

Elementary Lesson Plan #4

GRADE(S): 3rd, 4th, 5th

TOPIC: Watershed

TITLE: Watershed Model

OVERVIEW: Everyone lives in a watershed and everything that is done in a watershed can affect the receiving body of water. By designing and building a watershed model and observing the precipitation and its effects, students can develop an understanding of the factors that influence its ecology.

TEXAS ESSENTIAL KNOWLEDGE AND SKILLS:

Science, 3rd Grade

(b) Knowledge and Skills

- (3.1) Scientific processes. The student conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:
- (A) demonstrate safe practices during fields and laboratory investigations
 - (B) make wise choices in the use of conservation of resources and the disposal or recycling of materials
- (3.2) Scientific processes. The student uses scientific inquiry methods during field and laboratory investigations. The student is expected to:
- (A) plan and implement descriptive investigations including asking well defined questions, formulating well-defined hypotheses, and selecting and using equipment and technology
 - (B) collect information by observing and measuring
 - (C) analyze and interpret information to construct reasonable explanations from direct and indirect evidence
 - (D) communicate valid conclusions
 - (E) construct simple graphs, tables, maps, and charts to organize, examine, and evaluate information
- (3.3) Scientific processes. The student knows that information, critical thinking, and scientific problem solving are used in making decisions. The student is expected to:
- (A) analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information
 - (C) represent the natural world using models and identify their limitations
- (3.4) Scientific processes. The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to:

(A) collect and analyze information using tools including calculators, microscopes, cameras, safety goggles, sound recorders, clocks, computers, thermometers, hand lenses, meter sticks, rulers, balances, magnets, and compasses

(3.11) Science concepts. The student knows that the natural world includes earth materials and objects in the sky. The student is expected to:

(A) identify and describe the importance of earth materials including rocks, soil, water, and gases of the atmosphere in the local area and classify them as renewable, nonrenewable, or inexhaustible resources.

English Language Arts and Reading, 3rd Grade

(b) Knowledge and Skills

(3.12) Reading/inquiry/research. The student generates questions and conducts research using information from various sources. The student is expected to:

(E) interpret and use graphic sources of information, including maps, charts, graphs, and diagrams (2-3)

Social Studies, 3rd Grade

(b) Knowledge and Skills

(3.16) Social studies skills. The student applies critical thinking skills to organize the use of information acquired from a variety of sources including electronic technology. The student is expected to:

(E) interpret and create visuals including graphs, charts, tables, timelines, illustrations, and maps;

Science, 4th Grade

(b) Knowledge and Skills

(4.1) Scientific processes. The student conducts field and laboratory investigations following home and school safety procedures and environmentally appropriate and ethical practices. The student is expected to:

(A) demonstrate safe practices during fields and laboratory investigations

(B) make wise choices in the use of conservation of resources

(4.2) Scientific processes. The student uses scientific inquiry methods during field and laboratory investigations. The student is expected to:

(A) plan and implement descriptive investigations including asking well defined questions, formulating well-defined hypotheses, and selecting and using equipment and technology

(B) collect information by observing and measuring

(C) analyze and interpret information to construct reasonable explanations from direct and indirect evidence

(D) communicate valid conclusions

(E) construct simple graphs, tables, maps, and charts to organize, examine, and evaluate information

(4.3) Scientific processes. The student knows that information, critical thinking, and scientific problem solving are used in making decisions. The student is expected to:

(A) analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information

(C) represent the natural world using models and identify their limitations

(4.4) Scientific processes. The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to:

(A) collect and analyze information using tools including calculators, microscopes, cameras, safety goggles, sound recorders, clocks, computers, thermometers, hand lenses, meter sticks, rulers, balances, magnets, and compasses

Social Studies, 4th Grade

(b) Knowledge and Skills

(4.22) Social studies skills. The student applies critical-thinking skills to organize and use information acquired from a variety of sources including electronic technology. The student is expected to:

