Lesson Plan Three – Ecosystems Continued

Reference to: Understanding Life Systems, Interactions in the Environment

- **3.8** describe ways in which human activities and technologies alter balances and interactions in the environment
- **3.3** describe the roles and interactions of producers, consumers, and decomposers within an ecosystem

Resources

- 2 x 2-litre jars
- 4 litres of pond water, or tap water if none available
- 6 strands of pondweed e.g. Canada waterweed, fanwort, coontail. At least 10cm long
- Lawn fertiliser
- Protective gloves
- A World Without Fish worksheet (class set, extension activity)

Vocabulary

- Aquatic
- Fertilizer
- Malaria
- Parasite
- Runoff

Summary

Students will observe an ecosystem in the classroom, and see how humans can interfere with the balance of ecosystems in nature.

Objectives

Students will:

- See how humans can affect an aquatic ecosystem with the use of fertilisers.
- Appreciate how affecting the ecosystem can be detrimental to both organisms living in the ecosystem and also humans.

Starter Activity

Anagrams

Description

The students work out the anagrams below, a recap from last lesson.

Instructions

1. Write the following anagrams on the board for the students to solve in their books. Tell them they are not to call them out when they have found the answers, they are to give the other students a chance to solve them.
2. If they finish before the other students they can create some of their own anagrams using words from this module.
3. Once they have been solved. Write the definitions for the students to copy into their books.

- Rudecopr (Producer) - an organism which produces its own food e.g. plant
- Ruscomen (Consumer) – an organism which feeds on other organisms
- Hovrirbee (Herbivore) – an animal which only eats vegetation
- Vanriceor (Carnivore) – an animal which only eats meat
- Niomover (Omnivore) – an animal which eats both vegetation and meat
- Escpooderm (decomposer) – an organism which feeds on dead and decaying matter.

Main Activity

Model Ecosystem

Description

In this activity a model ecosystem is created in the classroom. The experiment below is the simplest version of this experiment. You can create an ecosystem as a class demonstration getting students to perform various stages of the process or in can be carried out as a class practical with each student, or groups of students making their own ecosystems. Ensure there is enough counter space in a sunny location to store all of the ecosystems created.

If you wish to take a more detailed approach to building a model ecosystem in the classroom please see the "Bottle Ecosystem Information Sheet"

Instructions

- Fill the two jars with equal amounts of pond water, or tap water if none available.
- Label one "Control" and one "Experiment".
- Wearing gloves dissolve a few granules of fertiliser in water and add to the "Experimental" jar (too much will kill most life found in pond water).
- Add half of the aquatic plants to each jar.
- Place the jars side by side in a bright location.
- Observe the changes in the plants over the next few weeks.

Questions to be completed in a few weeks once changes have been observed in the ecosystems.

1. What are the producers in this ecosystem? (plants)
2. Why is the control jar important? (to ensure that the changes in plant growth is due to the addition of fertilizer and not any other variables e.g. light or temperature, both of the jars are kept in the same location)
3. Describe the changes the fertilizer caused in your ecosystem.
4. Explain these changes. (the fertiliser provides extra nutrients which enables the plants to grow at a faster rate)
5. Explain how sewage and fertiliser runoff can cause changes in the Great Lakes ecosystem (Plant and algal growth, as the plants and algae die the decomposers feeding on them use up oxygen in the water, reducing the oxygen available to the other organisms living there)
6. What can we do to try to prevent the above from happening? (do not use fertiliser on garden – plant local plants instead of lawn grass to avoid use of chemicals, storm sewer collection – keep clean water flowing dispose of pet waste accordingly, choose non phosphate or low phosphate detergents)

Adapted from Adopt- A- Pond wetland curriculum resource, A Toronto Zoo and Picov's Water Garden Center and Fisheries Publication.

Plenary Activity

How Humans can Affect a Stream Ecosystem

Description

This activity is a worksheet looking at the issues that can affect a stream ecosystem if humans build a town in the area. Students will also complete a question about a food web, recapping on last lesson's work. They will see how by removing one species, in this case insects, the whole food web is disrupted.

Instructions

1. Students are to work independently or in small groups to answer questions on the "**Issues that Affect a Stream Ecosystem"** worksheet.
2. Go through their findings and give them any information they may have missed. **See "Answers for Issues that Affect a Stream Ecosystem"**

Extension Activity

- Students complete the **World Without Fish worksheet**.

Issues that Affect a Stream Ecosystem

1. Why might people want to live near a stream?

……..

……..

……..

……..

