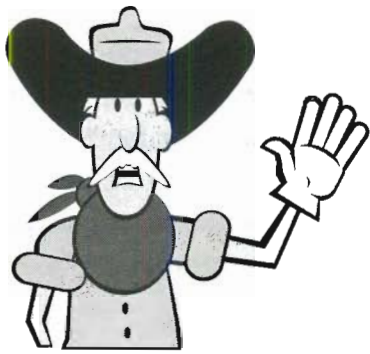


# MAJOR RIVERS

## Teacher's Guide





# MAJOR RIVERS TEXAS WATER EDUCATION PROGRAM

## Teacher's Guide

Welcome to the revised edition of Major Rivers, a Texas Water Education Program for elementary students.

### About Major Rivers

Major Rivers is designed to help fourth- and fifth-grade students learn about Texas' major water resources, how water is treated and delivered to their homes and schools, and how to care for their water resources and use them wisely.

The program's host, Major Rivers (named for the major rivers of Texas), and his horse Aquifer cover these topics in eight lessons that include a variety of activities in science, math, language arts, social studies and other subjects. The teaching package includes student workbooks, pretest and posttest sheets, home information leaflets, overhead transparencies and an introductory video. This Teacher's Guide shows how to use these materials and contains additional learning activities.

Most teachers complete the Major Rivers program over a two-week period, typically as part of their social studies and science curriculums.

### The History of Major Rivers

LCRA began developing Major Rivers in 1984 as part of its water conservation activities in the lower Colorado River basin.

In 1987 LCRA hired Educational Development Specialists, a California-based curriculum company, to help develop the program. LCRA also assembled an advisory group of teachers, curriculum directors, water utility officials, and other officials from throughout the lower Colorado River basin to determine subject matter and educational requirements. Field tests of the program in 1988 throughout the lower Colorado River basin played a significant role in shaping the final version of the lessons and of Major Rivers' depiction as a crusty, dusty Texas cowboy.

LCRA also reached an agreement with the Texas Water Development Board, the Texas Department of Health and the Texas Water Commission (now the Texas Commission on Environmental Quality) to distribute a statewide version of the program.

Formally launched in 1989, Major Rivers was an instant success. Students enjoyed the Major Rivers character as they learned about their water resources. Teachers appreciated a multidisciplinary program with a Texas focus that was correlated to state educational requirements. By the end of the 1990s, Major Rivers had reached more than 1 million fourth graders throughout Texas.

The program was revised in 1993 to include some additional activities and update the educational requirements correlation. In 2001 LCRA began work on a second revision, working with a curriculum consultant, LCRA staff and a Teacher Advisory Committee to produce a new edition for teachers in the lower Colorado River basin. Statewide interest in the curriculum grew and in 2003 LCRA, the Texas Water Development Board and many water providers and water management entities throughout the state began work on a new statewide version. This version is now available through the Texas Water Development Board.

### **What's New in Major Rivers**

The new edition of Major Rivers has the look and feel of the old program, while containing these additions and improvements:

- Correlation with Texas Essential Knowledge and Skills (TEKS) and Texas Assessment of Knowledge and Skills (TAKS) standards.
- More "hands-on" learning opportunities for students, in keeping with TEKS.
- Additional activities that expand such topics as water quality and water planning and provide additional interdisciplinary activities in math, language arts, history and other subject areas.
- Links to Internet resources, and information on how to incorporate these resources into your students' learning experiences.
- A new visual look that is cleaner and more appealing to a diverse audience while retaining the spirit and appeal of the original Major Rivers.

We hope you enjoy using this new, improved Major Rivers.

### **Acknowledgments**

LCRA would like to thank these people for their hard work:

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# TEACHING MAJOR RIVERS

Water in Texas is as important to our lives as the air we breathe. Yet our water supply is not always reliable in many parts of the state. Further, as our population continues to grow, greater and greater demands are placed on this limited resource. So it is important that we be aware of water — where it comes from, how our actions impact its quality, how we treat it, how much we use, and how we can use it wisely.

The Major Rivers Water Education Program is intended to help fourth-grade students throughout Texas learn how we get and use water, how important it is for us to conserve water, and how to keep it clean. This program contains teacher and student materials focused on specific instructional objectives.

## Objectives

The instruction in the program focuses on seven specific learning objectives.

### 1. Water in Texas

Students will become aware of the importance of water to Texas.

### 2. The Water Cycle

Students will identify the various steps in the water cycle — precipitation, surface runoff, percolation, evaporation and condensation.

### 3. Texas Water Supply and Water Planning

Students will identify basic facts about the water supply in Texas, including regional differences in rainfall, the amount of water supplied by surface water and by groundwater, and the state's major rivers and aquifers. Students will also understand the importance of water planning and identify water management strategies used to ensure adequate water supply.

### 4. Watersheds and River Basins

Students will understand the concepts of river basins and watersheds and be able to identify their river basin and local watershed. Students will create changes in a simulated streambed to evaluate the effects on water flow rates and directions.

### 5. How Our Water Use Affects Our World

Students will identify various uses of water, including municipal, agricultural, industrial, recreational, and electric generation. Students will differentiate between point-source and nonpoint-source pollution. Students will recognize that most water pollution is caused by human activity within the watershed.

