TEXAS
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GRACE Educational Curriculum WEATHER / CLIMATE/ ATMOSPHERE	
Teachers	Grades 6-8
Science	

GRACE Mission - "Modeling Your Watershed" (Hydrology)

Background:

Project GRACE is capable of measuring small changes in the Earth's mass. The gravitational pull of earth varies slightly from place to place because of subsurface water and rocks have different densities. GRACE is very sensitive to small changes in aquifers. With this powerful satellite, scientists will investigate yearly changes in aquifers, such as those under many of the deserts. In this activity, students learn about their own aquifers by modeling a watershed and predicting water flow. Students will interpret maps and images.

Teachers will discuss hydrology, watersheds, and divides with the students. Hydrology is the study of water circulating in a cycle from the Earth's surface to the atmosphere. This is one of the most basic processes in nature. A watershed is a system called a catch basin that guides precipitation and runoff to a common body of water. A divide, like the Continental Divide (CD), causes these watersheds to flow to the east of the CD into the Atlantic Ocean and to the west of the CD into the Pacific Ocean.

Objectives: At the end of the lesson, the students will be able to:

- read and interpret maps.
- create a model that demonstrates how water moves throughout their watershed.
- understand the basics of hydrology

Standards: Science: unifying concepts & processes; science as inquiry; physical science; earth & space science; science & technology

Vocabulary:

Hydrology	Mouth of a stream
Source of a stream	Watershed
Contour map	Cycle
Tributaries	Meandering

Materials:

Plywood sheet (approximately 1m x 1m)
Rocks of various sizes
Waterproofing material or a household plastic wrap
Plant sprayer
Topographic map of your Hydrology Study Site and surrounding area [see your state geologic survey web site or office for these maps]
Landsat image of your study site
Plaster of Paris, clay, or similar material

Procedure: **[This activity will take two-three class periods]**

1. Ask students:
   "What is a watershed?"
   "Why are watersheds important?"
2. Distribute the topographic maps and Landsat images for your area. Assist the students in their orientation of these two maps. Ask the students to identify their watershed with a name and find its boundaries. Use the contour lines and elevation changes on the topographic maps to establish the watershed boundaries. Students will mark hilltops and ridges of their watershed.
3. Ask the students to choose an easily identifiable point such as a mouth of a stream. Have the students work backwards from this point, marking peaks, ridges, and other landforms that separate adjacent streams. Ask the students: "Which way would the water flow from this point?" Have students draw arrows to show drainage patterns. As more points are identified on their maps, students will be able to visualize their watershed.
4. Use small groups. Students will create a model of their watershed. Provide the students with the materials to build their model. Using the plywood board, students will place rocks of different shapes and sizes, plaster of Paris, clay, and/or other materials to recreate their watershed. Cover the model with waterproofing material or household plastic wrap. Push down on the plastic to give it shape and to ensure that there are high and low spots.

5. Using a plant sprayer, ask the students to spray water on the model and trace the path a drop of water takes across the watershed and into the watercourse.
6. Discuss and locate where humans live and work in their watershed. Discuss the relationship between human activities and the physical features of the watershed. Locate the patterns of the flow of water in this watershed.
7. Ask students to research the following questions for homework:

   "What larger watershed is our watershed a part of?"

   "Which watershed is this new watershed a part of?"

   Keep answering this question for larger and larger watersheds.

   "What is the largest watershed of all?"

Extensions:

- Compare the modeled watershed with our watershed 50 years ago. What changes have taken place? How have we changed the watershed? Interview neighbors, grandparents, nursing home residents about our watershed. Use this oral history to write a paper or a newspaper article to share your results. Include pictures collected of our watershed from the past.
- Compare the modeled watershed with our watershed 50 years from now. Predict the changes that will take place in our watershed. Interview the mayor, board of supervisor members, water treatment facilitators, state or county naturalists, for information regarding the growth of your watershed. Use this information to write your predictions in a report or newspaper article to share your results. Include drawings of how you imagine our watershed will appear.
- Create a timeline that shows the history of our watershed.

References / Resources:

http://www.epa.gov/owow/watershed/earthday/earthday.html
http://www.epa.gov/OWOW/watershed/Proceed/arnold2.html