2. What if a town or village was built near the stream, or over top of part of the stream. What kind of disruptions or bad influences might this have on the ecosystem?

……

……..

……..

……..

3. Below is a food web from a stream ecosystem. If the number of insects living in the stream decreased, due to pollution. What would the effect be on the following organisms? Think about their numbers and their food source.

a) Aquaticplants……...

……..

b) Leopardfrog…….....

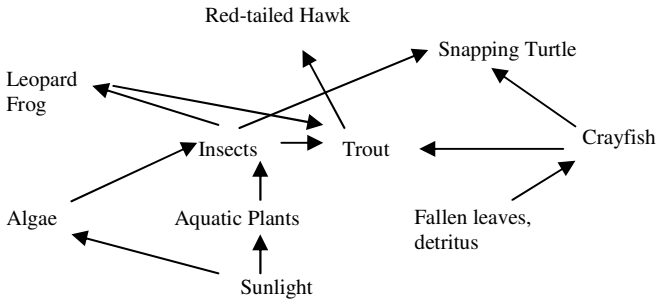
.....……

c) Trout……

……..

d) Red-tailed hawk……..

……..



Issues that Affect a Stream Ecosystem

1. **Why might people want to live near a stream?**

    1. People could catch fish for food.
    2. People could use water from the stream.
    3. People could build houses near the stream.
    4. The stream could still be healthy at this point if people lived in **balance** with the ecosystem and didn't *overexploit* it.

2. **What if a town or village was built near the stream, or over top of part of the stream. What kind of disruptions or bad influences might this have on the ecosystem?**

    Disruption to the area would destroy habitats and kill many species, including fish. This would reduce the *biodiversity* and balance of the ecosystem.

Disruptions may include:

a. **Over-fishing**
b. **Pollution**
c. **Paving** – when vegetation is lost and replaced by concrete there is an increased risk in flooding, as water runs straight off the concrete into the storm sewer, which runs straight into waterways. If vegetation is present, then the soil would absorb some of the water and it would make its way into waterways much more slowly.
d. **Destruction of wetlands** also leads to **flooding**, as these areas are the link between the land and the water. They act as natural sponges that trap and slowly release surface water, rain and snowmelt)
e. **Logging**- cutting down the trees will cause soil to be washed into the stream. The roots of trees hold the soil together. Without the trees, when it rains the soil can be washed into the stream leading to **siltation** (when the stream gets choked with silt or mud).
f. **Increased water temperature** – factories using water for cooling purposes may release warm water into the stream, affecting wildlife and plants.
g. **Disrupted flow of water** - the building of dams etc. will affect fish migratory paths.
h. **Extirpation of wildlife** – when a species lives in one area but is extinct in another area for example the Atlantic salmon in Lake Ontario.
i. **Extinction of wildlife** - when a species no longer exists, for example some cichlid fish species in Lake Victoria.

3. **What would the effect be on the following organisms? Think about their numbers and their food source**.

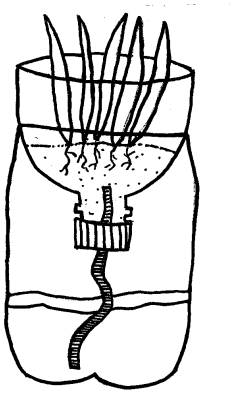
Aquatic plants	The number will increase as they are not being eaten.
Leopard frog	Their numbers will decrease as they have reduced food source.
Trout	They will have less to eat, as the number of two of their food sources has decreased, the insects and leopard frogs. They will feed mainly on crayfish. As they have less food the number of trout may also decrease.
Red-tailed hawk	Their numbers will decrease as their food sources – the leopard frogs and trout will be decreased.

A World Without Fish: What would it look like?

Effects on the Ecosystem **My local stream/river is called:** _____	**Effects on Us**
Example: Prey species (i.e. insects) would become overpopulated. →	Example: Greater risk of contracting diseases transmitted by insects (i.e. malaria).

Answer sheet
A World Without Fish: What would it look like?

Effects on the Ecosystem **My local stream/river is called:** _____	**Effects on Us**
Example: Prey species (i.e. insects) would become overpopulated. →	Example: Greater risk of contracting diseases transmitted by insects (i.e. malaria).
Disrupted Food Chains →	Loss of food sources Loss of fishing industry, income
Wetlands and watersheds disrupted →	Wetlands may be degraded, impacting drinking water quality
Loss of biodiversity →	Unstable ecosystems could lead to losses of other species needed for food, medicine, etc.
Loss of food for predators (i.e. birds, reptiles) →	Loss of other species used for food
Overpopulation of species that compete with fish for space and food →	Loss of jobs, trade and tourism
Loss of food source for decomposers →	Loss of wildlife enjoyment for future generations



Bottle Ecosystem Information Sheet

This experiment has been based on experiments found at www.bottlebiolgy.org/investigations and additional information and ideas can be found there.