### 6. Water Treatment and Distribution

Students will identify the steps and processes of the water distribution system in Texas — wells and reservoirs, pipelines, water and wastewater treatment plants, septic systems, and recycled water.

### 7. Using Water Efficiently

Students will review which home water activities use the most water, identify water conservation practices, and assess their individual water conservation practices.

### 8. Review and Posttest

Students will exhibit an understanding of the importance of water to Texas.

These objectives not only define important knowledge and skills related to water, but they also support many of the Texas Education Agency's TEKS and TAKS objectives for social studies, science, language arts and math. A chart showing the program correlations to the TEKS and TAKS objectives is on pages viii-xii.

## **Instructional Planning**

Procedures for each lesson are in this teacher's guide. Each lesson can usually be completed in one or two class periods. Some lessons will take more or less time, depending on the pace of instruction and student interest. In most lessons, suggestions are provided for optional extension and enrichment activities that can help expand the outcomes of the program.

## **Materials**

The program contains all the basic teacher and student materials needed to conduct instruction. Additional materials are listed with each lesson. Included with the packet are:

- Teacher's Guide
- Major Rivers Video
- The Water Cycle overhead transparency
- Texas Average Annual Rainfall overhead transparency
- Major River Basins overhead transparency
- Regional Water Planning Groups overhead transparency
- Water Treatment and Distribution overhead transparency
- Program Evaluation Sheet
- Originals of the following:
  - Pretest
  - Posttest
  - Groundwater and Surface Water Student Data Sheet
  - Regional Water Planning Groups Worksheet
  - Major River Basins in Texas Worksheet
  - Streambed Simulation Student Data Sheet
  - Frankie the Fish Data and Observation Sheet
  - Water Treatment Laboratory Worksheet
  - Don't Be Clueless Worksheet
  - Wa-Ter Your Choices? Cards
  - Review Worksheets
  - Water Puzzles
- 30 copies of the following:
  - Student Workbook
  - Home Information Leaflet

## **Other Materials Needed — Listed by Lesson**

The following are comprehensive lists of materials need to complete each activity and exercise in the Major Rivers curriculum that are not included with a teacher set. The activities and exercises are designed to use as many readily available household supplies as possible. Prior to each lesson you may want to request assistance with gathering materials from the students and their parents. Once a set of materials is gathered it can easily be reused with proper care and cleaning.

### **LESSON 1**

Cups

Water

Computer with TV connection/LCD or computer projector

For Change of Temperature Effects Investigation:

Ice cubes

Plates

Clock

Fan (to simulate wind)

### **LESSON 2**

For teacher demonstrations of the water cycle:

Tea kettle

Two tea cups

Hot plates

Water

For student laboratory activities on water cycle:

3 or 4 different types of soil (clay, potting soil, sand, crushed gravel, etc.)

2 identical jars or glasses

Tape

Food coloring

Bowl of ice water

Water

3 to 4 two-liter clear soda bottles per group

Liquid measuring cup

Scissors

Cotton cloth or nylon hose

For student water cycle demonstration:

4 eight-ounce clear plastic cups per group

Plastic wrap

Water

Rubber bands

Liquid measuring cups

Watch or clock with a second hand

### LESSON 3

Scheduled time in computer lab or classroom

Computer (with Internet access) with TV connection/LCD or computer projector

Map colors or colored pencils

For groundwater/surface water demonstration:

Small aquarium or one-gallon pickle jar

Aquarium gravel or pea gravel

Glass jar or drinking glass

Overhead projector

Watering can

Meat baster

For soil stratification investigation:

3 or 4 different types of soil (clay, potting soil, sand, crushed gravel, etc.)

Water

1 two-liter clear soda bottle per student pairs

Liquid measuring cup

Scissors

Plastic wrap or modeling clay

For Water Coursing Through History:

Large bucket (The bucket should hold several gallons of water. The amount of water in the bucket should be visibly reduced when five spongefuls of water are removed.)

Containers (Bowls or milk cartons with the tops cut off, 1 for each student.)

Metric graduated cylinders

17 large household sponges (Cut three of the sponges into fourths, five into thirds, five into halves, and leave the last four whole. Increase or decrease the number of sponges to fit the number of students. Pieces of absorbent terry cloth can be substituted.)

Various colors of food coloring or washable paints (Put several drops of food coloring of any color on all the sponges and sponge pieces just before passing out the sponge pieces.)

