain from doing the activity. In this case, do the cutting work ahead of time, and let the youth do the construction.

**Information about Duckweed:**

*If you pass a pond somewhere in your travels, and it has little lime green leafy plants floating on top, it is likely to be duckweed. The pond owner would probably welcome you to take this off his/her hands. However, don't go onto private property without permission and without an adult present. Oftentimes, an increase in the amount of duckweed means that the fish population is out of balance. With permission, use the empty gallon bottles, to collect the duckweed and pond water together.

**When looking for snails, you want the really little kind. Often times you can go to a pet store that sells fish--they may give you some for free. Sometimes snails come in on their plant material and it becomes a nuisance in the aquariums.

**Open Ended Questions:**

1. What things in an ecosystem do plants need to live?
2. How are organisms affected by abiotic factors?
3. What happens to the animals and plants when humans harm the ecosystem?

Divide the youth into teams of two and instruct them to:

1. Gather one soda bottle unit, some clear packing tape, and 6 inches of plain cotton yarn.
2. Take the base of the soda bottle unit and place it upright on their tables.
3. Fill the base with pond water and duckweed.
4. Gather 2-3 snails for their team, for the base of their soda bottle unit.
5. Wet the yarn and thread it through the hole in the bottle cap, with equal portions on each side. *Note:* The yarn will serve as a wick to water the plants.
6. Place the top portion of the bottle unit upside down (cap portion down) into the base. Have the youth place sand or vermiculite or gravel in this section (called the "terra section") of the column, up to where it meets the top line of the base.
7. Take three cuttings from the Pothos or Philodendron plant. Dip the tips that were just cut into the rooting hormone.
8. Place the cuttings upright into the terra section and slowly fill it with potting soil until it is approximately ½ inch away from the top.
9. Use clear packing tape to make a tight seal around the opening where the base and the top of the soda bottle meet. *Note:* This should make the terraqua column tight and leak proof. You do not want to shake it up, because doing so would disturb the ecosystem and its living creatures.

## Checkpoint:

1. What is role of the duckweed in the terraqua column? (Food source for the snails; gives off nutrients for the house plants.)
2. What role does the sand/vermiculite/gravel play in terra portion? (Assists drainage.)
3. What is the purpose of the rooting hormone? (Stimulates a plant to send new roots out of a stem node) Why did we use it today? (We planted a cutting with no roots and we want it to be able to take up nutrients so that it won't die. In order to do that, it needs roots.)
4. What would happen if salt water got into our freshwater system and remained there? (The freshwater plants and creatures would most likely die off due to salinity poisoning.)
5. What other kinds of water systems function in a similar way in your community? (Open-ended discussion.)

Note: It is important to let the youth know that when the duckweed is dwindling, they will need to replace it, since it is a food source for a live creature.