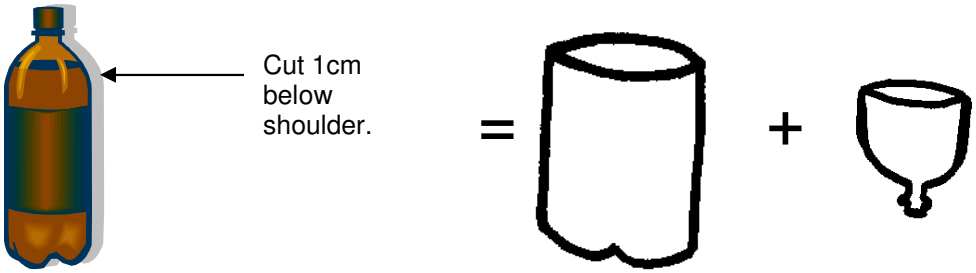
- Below shows you how to make an ecosystem for the classroom out of a 2 litre pop bottle.
- You could make one classroom ecosystem or each student could make their own.

Resources

- One 2-litre pop bottle
- One bottle cap
- Cotton string
- Water, preferably from a pond, stream, lake, puddle etc.
- Soil, bought or found locally
- Plants, fast growing ones work best, e.g. lawn seed mixes
- Tool box (for making hole in bottle cap)
- Scissors

Instructions

1. Remove label from the pop bottle. Cut the bottle 1cm below shoulder.

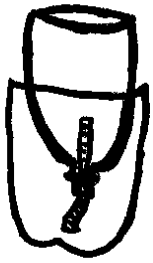


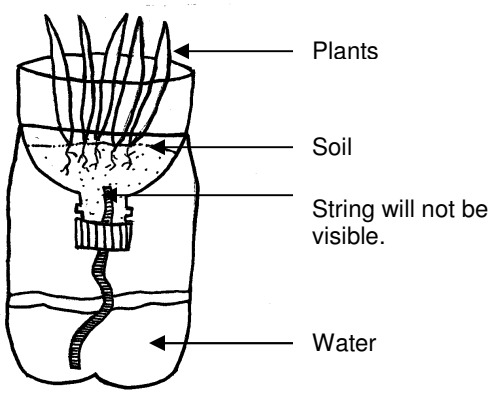
2. Put a 1cm diameter hole in the bottle cap (using tool from tool box).

3. Put the cap back onto the bottle.

4. Wet the string and thread it through the hole in the bottle cap. It should be quite loose in the hole.

5. Invert the top of the bottle into the base of the bottle. The string should be long enough to reach the bottom of the reservoir bottle, and some should be pocking out into the inverted bottle – about 5cm.





6. Fill the reservoir with water. It is best to use water from a stream, lake or puddle as they will contain micro-organisms. If these sources of water are not available use tap water.

7. Add a layer of gravel or sand to the bottom of the top chamber to aid drainage.

8. Add soil to the top chamber, preferably collected soil not store bought.

9. Ensure the string in the top chamber is running up through the soil and not stuck to the side of the chamber.

The plants growing in the top chamber, the terrestrial portion of the ecosystem (land) will take nutrients from the soil and with the help of the string wick, take water and nutrients up from the aquatic portion of the ecosystem.

Anything you add to the terrestrial section of the ecosystem will move down through the soil and wick into the aquatic section and vice versa. You can use this model to see how substances added to the land can find their way into the aquatic ecosystem and effect life there, and to see how substances that find their way into the aquatic part of an ecosystem can affect the terrestrial components.

Example Experiments

When investigating a variable in your ecosystem always ensure you have a "control" ecosystem. This is an exact replica of your ecosystem – it has the exact same soil and amount of soil, it is given the same amount of water etc. it also needs to be kept in the same location, to ensure the temperature and light intensities are the same.

Does putting fertilizer on your lawn affect the quality of your local streams and lakes?

Add a few drops of fertilizer onto the soil of the "test ecosystem" add none to the "control ecosystem". Observe the effects on the terrestrial plants and see if any algae develops in the aquatic portion. A few drops of fertilizer could be added each week.

Does putting salt on your drive way affect aquatic plants growing in local streams and lakes?

You could add aquatic plants to the aquatic component of the ecosystem and see if adding salt to the terrestrial component affects their growth.