Markers

Poster board

For Water Baseball (optional):

Group sets of 12 pieces of paper cut in two- by three-inch pieces

## **LESSON 4**

Map colors

Scheduled time in computer lab or classroom

Computer (with Internet access) with TV connection/LCD or computer projector

For impact of water flow on water systems investigation:

Meter tape measures

Fine soil

Sand

Pebbles or fine gravel

Rocks, bricks and/or wood blocks

Ping-Pong balls or corks or foam peanuts

Water source with ability to vary flow (water hoses)

Stop watches or watches with second hands

Playground area, stream table or aluminum roasting pan with diatomaceous earth

## **LESSON 5**

Thermometers

Optional:

Scheduled time in computer lab or classroom

Computer (with Internet access) with TV connection/LCD or computer projector

For Frankie the Fish Activity:

aquarium (optional)

three-liter soda bottles with top cut off

black permanent marker

graduated cylinder and measuring spoons

pitchers with water

string

water

white poker chips

yellow sponges

washers

hot-glue gun

ruler

soil

brown sugar

molasses

detergent

shredded paper

scissors

food coloring – red and yellow

## LESSON 6

Optional:

Scheduled time in computer lab or classroom

Computer (with Internet access) with TV connection/LCD or computer projector

For Water Treatment Lab:

Below is enough for four groups. **[Note: you will need at least 16 of the 20-ounce soda bottles and at least 12 small plastic cups.]**

Plan ahead a couple of weeks and ask students to bring these materials in from home:

4 small (four-ounce) plastic cups (such as an applesauce cup) containing one tablespoon alum (Buy it at any grocery store in the canning department.)

4 two-liter soda bottles containing 750 mL (24 ounces or three cups) water mixed with 230 mL (eight ounces or one cup) of garden dirt (Label these: "Source Water" or "Surface Water.")

**[Note: Mix water to soil in a 3:1 ratio.]**

4 clean two-liter soda bottles, cut in half without tops, labeled "Aeration"

4 clean two-liter clear soda bottles, cut in half without tops, labeled "Coagulation"

4 clean two-liter soda bottles, cut in half with tops labeled "Filtration"

4 rubber bands

4 stirring sticks

4 small pieces of old stockings or cheesecloth

4 eight-ounce plastic cups filled with gravel

4 eight-ounce plastic cups filled with sand

4 metric rulers

4 graduated cylinders or measuring spoons

4 stop watches or watches with a second hand

## LESSON 7

three-inch by three-inch pieces of blue, yellow and red paper for each student

For Don't Be Clueless Investigation:

Student handout for Don't Be Clueless investigation

Compasses

Metric rulers/measuring tapes

Red markers

## LESSON 8

No other materials are needed.

## ADDITIONAL RESOURCES

Asimov, Isaac. *The Ocean Book*, Wiley.  
Bellamy, David. *The River*, Clarkson Porter.  
Cherry, Lynn. *A River Ran Wild*, Harcourt.  
Cole, Joanna. *The Magic School Bus at the Water Works*, Scholastic.  
Cole, Joanna. *The Magic School Bus, Wet All Over*, Scholastic.  
Cole, Joanna. *The Magic School Bus on the Ocean Floor*, Scholastic.  
Drutman, Ava. *Water*, Good Apple.  
French, Vivian. *Why the Sea is Salty*, Harcourt.  
Jacobs, Francine. *Sam the Sea Cow*, Walker and Company.  
Goldish, Meish. *Science Poems and Songs for Young Learners*, Scholastic.  
Molengraft, Lisa. *Oceans*, Instructional Fair.  
Murphy, Bryan. *Experiments with Water*, Scholastic.  
Peters, Lisa. *Water's Way*, Scholastic.  
The Earth Group. *50 Simple Things Kids Can Do to Save the Earth*, Andrews and McMeel.  
*Using Water Series*, Scholastic.

EPA Water Quality Protection Division Educator Resources  
<http://www.epa.gov/region6/water/edu/>

River of Words (an environmental art and poetry watershed awareness program)  
<http://www.riverofwords.org/>

Texas Water Development Board  
<http://www.twdb.state.tx.us>

U.S. Geological Survey Water Science for Schools  
<http://ga.water.usgs.gov/edu/>

