# USU 4-H Enviroscape Tote

**BIG IDEA:**
Geologic formations and vegetation affect the flow of water in an area.

**UNDERSTANDINGS:**
As water flows into watersheds it picks up pollutants.
Best management practices help reduce how many pollutants enter the watershed.

**ESSENTIAL QUESSTIONS:**
What activities cause pollution?
How can people best prevent pollutants from entering the watershed?

**THREE DIMENSIONS, UTAH SCIENCE STANDARDS, AND INTENDED LEARNING OUTCOMES:**
See pg. 5-7

**Supplies**

- Paper*
- Pencils*

**Watershed Model** p. 2
- Enviroscape/watershed model
- Spray Bottles*
- Pollutants* (it is best to use sugar free pollutants on the model because they are less sticky)
    - Red drink mix
    - Green drink mix
    - Cocoa
    - Soy sauce
- Best Management Practice Materials
    - Strips of green felt
    - Modeling clay
    - Small Sponges

*Not included in tote

**Activity 1: Watershed Model** (This lesson is from Utah State University Water Quality Extension http://extension.usu.edu/waterquality.)

Time: 15-30 min

Grade Level: K-12

Materials:

- Enviroscape/watershed model
- Spray Bottles
- Pollutants (it is best to use sugar free pollutants on the model because they are less sticky)
    - Red drink mix (pesticides)
    - Green drink mix (fertilizers)
    - Cocoa (sediment, sewage-add water to make sludge)
    - Soy sauce (gas and oil)
- Best Management Practice Materials
    - Strips of green felt (vegetation)
    - Modeling clay (berms to prevent runoff)
    - Small Sponges (hay bales at a construction site)

**To Do:**

1. Position the model so it is visible to all the students.
2. Ask the students what the model represents. (A watershed. A watershed is an area of land from which all the water drains to the same location such as a stream, pond, lake, river, wetland or estuary.)
3. Have the students spray water on the model to simulate a rain event. Ask students where all the rain goes? (Most of the water eventually flows through the river and to the lake.)
4. Discuss how water moves through a watershed (i.e., runoff, groundwater). Be sure to point out that some water never runs off, but stays in the watershed. Ask the students: Does the lake look clean or dirty? Would you like to swim in it?
5. Dry off the model.

Part Two:

6. Ask student what they think of when they hear the word pollution? Discuss point source and no-point source pollution (information is found in the Apply section of this activity).

7. Ask students what places on the model might contribute to point source pollution (i.e. Industrial plant and sewer treatment plant.) Ask what places might contribute to non-point source pollution (i.e. plowed field, construction site, stream bank, lawns and golf course, forest, areas with livestock, roads and parking lots, and household waste).
8. As you discuss possible pollution sources, sprinkle the contaminants onto the model.
    - Red drink mix – pesticides can be found on a farm, or on gardens in the residential areas.
    - Green drink mix – fertilizers can be found on the golf course, lawns in the residential area or on farms.
    - Cocoa – sediment can be found on the mountain (which may have had logging activity), on farms (where the farmer has recently plowed the field) or on a construction site.
    - Soy sauce – gas and oil may be found on the road ways, driveways, or the construction site.
9. Have the students spray the model to simulate a rain event.
10. Ask the students how this rain event compares with the rain event before the pollutants were added. What was different? Where did most of the pollutants end up?
11. Ask the students how water pollution can be prevented. (Permits and regulations are put in force for point source pollutions. Best management practices are used to reduce non-point source pollution.)
12. Demonstrate Best Management Practices (BMPs) on the surface water model. Use green strips of felt to create vegetation along the stream banks and lake shores. Use small sponges to represent hay bales at a construction site. Use the modeling clay to create berms to prevent runoff. Repeat the procedure starting at "Part Two." Have the students compare the amounts of pollutants that entered the lake with the BMPs in place and without.
13. Discuss strategies on how to reduce water pollution and why reducing water pollution is important. Have the students brainstorm how they can help reduce water pollution on a large scale (in their community) and on a small scale (in their own homes).

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**REFLECT:**

- What does the model represent?
- Where does all the water go?
- Does the lake look clean or dirty? How would you feel about swimming in it or drinking

it?

- What do you think of when you hear the word pollution? What is point source pollution? What is non-point source pollution? What places contribute to pollution?
- How do the rain events compare between the different models? Where did the pollutants end up?
- What can we do to prevent pollution? What types of strategies can we use?

