Texas Aquatic Science

From Molecules to Ecosystems, and Headwaters to Ocean

Teacher Guide to Aquatic Science and Ecosystems Curriculum for Middle School and High School

A joint project

Texas Parks and Wildlife Department

The Meadows Center for Water and the Environment, Texas State University

Harte Research Institute for Gulf of Mexico Studies, Texas A&M University - Corpus Christi
Texas Aquatic Science
Teacher Guide

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A Comprehensive Aquatic Science Curriculum
Texas Aquatic Science is a curriculum consisting of a teacher guide, student reading text and guide, specially produced videos, and ancillary materials.

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About the Author

Sandra Johnson, Ph.D.

Dr. Sandra Johnson specializes in writing science curriculum aligned with state curriculum standards and conducting professional development for teachers. Dr. Johnson is a former teacher with experience with kindergarten, elementary, secondary, and gifted and talented students. She served as Science Consultant for Region XIII Education Service Center serving 59 school districts training teachers in kindergarten, elementary, and secondary classrooms. In addition, she has taught at both the University of Texas in Austin and Texas A&M–Corpus Christi. She is an educational consultant providing curriculum writing for a number of non-profit educational and conservation organization and conducts professional development for teachers all over Texas.
About the Partners

Texas Parks and Wildlife Department

Texas Parks and Wildlife is the state agency charged with the management of the state's fish, wildlife and parks, and the habitats upon which they rely. In a state whose population is 86% urban and land is 95% privately owned, TPWD relies on the understanding and cooperation of Texans for conservation of natural resources. Studies have shown that most Texans don't know where their drinking water comes from and struggle to navigate environmental issues. With the long-term challenges our state faces, such as how to provide water for people and the environment, TPWD believes building science-based knowledge and outdoor experiences are essential to developing the critical skills Texans will need to make informed decisions about the future of our natural resources. TPWD was a leader in forging a public-private partnership to develop the Texas Children in Nature strategic plan and network of regional efforts, and in the development of the companion Texas Natural Resource/Environmental Literacy Plan. TPWD was inspired by the work of the Missouri Department of Conservation’s aquatic ecosystem curriculum for schools and obtained permission to adapt their guide for Texas. TPWD engaged two of Texas' most trusted leaders in water issues as partners for this project.

The Meadows Center for Water and the Environment, Texas State University

Located at the San Marcos Springs, on the Texas State University campus, The Meadows Center for Water and the Environment’s core mission is to develop and promote programs and techniques for ensuring sustainable water resources for human needs, ecosystem health, and economic development. The Meadows Center engages in a holistic approach to the management of natural systems where key principles of sustainability and equitable use guide sound water policy. Work includes the following:

- Advancing scientific and technical knowledge through research on aquatic resources
- Identifying and analyzing socio-economic and political issues affecting water use
- Guiding the development of environmentally sustainable public water policy in Texas
- Cultivating public awareness and education about water resource issues

At Texas State, The Meadows Center serves as an integrating mechanism for the university’s multidisciplinary expertise in aquatic resources. The Meadows Center’s projects create new opportunities to disseminate this significant repository of knowledge and information to the community at large.
Harte Research Institute for Gulf of Mexico Studies, Texas A&M University - Corpus Christi

The Harte Research Institute for Gulf of Mexico Studies (HRI) is an endowed research component of Texas A&M University-Corpus Christi dedicated to advancing the long-term sustainable use and conservation of the Gulf of Mexico. It is the goal of HRI to be a research center of excellence providing international leadership in generating and disseminating knowledge about the Gulf of Mexico ecosystem and its critical role in the economies of the North American region. It is our further goal, to actively engage in efforts to both realize our vision and further our mission.

Among objectives, HRI establishes partnerships and alliances with educational, governmental, nongovernmental, and private sector organizations interested in long-term sustainable use and conservation of the Gulf of Mexico; develops and supports outreach and education activities that promote the development of critical thinking skills, and; advances conservation biology and biodiversity of the Gulf of Mexico.
**TEKS in Texas Aquatic Science**

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Environmental Science: 2 K;

9.3 Changing Environments: Pond Succession

6.1 A, B; 6.2 A, C, D, E; 6.3 B, C; 6.4 A; 6.12 E;
7.1 A, B; 7.2 A, C, D, E; 7.3 B, C; 7.4 A; 7.8 A; 7.10 C; 7.13 A;
8.1 A, B; 8.2 A, C, D, E; 8.3 B, C; 8.4 A; 8.11 C;
Aquatic Science: 1 A, B; 2 E, F, H, J; 4 B; 12 A;
Environmental Science: 1 A, B; 2 E, F, G, I, K; 4 D; 8 A, D;