**SCIENCE**

| Texas Essential Knowledge and Skills Objectives  |   | Correlating TAKS Objectives |   | L E S S O N |   |   |   |   |   |   |   |   |   |
|--|---|-----------------------------|---|-------------|---|---|---|---|---|---|---|---|---|
|  |   |                             |   | 1           | 2 | 3 | 4 | 5 | 6 | 7 | 8 |   |   |
| <b>(1) Scientific Processes</b>  |   |                             |   |             |   |   |   |   |   |   |   |   |   |
| (a) demonstrate safe practices during field and laboratory investigations.   | TAKS Grade 5 Objective 1: Student will demonstrate an understanding of the nature of science. | ■                           | ■ | ■           | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| (b) make wise choices in the use and conservation of resources.  | TAKS Grade 5 Objective 1  | ■                           |   | ■           | ■ |   |   |   |   |   | ■ | ■ |   |
| <b>(2) Scientific Processes</b>  |   |                             |   |             |   |   |   |   |   |   |   |   |   |
| (a) plan and implement descriptive investigations.   | TAKS Grade 5 Objective 1  |                             | ■ |             |   |   |   |   |   |   | ■ |   |   |
| (b) collect information by observing and measuring.  | TAKS Grade 5 Objective 1  | ■                           | ■ | ■           | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| (c) analyze and interpret information to construct reasonable explanations.  | TAKS Grade 5 Objective 1  | ■                           | ■ | ■           | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| (d) communicate valid conclusions.   | TAKS Grade 5 Objective 1  |                             | ■ | ■           | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| (e) construct simple graphs, tables, maps and charts to organize, examine and evaluate information.  | TAKS Grade 5 Objective 1  |                             | ■ |             | ■ |   |   |   | ■ | ■ |   |   |   |
| <b>(3) Scientific Processes</b>  |   |                             |   |             |   |   |   |   |   |   |   |   |   |
| (a) analyze, review, and critique scientific explanations, including hypotheses and theories.  | TAKS Grade 5 Objective 1  |                             | ■ |             |   |   |   |   | ■ |   |   |   |   |
| (c) represent the natural world using models and identify their limitations.   | TAKS Grade 5 Objective 1  |                             | ■ | ■           | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| <b>(4) Scientific Processes</b>  |   |                             |   |             |   |   |   |   |   |   |   |   |   |
| (a) collect and analyze information using tools.   | TAKS Grade 5 Objective 1  | ■                           | ■ | ■           | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| <b>(6) Science Concepts</b>  |   |                             |   |             |   |   |   |   |   |   |   |   |   |
| (a) identify patterns of change such as in weather.  | TAKS Grade 5 Objective 2: Student will demonstrate an understanding of the life sciences.     |                             | ■ | ■           | ■ |   |   |   |   |   |   |   |   |
| <b>(7) Science Concepts</b>  |   |                             |   |             |   |   |   |   |   |   |   |   |   |
| (a) observe and record changes in the states of matter caused by the addition or reduction of heat.  | TAKS Grade 5 Objective 3: Student will demonstrate an understanding of the physical sciences. |                             | ■ |             |   |   |   |   |   |   |   |   |   |
| (b) conduct tests, compare data, and draw conclusions about physical properties of matter including states of matter, conduction, density, and buoyancy.     | TAKS Grade 5 Objective 3  |                             |   | ■           | ■ |   |   |   |   |   |   |   |   |
| <b>(10) Science Concepts</b>   |   |                             |   |             |   |   |   |   |   |   |   |   |   |
| (a) identify and observe effects of events that require time for changes to be noticeable including growth, erosion, dissolving, weathering, and flow.       | TAKS Grade 5 Objective 4: Student will demonstrate an understanding of the earth sciences.    |                             |   | ■           | ■ |   |   |   |   |   |   |   |   |
| (b) draw conclusions about "what happened before" using fossils or charts and tables.  | TAKS Grade 5 Objective 4  |                             |   | ■           | ■ |   |   |   |   |   |   |   |   |
| <b>(11) Science Concepts</b>   |   |                             |   |             |   |   |   |   |   |   |   |   |   |
| (a) test properties of soil including texture and capacity to retain water.  | TAKS Grade 5 Objective 4  |                             | ■ | ■           | ■ |   |   |   |   | ■ |   |   |   |
| (c) identify the sun as the major source of energy for Earth and understand its role in the growth of plants, in the creation of winds, and the water cycle. | TAKS Grade 5 Objective 4  | ■                           | ■ |             |   |   |   |   |   |   |   |   | ■ |

| <b>MATH</b>   |  | <b>L E S S O N</b> |          |          |          |          |          |          |          |
|---|--|--------------------|----------|----------|----------|----------|----------|----------|----------|
| <b>Texas Essential Knowledge and Skills Objectives</b>  | <b>Correlating TAKS Objectives</b>   | <b>1</b>           | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>6</b> | <b>7</b> | <b>8</b> |
| <b>(2) Number, Operation and Quantitative Reasoning</b><br>(a) generate equivalent fractions using concrete and pictorial models.                 | TAKS Grade 4 Objective 1: Student will demonstrate an understanding of numbers, operations and quantitative reasoning. |                    |          | ■        |          |          |          |          |          |
| <b>(3) Number, Operation and Quantitative Reasoning</b><br>(a) use addition and subtraction to solve problems involving whole numbers.            | TAKS Grade 4 Objective 1   |                    |          | ■        |          |          | ■        | ■        |          |
| <b>(4) Number, Operation and Quantitative Reasoning</b><br>(d) use multiplication to solve problems involving two-digit numbers.                  | TAKS Grade 4 Objective 1   |                    |          |          |          |          | ■        | ■        |          |
| (e) use division to solve problems involving one-digit divisors.  | TAKS Grade 4 Objective 1   |                    |          | ■        |          |          | ■        | ■        |          |
| <b>(11) Measurement</b><br>(b) estimate and measure capacity using standard units including milliliters, liters, cups, pints, quarts and gallons. | TAKS Grade 4 Objective 4: Student will demonstrate an understanding of the concepts and uses of measurement.           |                    | ■        | ■        | ■        |          | ■        | ■        |          |
| <b>(13) Probability and Statistics</b><br>(c) interpret bar graphs.   | TAKS Grade 4 Objective 5: Student will demonstrate an understanding of probability and statistics.                     |                    |          | ■        |          |          | ■        | ■        |          |