(B) analyze information by sequencing, categorizing, identifying cause-and-effect relationships, comparing, contrasting, finding the main idea, making generalizations and predictions, and drawing inferences and conclusions

(C) organize and interpret information in outlines, reports, databases, and visuals including graphs, charts, timelines, and maps

(F) use appropriate mathematical skills to interpret social studies information such as maps and graphs

English Language Arts and Reading, 4th Grade

(b) Knowledge and Skills

(4.13) Reading/inquiry/research. The student inquires and conducts research using a variety of sources. The student is expected to:

(D) interpret and uses graphic sources of information such as maps, graphs, timelines, tables, and diagrams to address research questions (4-5)

Science, 5th Grade

(b) Knowledge and Skills

(5.1) Scientific processes. The student conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:

(A) demonstrate safe practices during field and laboratory investigations

(B) make wise choices in the use of conservation of resources and the disposal or recycling of materials

- (5.2) Scientific processes. The student uses scientific inquiry methods during field and laboratory investigations. The student is expected to:
- (A) plan and implement descriptive investigations including asking well defined questions, formulating well-defined hypotheses, and selecting and using equipment and technology
 - (B) collect information by observing and measuring
 - (C) analyze and interpret information to construct reasonable explanations from direct and indirect evidence
 - (D) communicate valid conclusions
 - (E) construct simple graphs, tables, maps, and charts to organize, examine, and evaluate information
- (5.3) Scientific processes. The student knows that information, critical thinking, and scientific problem solving are used in making decisions. The student is expected to:
- (A) analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information
 - (C) represent the natural world using models and identify their limitations
- (5.4) Scientific processes. The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to:
- (A) collect and analyze information using tools including calculators, microscopes, cameras, safety goggles, sound recorders, clocks, computers, thermometers, hand lenses, meter sticks, rulers, balances, magnets, and compasses

Social Studies, 5th Grade

(b) Knowledge and Skills

- (5.25) Social studies skills. The student applies critical-thinking skills to organize and use information acquired from a variety of sources including electronic technology. The student is expected to:
- (B) analyze information by sequencing, categorizing, identifying cause-and-effect relationships, comparing, contrasting, finding the main idea, making generalizations and predictions, and drawing inferences and conclusions
 - (C) organize and interpret information in outlines, reports, databases, and visuals including graphs, charts, timelines, and maps
 - (F) use appropriate mathematical skills to interpret social studies information such as maps and graphs

English Language Arts and Reading, 5th Grade

(b) Knowledge and Skills

- (5.13) Reading/inquiry/research. The student inquires and conducts research using a variety of sources. The student is expected to:
- (D) interpret and uses graphic sources of information such as maps

DID YOU KNOW?

A watershed is a land area from which water drains into a particular body of water.

Sediment is solid suspended particles that sink to the bottom of a body of water.

Erosion is the loss of topsoil as a result of wind, ice or runoff from precipitation.

The hydrologic cycle is the continual exchange of water from the atmosphere to the land and oceans and back again.

Run-off is water that originates as precipitation that flows over the land rather than soaking in.

LEARNING EXPERIENCE:

GENERAL TIME FRAME: Approximately 45 minutes.

Materials:

For each group:

Large container (tub, children's wading pool, or ice chest)

Soil - enough to make a large mound in one half of the container

water - approximately 1 gallon

Ice chips

Spray bottle

Sprinkling can

Measuring cup

Advanced Preparation:

1. Obtain all materials listed in Materials section.
2. Obtain a map of the Texas river basins from TWDB's website at <http://www.twdb.state.tx.us/mapping/index.htm>

Procedure:

1. Place a book or other object under one end of the container so that one end is approximately one inch higher than the other.
2. Place a large mound of soil at higher end.
3. Using one finger, make a stream-bed down the center of the mound.
4. Add an additional amount of soil at the lower end and make a shallow depression to eventually become a lake.
5. Using the sprinkling can, apply water to the mound and record observations on the chart below.
6. Measure amount of sediment that flows into the lake and record results.
7. Repeat the above procedure with the spray bottle and then the ice chips.
8. Allow model to sit undisturbed overnight.
9. Record the appearance of the mound and lake.