9.4 Aquatic Invasion

6.2 C, D, E; 6.3 B, C; 6.12 E;
7.2 C, D, E; 7.3 B, C;
8.2 C, D, E; 8.3 B, C; 8.11 B;
Aquatic Science: 2 F, H, J;
Environmental Science: 2 F, I, K; 4 F;

9.5 Micro-organisms in Ponds

6.1 A, B; 6.2 A, C, D, E; 6.4 A; 6.12 A, D;
7.1 A, B; 7.2 A, C, D, E; 7.4 A; 7.12 D;
8.1 A, B; 8.2 A, C, D, E; 8.4 A; 8.11 A;
Aquatic Science: 1 A, B; 2 F, G, H, I, J; 5 C, D; 10 B;
Environmental Science: 1 A, B; 2 F, G, I, K;

Chapter 10: Wetlands

10.1 What Is a Wetland

6.2 C; 6.12 E;
7.2 C; 7.10 A;
8.2 C; 8.11 A, B;
Aquatic Science: 2 J; 10 B;
Environmental Science: 2 K;

10.2 Reading and Research
6.2 C; 6.12 E;
7.2 C; 7.11 B;
8.2 C; 8.11 B;
Aquatic Science: 2 J; 10 B;
Environmental Science: 2 K;

10.3 Wetland Food Webs
6.2 C; 6.12 E;
7.2 C; 7.5 C; 7.10 A; 7.11 A, B;
8.2 C; 8.11 A;
Aquatic Science: 2 J; 5 C; 10 B; 11 A;
Environmental Science: 2 K; 4 B; 6 E;

10.4 Migration Stations
6.3 B, C; 6.12 E;
7.3 B, C; 7.11 B; 7.12 A; 7.13 A, B;
8.3 B, C; 8.8 C; 8.11 C;
Aquatic Science: 2 H, J; 3 B; 12 A, D;
Environmental Science: 2 I, K; 4 A; 9 E;

10.5 Field Trip to a Wetland
6.1 A, B; 6.2 A, C, D, E; 6.4 A, B; 6.12 E;
7.1 A, B; 7.2 A, C, D, E; 7.4 A, B; 7.5 A, B; 7.8 C; 7.10 A; 7.11 A; 7.13 A, B;
8.1 A, B; 8.2 A, C, D, E; 8.4 A, B; 8.11 A, B, C;
Aquatic Science: 1 A, B; 2 E, F, G, J; 3 E; 5 C D; 7 C; 9 C; 10 A, B; 11 A, B; 12 A, B, D;
Environmental Science: 1 A, B; 2 E, F, G, H, K; 3 B, E; 4 A, B, E; 5 B; 6 E; 7 D;

Chapter 11:  Bays and Estuaries

11.1 What Do We Know about Bays and Estuaries?
6.2 C; 6.12 E;
7.2 C;
8.2 C;
Aquatic Science: 2 J; 9 A;
Environmental Science: 2 K;

11.2 Reading and Research
6.2 C; 2.12 E;
7.2 C; 7.11 B;
8.2 C; 8.7 C; 8.11 C;
Aquatic Science: 2 J; 4 A; 9 A; 10 B; 12 A, C;
Environmental Science: 2 K; 5 B; 8 A; 9 A, E;
11.3 Salinity

6.1 A, B; 6.2 C, D, E; 6.4 A; 6.12 E; 7.1 A, B; 7.2 C, D, E; 7.10 A; 13 A; 8.1 A, B; 8.2 C, D, E; 8.4 A, B; 8.11 B, C; Aquatic Science: 1 A, B; 2 F, G, H, J; 4 A; 9 A; 10 B, C; Environmental Science: 1 A, B; 2 F, G, K; 4 B, D;

11.4 The Ups and Downs in an Estuary

6.2 E; 6.3 C; 6.12 E; 7.2 E; 7.3 C; 7.5 A; 7.8 A; 7.13 A; 8.2 E; 8.3 C; 8.11 A, B, C; Aquatic Science: 2 F, H, J; 11 B; 12 B, C, D; Environmental Science: 2 F, I, K; 3 G; 5 A; 8 A, 9 E;

11.5 Ecosystem Services

6.2 C; 6.12 E; 7.2 C; 7.10 B; 8.2 C; 8.11 B, C, D; Aquatic Science: 2 J; 3 B; 12 A, B, D; Environmental Science: 2 K; 3 B; 8 B; 9 A, D;