**READING – LANGUAGE ARTS**

**Texas Essential Knowledge and Skills Objectives**

|  | L E S S O N |   |   |   |   |   |   |   |
|--|-------------|---|---|---|---|---|---|---|
|  | 1           | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| <b>(1) Listening/Speaking/Purposes</b><br>(a) determine the purposes for listening such as to gain information, to solve problems, or to enjoy and appreciate.               | ■           |   | ■ | ■ | ■ |   |   |   |
| <b>(4) Listening/Speaking/Culture</b><br>(a) connect his/her own experiences, information, insights and ideas with those of others through speaking and listening.           |             | ■ | ■ | ■ | ■ | ■ | ■ |   |
| <b>(5) Listening/Speaking/Audiences</b><br>(c) present dramatic interpretations of experiences, stories, poems or plays to communicate.                                      | ■           |   |   |   |   |   | ■ |   |
| <b>(7) Reading/Fluency</b><br>(a) read regularly in independent-level materials.   | ■           | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| (b) read regularly in instructional-level materials that are challenging but manageable.   |             |   | ■ | ■ | ■ | ■ |   |   |
| <b>(8) Reading/Variety of Texts</b><br>(c) read for varied purposes such as to be informed.  | ■           | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| (g) paraphrase and summarize text to recall, inform, and organize ideas.   | ■           |   | ■ | ■ |   |   |   |   |
| <b>(9) Reading/Vocabulary Development</b><br>(a) develop vocabulary by listening to selections read aloud.   |             |   | ■ | ■ | ■ | ■ |   |   |
| <b>(10) Reading/Comprehension</b><br>(k) answer different types and levels of questions as well as test-like questions such as multiple choice, true-false and short answer. | ■           | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| <b>(11) Reading/Literary Response</b><br>(a) offer observations, make connections, react, speculate, interpret, and raise questions in response to texts.                    | ■           |   | ■ | ■ | ■ | ■ |   |   |
| (b) interpret text ideas through such varied means as journal writing, discussion, enactment, media.   |             | ■ | ■ | ■ |   |   |   |   |
| <b>(13) Reading/Inquiry/Research</b><br>(b) use text organizers, including headings, graphic features, and table of contents to locate and organize information.             |             |   | ■ | ■ |   |   |   |   |
| (c) use multiple sources, including electronic texts, experts and print resources, to locate information relevant to research questions.                                     |             |   | ■ | ■ | ■ |   |   |   |
| (d) interpret and use graphic sources of information such as maps, graphs, timelines, tables and diagrams.   | ■           | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| (f) produce research project and reports in effective formats using visuals to support meaning, as appropriate.  | ■           |   | ■ | ■ |   |   |   |   |
| (g) draw conclusions from information gathered from multiple sources.  |             |   | ■ | ■ |   |   |   |   |
| <b>(23) Viewing/Representing/Interpretation</b><br>(b) interpret important events and ideas gathered from maps, charts, graphics, video segments or technology presentation. | ■           | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

**SOCIAL STUDIES**

**Texas Essential Knowledge and Skills Objectives**

**L E S S O N**

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|--|---|---|---|---|---|---|---|---|
| <b>(1) History</b>   |   |   |   |   |   |   |   |   |
| (a) identify Native American groups in Texas and the Western Hemisphere before European exploration and describe the regions in which they lived.                              |   |   |   | ■ |   |   |   |   |
| (b) compare the ways of life of Native American groups in Texas and the Western Hemisphere before the European exploration.  |   |   | ■ | ■ |   |   |   |   |
| <b>(2) History</b>   |   |   |   |   |   |   |   |   |
| (a) summarize reasons for European exploration and settlement of Texas and the Western Hemisphere.   |   |   |   | ■ |   |   |   |   |
| (c) explain when, where, and why the Spanish established Catholic missions in Texas.   |   |   |   | ■ |   |   |   |   |
| (d) identify the accomplishments of significant impresarios including Moses Austin, Stephen F. Austin, and Martin de Leon and explain their impact on the settlement of Texas. |   |   |   | ■ |   |   |   |   |
| <b>(3) History</b>   |   |   |   |   |   |   |   |   |
| (e) identify leaders important to the founding of Texas as a republic and state.   |   |   | ■ | ■ |   |   |   |   |
| <b>(4) History</b>   |   |   |   |   |   |   |   |   |
| (c) identify the impact of railroads on life in Texas, including changes to cities and major industries.   |   |   |   | ■ |   |   |   |   |
| (d) describe the effects of political, economic and social changes on Native Americans in Texas.   |   |   |   | ■ |   |   |   |   |
| <b>(5) History</b>   |   |   |   |   |   |   |   |   |
| (a) identify the impact of various issues and events on life in Texas such as urbanization.  | ■ |   | ■ | ■ | ■ | ■ | ■ |   |
| <b>(6) Geography</b>   |   |   |   |   |   |   |   |   |
| (a) apply geographic tools, including grid systems and legends to construct and interpret maps.  |   |   | ■ | ■ |   |   |   |   |
| (b) translate geographic data into a variety of formats such as raw data to graphs and maps.   |   |   | ■ | ■ |   |   |   |   |
| <b>(7) Geography</b>   |   |   |   |   |   |   |   |   |
| (a) describe a variety of regions in Texas that result from patterns of human activity.  |   |   | ■ | ■ | ■ |   |   |   |
| (b) describe a variety of regions in Texas that result from physical characteristics.  |   |   | ■ | ■ | ■ |   |   |   |
| <b>(8) Geography</b>   |   |   |   |   |   |   |   |   |
| (a) identify clusters of settlement in Texas and explain their distribution.   |   |   | ■ | ■ |   |   |   |   |
| (b) explain patterns of settlement at different time periods in Texas.   |   |   | ■ | ■ |   |   |   |   |
| (c) describe the location of cities in Texas and explain their distribution.   | ■ |   | ■ | ■ |   |   |   | ■ |
| (d) explain the geographic factors that influence patterns of settlement and the distribution of population in Texas, past and present.  |   |   | ■ | ■ |   |   |   |   |
| <b>(9) Geography</b>   |   |   |   |   |   |   |   |   |
| (a) describe ways people have adapted to and modified their environment in Texas.  |   |   | ■ | ■ | ■ | ■ | ■ |   |
| (b) identify reasons why people have adapted to and modified their environment in Texas.   |   |   | ■ | ■ | ■ | ■ |   |   |
| (c) analyze the consequences of human modifications of the environment in Texas, past and present.   |   |   | ■ | ■ | ■ | ■ |   |   |
| <b>(11) Economics</b>  |   |   |   |   |   |   |   |   |
| (b) identify the economic motivations for Anglo American colonization in Texas.  |   |   | ■ | ■ |   |   |   |   |
| <b>(13) Economics</b>  |   |   |   |   |   |   |   |   |
| (a) explain how people in different regions of Texas earn their living.  |   |   | ■ | ■ | ■ |   |   |   |
| (b) explain how geographic factors have influenced the location of economic activities in Texas.   |   |   | ■ | ■ |   |   |   |   |
| (c) analyze the effects of immigration, migration, and limited resources on the economic development and growth of Texas.  |   |   | ■ | ■ |   |   |   |   |
| (e) explain how developments in transportation and communication have influenced economic activities in Texas.   |   |   |   | ■ |   |   |   |   |
| <b>(17) Citizenship</b>  |   |   |   |   |   |   |   |   |
| (a) explain the meaning of selected patriotic symbols and landmarks of Texas, including the six flags over Texas, San Jose Mission and the San Jacinto Monument.               |   |   |   | ■ |   |   |   |   |
| <b>(21) Science, Technology and Society</b>  |   |   |   |   |   |   |   |   |
| (b) describe how scientific discoveries and technological innovations have benefited individuals, businesses and society in Texas.   |   |   | ■ |   |   |   |   |   |

