



## CHATHAM CONSERVATION FOUNDATION, INC.

540 Main Street • Chatham, MA • 02633-2239

508 945-4084

CCFinc@comcast.net

www.chathamconservationfoundation.org

### **Lesson Plans in Conservation of Earth's Natural Resources**

Per the NGSS standards revision on April 16 2016

MA DESE template

Strand: Earth's Systems

Standards Covered: 7.MS-ESS2-4.

Develop a model to explain how the energy of the Sun and Earth's gravity drive the cycling of water, including changes of state, as it moves through multiple pathways in Earth's hydrosphere.

**Essential Question:** How does the water cycle function and is it the same in all environments?

#### **Introduction:**

What is the water cycle? The water on Earth is continuously recycled and is never created. The process of this continuous recycling is called the water cycle. The water content in, on and above the Earth is transformed from liquid to water vapor and ice. All life on Earth, the local weather conditions and the global climate itself depend on the water cycle.

A number of human activities can impact the water cycle such as using water for agriculture, deforestation, damming rivers and the burning of fossil fuels.

We have seen many extreme weather events this year according to the National Weather Service ([www.weather.gov](http://www.weather.gov)) which have resulted in flooding, drought, wind damage, erosion, etc.. Drought is defined as the below-average precipitation which affects the amount of moisture in soil, as well as the amount of water in streams, rivers, lakes, oceans and groundwater.

Assessing Prior knowledge:

Before the lesson, have students, in small groups, brainstorm and create a graphic organizer to describe the main processes of the water cycle using the correct content vocabulary and graphics.

#### **Content vocabulary:**

Evaporation, condensation, precipitation, runoff, groundwater, percolation (or infiltration), transpiration

Student Challenge: How can you design a model to illustrate the water cycle in a particular environment such as an urban setting, coastal area or forest? Would the water cycle transfer the

equivalent amounts of water in an urban setting vs one in a natural setting such as a wooded area?

**Materials:** Goose-neck or heat lamps, empty rotisserie chicken containers (grocery stores will gladly donate a class set), sand, soil, greenery from outside (moss, chunks of live grass, small live plants, if available depending on the time of year), spoons or trowels, rulers, plastic wrap or foil, a 1 cup measuring cup, a journal or science notebook to record observations over time.

**Procedure:**

- Divide the students into groups of 3
- In their groups, they will decide which environment they will create in their container.
- Place 10 cm of sand or soil in the bottom.
- Teacher discretion is needed here in terms of amounts; keeping in mind that there needs to be enough to observe percolation (infiltration) if they are not covering it over with 'asphalt' (foil or plastic wrap).
- Add the greenery, if applicable.
- Gently pour 1 cup of water throughout the container to simulate rain and so that it does not pool in one area.
- Seal the containers and place them under the lamps or in direct sunlight.
- Record their observations over time intervals of your choosing, noting the duration of 'sunlight' exposure between recordings.
- Have each group share their results with the class, as to compare the different environments.

**Results and Discussion:**

1. What did you observe in terms of the amounts of condensation?
2. When constructing your environment, did you have parts that would have affected the amounts of evaporation in your model? Explain your answer.
3. Was your land surface flat? Did you have areas of runoff? Explain.
4. Upon comparing your model with other groups, did you see different amounts of percolation (infiltration) in other models and, if so, explain why.
5. Can you make a prediction as to the effect of increasing the temperature (by adding a second heat lamp or leaving the lamps on 24/7) on your water cycle model?
6. Can you make a prediction as to the effect of increasing or decreasing the amount of rainfall on your model?

**Further Extensions:**

A watershed is an area of land where water collects to feed into bodies of water such as a wetland, pond, stream, mouth of the bay, etc.. Have the students construct a watershed outside by laying a tarp down on land with a bumpy topography and using spray bottles for simulated rainfall. OR construct a watershed indoors using a plastic shoe box filled with sand or dirt.