**APPLY:**

A watershed is an area of land from which all the water drains to the same location such as a stream, pond, lake, river, wetland or estuary. A watershed can be large, like the Mississippi River watershed, or small, such as all the water that drains to a small pond. Large watersheds are often called basins, and contain many small watersheds.

Watersheds can transport non-point source and point source pollution. Non-point source pollution refers to pollutants that are brought into the water system by rainfall and snowmelt runoff moving over and through the ground to a water source. There is typically no single source of these pollutants, and they often accumulate over a large area. Examples of non-point source pollutants are pesticides, fertilizers, sediment, and gas and oil (e.g., from car leaks). Point source pollutants refer to pollution that enters the water from a pipe or ditch. Often the pollution has a single source such as chemical waste entering a stream from a pipe. Best Management Practices (BMPs) are ways to manage the land in order to reduce or prevent non-point source pollution to surface and groundwater.

Examples of best management practices include:

- Native vegetation along streams and lakes to prevent sediment and other contaminants from washing into the water.
- Using the appropriate amount of pesticides and fertilizers to prevent chemicals from becoming runoff and entering bodies of water.
- Keeping automobiles in good condition and fixing leaks to prevent oil and gas from contaminating the water.
- Reforesting after a logging event, or practicing selective logging.
- Placing hay bales or silt fences around a construction site to prevent sediment runoff.

**LINKS FOR FURTHER INFORMATION AND RESOURCES:**

http://cfpub.epa.gov/surf/locate/index.cfm (for information on watersheds in your area)
http://extension.usu.edu/waterquality/htm/contact (for landfill and wetland models)
http://water.epa.gove/polwase/nps/dosdont.cfm (for information on reducing pollution around your home)

# Three Dimensions, Utah Science Standards, and Intended Learning Outcomes

**Note:** These applications of National and State Science Standards are not comprehensive. They are meant to serve as suggestions. While only standards for elementary levels have been listed, standards for more advanced grade levels can also be applied. Additionally, this tote is an excellent tool to facilitate inquiry for any age group.

## THREE DIMENSIONS

### K-ESS3-3. Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment

**Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.**

**Science and Engineering Practices:**

- Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas.

**Disciplinary Core Ideas:**

- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things.
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

**Crosscutting Concepts:**

- Events have causes that generate observable patterns.

### 2-ESS2-1. Earth's Systems: Processes that Shape the Earth

**Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.**

**Science and Engineering Practices:**

- Compare multiple solutions to a problem.

**Disciplinary Core Ideas:**

- Wind and water can change the shape of the land.
- Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

**Crosscutting Concepts:**

- Things my change slowly or rapidly.
- Developing and using technology has impacts on the natural world.

- Scientists study the natural and material world.

**2-ESS2-2. Earth's Systems: Processes that Shape the Earth**

**Develop a model to represent the shapes and kinds of land and bodies of water in an area.**

**Science and Engineering Practices:**

- Develop a model to represent patterns in the natural world.

**Disciplinary Core Ideas:**

- Maps show where things are located. One can map the shapes and kinds of land and water in any area.

**Crosscutting Concepts:**

- Patterns in the natural world can be observed.

**3-LS4-4. Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms**

**Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.**

**Science and Engineering Practices:**

- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

**Disciplinary Core Ideas:**

- When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations yet others move into the transformed environment, and some die.
- Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

**Crosscutting Concepts:**

- A system can be described in terms of its components and their interactions.
- Knowledge of relevant scientific concepts and research finding is important in engineering.

**3-ESS3-1. Weather and Climate**

**Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.**

**Science and Engineering Practices:**

- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

**Disciplinary Core Ideas:**

- A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazard but can take steps to reduce their impacts.

**Crosscutting Concepts:**

- Cause and effect relationships are routinely identified, tested, and used to explain change.
- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.
- Science affects everyday life.

## UTAH SCIENCE STANDARDS

### K-Grade 2

**Standard 1:**

- The Processes of Science, Communication of Science, and the Nature of Science. Students will be able to apply scientific processes, communicate scientific ideas effectively, and understand the nature of science.

## INTENDED LEARNING OUTCOMES (ILO'S):

1. Use science process and thinking skills.
2. Manifest science interests and attitudes.
3. Understand important science concepts and principles.
4. Communicate effectively using science language and reasoning.
5. Demonstrate awareness of the social and historical aspects of science.
6. Understand the nature of science.