Continued on next page

**SOCIAL STUDIES (continued)**

**Texas Essential Knowledge and Skills Objectives**

|   | L E S S O N |   |   |   |   |   |   |   |
|---|-------------|---|---|---|---|---|---|---|
|   | 1           | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| <b>(22) Social Studies Skills</b>   |             |   |   |   |   |   |   |   |
| (a) differentiate between, locate and use primary and secondary sources.  |             |   | ■ | ■ |   |   |   |   |
| (b) analyze information by sequencing, categorizing, identifying cause-and-effect relationships, comparing and contrasting.   |             |   | ■ | ■ | ■ | ■ | ■ |   |
| (c) organize and interpret information in outlines, reports, databases and visuals, including graphs, charts, timelines and maps.   |             |   | ■ | ■ |   | ■ | ■ |   |
| (d) identify different points of view about an issue or topic.  |             |   | ■ |   |   |   |   |   |
| (f) use appropriate mathematical skills to interpret social studies information such as maps and graphs.  |             |   | ■ | ■ |   |   | ■ |   |
| <b>(23) Social Studies Skills</b>   |             |   |   |   |   |   |   |   |
| (a) use social studies terminology correctly.   |             |   | ■ | ■ |   |   |   |   |
| (b) incorporate main and supporting ideas in verbal and written communication.  |             |   | ■ | ■ |   |   |   |   |
| (c) express ideas orally based on research and experiences.   |             |   | ■ | ■ |   |   |   |   |
| (d) create written and visual materials such as journal entries, reports, graphic organizers, outlines and bibliographies.  |             |   | ■ | ■ |   |   |   |   |
| (e) use standard grammar, spelling, sentence structure and punctuation.   |             |   | ■ | ■ |   |   |   |   |
| <b>(24) Social Studies Skills</b>   |             |   |   |   |   |   |   |   |
| (a) use a problem-solving process to identify a problem, gather information, list and consider options.   |             |   | ■ | ■ | ■ |   | ■ |   |
| (b) use a decision-making process to identify a situation that requires a decision, gather information, identify options, predict consequences and take action to implement a decision. |             |   | ■ | ■ |   |   |   |   |

**Message:**

Although it may appear that Texas has plenty of water, in fact the state has faced water challenges throughout history. Without water, people, animals and plants could not live. Water is a valuable resource that we should not take for granted.

**Time Requirements:**

Two class periods.

**Objective:**

Students will become aware of the importance of water to Texas.