PRECIPITATION CHART

Type of Precipitation	Appearance of Mound	Appearance of Stream	Amount of Sediment
Heavy			
Light			
Ice/snow			

Teacher Talk:

Watersheds are geographic areas in which water, sediments and dissolved materials drain into a common body of water. This common body of water could be a stream, lake, pond, aquifer or ocean. A watershed can be as large or as small as you want to define it. For example, in a city the gutters that run along the curbs are the drainage outlets for the street's watershed. This water in the gutters that drain the small watershed of the neighborhood flow into the storm drain system that empties into a nearby stream, which drains several streets in a larger watershed. That stream in turn flows into a larger stream, river or lake.

Show the map of Texas river basins. Trace the flow of water from a selected area into the lake, river or gulf into which it flows.

Discuss definitions in the Did you Know? section.

The model that the students will build of a watershed will demonstrate how different types of precipitation affect the surface of the land and the body of water that receives the flow.

At the conclusion of the precipitation exercise, ask the following questions.

Teacher Questions	Possible Replies
1. Does all of the precipitation reach the lake? If not, where does it go?	1. No, some of the water soaks into the soil.
2. What two products flow into the lake? Could this be a problem over time? Why and can you think of any solutions?	2. Water and soil flow into the lake. The soil eventually settles out in the form of sediment. Over a period of time, this sediment makes the lake shallower. This changes the dynamics of the lake. The habitat for plants and animals changes. For recreational purposes this could pose a problem. Boats may not be able to operate in the shallow water. Also the water supply is diminished because the water is displaced by sediment. Possible solutions are the prevention of run-off by planting vegetation to hold the topsoil in place and dredging the accumulated sediment from the lake.
3. What possible use could be made of the water that flows into Texas lakes?	3. Answers may vary. Possible responses may include: irrigation of crops, municipal, manufacturing, power generation, livestock watering and mining.

RESOURCES:

Literature on water conservation by the Texas Water Development Board. View and order currently available brochures at <http://www.twdb.state.tx.us/assistance/conservation/pubs.htm>, contact Patsy Waters at patsy.waters@twdb.state.tx.us, fax the form to (512) 936-0812, call (512) 463-7955, or write to:

Conservation
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Maps of Texas River Basins, Aquifers, and Regional Reservoir Basin Maps are available on TWDB's website at <http://www.twdb.state.tx.us/mapping/index.htm>

Texas Guide to Rainwater Harvesting, Texas Water Development Board in cooperation with Center for Maximum Potential Building Systems, Austin, 1997.

State of Texas Water Quality Inventory by the Texas Commission on Environmental Quality:
<http://www.tnrcc.state.tx.us/water/quality/>

Lesson plans and literature on water quality is also available from the Texas Commission on Environmental Quality at <http://www.tnrcc.state.tx.us/admin/topdoc/index.html>. Search for the following publications by number on TCEQ's website.

Lesson Plans and Resources for Teaching Environmental Sciences- GI 268

Water Education Team (WET) Instruction Handbook- GI 026

Land Use and the Water Cycle poster- GI 194

Conducting a Watershed Survey- GI 232

Watershed Owner's Streamwalk Guide- GI 218

For additional information, call (512) 239-1000, or write to:

Texas Commission on Environmental Quality

P.O. Box 13087

Austin, Texas 78711-3087

Tarback, Edward J. and Frederick K. Lutgens, **Earth Science**, Columbus, 1988.

The Water Sourcebook, Tennessee Valley Authority, 1994.

EXTENSIONS:

1. Visit and sketch the watershed of your school. Use a map of the local area to determine the eventual body of water that the school's run-off flows into.
2. Contact the local water utility and ask if sedimentation is a problem in your water supply and how they deal with it.
3. Using a map of the state of Texas, draw and label the watersheds of the nearest river system.
4. Invite a speaker from the local water utility or a conservation group to discuss the impact that man has on the local watershed.