**Materials:**

Cups

Water

Pretest (see Appendix 1)

Program evaluation sheet

Major Rivers Video

Computer with TV connection/LCD or computer projector

Major Rivers Student Workbook

For Change of Temperature Effects Investigation:

Ice cubes

Plates

Clock

Fan (to simulate wind)

**Procedures:****A. Administer pretest (see Appendix 1).**

- Tell students that for the next two weeks they will be learning how we get and use water in Texas.
- Explain to students that they are going to take a pretest. The pretest will show how much they already know about water. Tell students it is all right if they do not know some of the answers. They will learn the answers during the program.
- Pass out a copy of the pretest to each student.
- Give students time to mark their answers.
- Collect the pretests. Tell students that they will be learning the correct answers during the next couple of weeks.
- Later, score the students' pretest, using the answer key on pages 4 and 5 of this guide. Record the scores on the program evaluation sheet.

**B. Lead students in an examination and discussion of water and its properties.**

- Give each student a cup of water.
- Use the following questions to generate a discussion of water. Possible student answers are shown in parentheses.
  1. What color is water?  
*(Water is colorless.)*
  2. What is the taste of water?  
*(Water is tasteless.)*
  3. What does water smell like?  
*(Water has no smell.)*
  4. What would happen if you put your cup of water in a freezer?  
*(It would turn to ice. It would become solid instead of liquid.)*
  5. What would happen if you boiled the water in your cup?  
*(It would turn into steam, which is water vapor. It would become a gas instead of a liquid.)*
  6. What do you use water for every day?  
*(We use water for drinking, cooking, bathing, washing dishes, washing clothes, brushing teeth, watering plants, fighting fires, etc.)*
  7. How much of our bodies do you think is made up of water?  
*(More than two-thirds of our bodies is water.)*
  8. Why is water important to us?  
*(People and animals need water to drink. Plants need water to make them grow. Without water, people, animals and plants could not live.)*

**C. Have students read Water in Texas, page 2 in Student Workbook. (See page 2 of Teacher's Guide.)**

- Tell students that they will be learning about water from a special character named Major Rivers. Show students the picture of Major Rivers on the cover of a Student Workbook.
- Give each student a workbook. Tell students that they will be working in these workbooks for the next two weeks.

- Have students turn to page 2 in their workbooks. Call on individual students to take turns reading aloud.
- Use the following questions to generate a discussion.
  1. Why is it important that we do not waste water?  
*(There is only so much water and there are more and more people in Texas all the time. In some years, when there is very little rain, we have even less water.)*
  2. How do you think water gets to your faucet?  
*(Answers will vary. Tell students that they will soon be learning exactly how water gets to their homes.)*
  3. What would happen if one day you turned on your faucet and no water came out?  
*(Answers will vary.)*

- Ask students to pay attention to the name of Major Rivers' horse, and ask them why they think Major Rivers gave his horse the name Aquifer.  
*(Aquifer is the name of his horse because more than half of the water we use in Texas comes from aquifers, which are underground sources of water.)*

- Show the video.

**Topics addressed:**

1. Comparison of water availability in early Texas and today.
2. Historical accounts of rivers prior to river authorities.
3. Purpose(s) of reservoirs.
4. Water treatment and wastewater treatment.
5. Conservation.

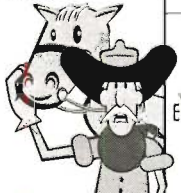

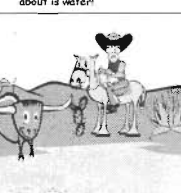
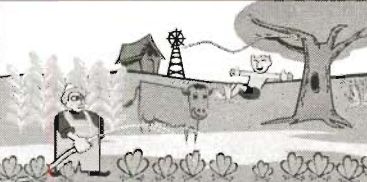



- Use the following questions to discuss the video.

1. How did people get their water in the old days?  
*(People would dip their buckets into a river to get water; or they would dig a well to get water that was stored underground.)*
2. How do we get our water today?  
*(We still get our water from rivers and from groundwater wells, but for most folks water utilities get the water and send it to them through pipelines. They turn on a tap, and out comes the water.)*
3. Where does most of the water come from in the area where we live?  
*(Answers will vary.)*
4. Why do river authorities, groundwater districts and other water districts manage water in Texas?  
*(Sometimes, when it rained a lot, the rivers would flood. These floods killed people and destroyed animals, crops and buildings. Other times, when it rained very little, rivers would dry up to a trickle and wells would go dry, so that no one had enough water. Even if rivers and aquifers did not flood or dry up naturally, they could dry up because people took out too much water.)*
5. How do river authorities, groundwater districts and other water districts manage water?  
*(Some river authorities built dams on the rivers. The dams hold the water back and keep the river from flooding the land. The dams*

**D. Students will view the Major Rivers video.**

- Inform students they are going to see a video in which Major Rivers tells them about water in Texas.  
**[Note: The video is 8:33 minutes long.]**
- Ask if any of the students can explain why the program and the character are named Major Rivers.  
*(Much of the water we use in Texas comes from "major rivers.")*

**LESSON 1: WATER IN TEXAS**

|   |  |   |
|---|--|---|
| <p><b>1.</b> Howdy! I am Major Rivers, and this is my trusty horse, Aquifer.</p>   | <p><b>2.</b> We've done lots of traveling through Texas. We've roamed from Amarillo to Brownsville and from El Paso to Beaumont.</p>  | <p><b>3.</b> We've learned a lot about Texas. One of the most important things we learned about is water!</p>  |
| <p><b>4.</b> Every living thing needs water. Ranchers need water for their cattle to drink. Farmers need it to grow our food. You and your families need water for cooking, for cleaning, and even for playing.</p>  | <p><b>5.</b> In Texas, many folks work hard to see that you have clean water when you turn on the faucet.</p>                         |   |
| <p><b>6.</b> There is only so much water, and there are more people using it every day. In dry years, when very little rain falls, we have even less water.</p>    | <p><b>7.</b> It is important that we use water wisely. We should never waste water.</p>   |   |

2

also created lakes, called reservoirs, which store water for the people of Texas. Other river authorities, groundwater conservation districts, and water districts were created to keep track of how much water is used and, if necessary, restrict water use during droughts to prevent rivers and aquifers from drying up.)

6. What else are the dams used for besides managing floods and storing water?  
*(The floodgates on some dams can be opened so that the water rushes out to turn big turbine-generators that produce electricity.)*
7. What happens to the water in the river, reservoirs or wells before it comes into our homes?  
*(The water is sent to water treatment plants, where dirt is taken out, and chlorine or another chemical is added to kill any germs.)*
8. What happens to wastewater when it goes down our drain?  
*(In some areas, mainly rural, wastewater goes into a septic system where it slowly seeps back into the ground or is sprayed into the air to evaporate after it has been treated. In other areas, wastewater travels through pipelines to a wastewater treatment plant, where the water is cleaned, then pumped back into a river or into the ground. Wastewater also can be reused or recycled for irrigating landscapes and other uses, but not for drinking.)*
9. Why do we need to use water wisely?  
*(More people need water every year in Texas, but there is not more water available every year.)*
10. What are some ways we use water wisely?  
*(We can turn the water off while we are brushing our teeth; we can take quick showers; we can use a timer on our hose when using the sprinkler to irrigate the lawn, etc.)*

**E. Investigation of effects of temperature changes on frozen state of water.**

- Give each student an ice cube.
- Have students develop a research question and conduct an experiment to investigate the physical properties of water. For example:
  1. How long does it take for an ice cube to melt?

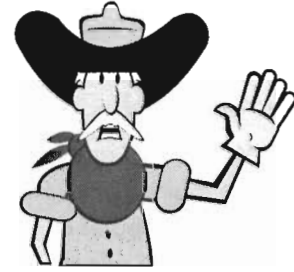
2. Does moving air (wind) increase or decrease the rate of melting?
3. Does an ice cube melt faster in a cup of water or a plate?
4. How does the distance from a light bulb affect the rate at which an ice cube melts?

**Optional Extension and Enrichment Activities:**

- Have students write stories about Major Rivers and Aquifer. Suggested titles might be "Seeing Texas With Major Rivers and Aquifer," or "Major Rivers Saves Water."
- Read one of the legends of "Pecos Bill" and discuss the concept of a legend. Have students write a legend about Major Rivers and Aquifer as they ride through Texas teaching people about water. The legends can be turned into skits or plays to be acted out for the class.
- Allow students to look through old magazines for pictures of water use. Cut the pictures out and make a collage of water use on the bulletin board. You may want to divide the bulletin board into categories such as Water for Fun and Water that Works for Us, or Water in the Home, Water at Work, Water at School, etc.
- Have students write stories about a day their town had no water.
- Have students research a current or historic Texas water issue. Students can make presentations on their research to the class.
- Have students research how a windmill works and why they were important to Texas in the past. Students can make a model of a windmill, or present the information that they have learned about windmills to the class.

# PRETEST ANSWER KEY

Name \_\_\_\_\_



## PRETEST MAJOR RIVERS TEXAS WATER EDUCATION PROGRAM

### PART A: The Water Cycle

**Directions:** Circle the letter of the word that best completes each sentence.

1. Water falls to earth as either rain or snow. This is called \_\_\_\_\_.  
a) surface runoff      b) percolation       c) precipitation
2. Some water on the ground flows into rivers, lakes and oceans. This is called \_\_\_\_\_.  
a) condensation      b) evaporation       c) surface runoff
3. Some water soaks into the ground. This is called \_\_\_\_\_.  
 a) percolation      b) precipitation      c) condensation
4. The sun heats water on the ground and changes it into vapor. The vapor rises into the sky.  
This is called \_\_\_\_\_.  
 a) evaporation      b) precipitation      c) percolation
5. Vapor cools, forms clouds and changes back into water. This is called \_\_\_\_\_.  
a) percolation       b) condensation      c) precipitation

### PART B: Texas Water Supply

**Directions:** Circle the letter of the word that best completes each sentence.

6. Most large cities in Texas are in the \_\_\_\_\_ half of the state where there is more water.  
 a) eastern      b) northern      c) western
7. The river that supplies Austin, our capital city, is the \_\_\_\_\_.  
a) Sabine       b) Colorado      c) Trinity
8. An underground area filled with water is called \_\_\_\_\_.  
a) reservoir       b) an aquifer      c) a lake
9. The river between Texas and Mexico is the \_\_\_\_\_.  
a) Red      b) Brazos       c) Rio Grande
10. More than half of the water used in Texas comes from \_\_\_\_\_.  
a) the ocean      b) rivers       c) aquifers