Chapter 12: Oceans–The Gulf of Mexico

12.1 ABC’s of the Gulf

6.2 C; 6.12 E; 7.2 C; 7.10 A; 8.2 C; 8.11 A; Aquatic Science: 2 J; 10 B; Environmental Science: 2 K;

12.2 Reading and Research

6.2 C, D; 12 E; 7.2 C, D; 7.5 C; 7.10 A; 8.2 C, D; 8.11 A; Aquatic Science: 2 J; 11 A; 12 B; Environmental Science: 2 K; 9 E;

12.3 Ocean Currents

6.1 A, B; 6.2 A, C, E; 6.3 B, C; 6.4 A, B; 6.9 A, B; 7.1 A, B; 7.2 A, C, E; 7.3 B, C; 7.4 A, B; 8.1 A, B; 8.2 A, C, E; 8.3 B, C; 8.4 A, B; 8.10 A; Aquatic Science: 1 A, B; 2 E, F, G, H, J; 6 B; 8 A; Environmental Science: 1 A, B; 2 E, G, H, I, K; 6 C; 8 B;

12.4 Wind and Waves

6.1 A, B; 6.2 C, D, E; 6.3 B, C; 6.4 A, B; 7.1 A, B; 7.2 C, D, E; 7.3 B, C; 7.4 A, B; 8.1 A, B; 8.2 C, D, E; 8.3 B, C; 8.4 A, B; Aquatic Science: 1 A, B; 2 G, H, J;
12.5 Researching Ocean Organisms and Food Webs

- Environmental Science: 1 A, B; 2 E, F, G, H, I, K;
- 6.12 C, D, E, F;
- 7.11 A, B; 7.12 A; 7.13 A;
- 8.10 A;
- Aquatic Science: 3 B; 5 C; 10 B; 11 A;
- Environmental Science: 3 B; 4 B; 6 E;

12.6 Field Trip to the Gulf of Mexico

- Environmental Science: 1 A, B; 2 E, F, G, H, I, K;
- 6.12 A, B; 6.12 C, D, E; 6.4 A, B; 6.12 E;
- 7.1 A, B; 7.2 A, C, D, E; 7.4 A, B; 7.5 A, B; 7.8 C; 7.10 A; 7.11 A; 7.13 A, B;
- 8.1 A, B; 8.2 A, C, D, E; 8.4 A, B; 8.11 A, B, C;
- Aquatic Science: 1 A, B; 2 E, F, G, J; 3 E; 5 C D; 7 C; 9 C; 10 A, B; 11 A, B; 12 A, B, D;
- Environmental Science: 1 A, B; 2 E, F, G, H, K; 3 B, E; 4 A, B, E; 5 B; 6 E; 7 D;

Chapter 13: Fishing for Conservation

13.1 Gone Fishing?

- Aquatic Science: 2 J;
- Environmental Science: 2 K;

13.2 Which Fish Am I?

- Aquatic Science: 1 A; 2 G, J; 10 A, B;
- Environmental Science: 1 A; 2 F, G, K; 4 A, B;

13.3 Reading and Research

- Aquatic Science: 2 J; 10 A; 12 C, D;
- Environmental Science: 2 K; 9 A, E, G;

13.4 Fishing Line Experiment

- Aquatic Science: 1 A, B; 2 E, F, G J; 3 B, C, E; 5 C, D; 10 B; 11 A, B;
- Environmental Science: 1 A, B; 2 E, F, G, H, K; 3B, C, E; 4 B; 6 E; 9 G;

13.5 Fish Sampling and Ecosystem Assessment
Chapter 14: Water for People and the Environment

14.1 Who Owns the Water?
   6.2 C; 7.2 C; 8.2 C;
   Aquatic Science: 2 J;
   Environmental Science: 2 K;

14.2 Reading and Research
   6.2 C; 6.12 E; 7.2 C; 8.2 C; 8.11 C;
   Aquatic Science: 2 J; 12 A, B, D, E;
   Environmental Science: 2 K; 9 A, E, F, J, K;

14.3 What’s the Pollution?
   6.2 C; 6.3 B, C; 6.12 E; 7.2 C; 7.3 B, C; 7.8 C;
   8.2 C; 8.3 B, C; 8.11 C;
   Aquatic Science: 2 H, J; 7 A, B; 12 A, B, E;
   Environmental Science: 2 I, K; 5 B, C; 9 A, E, F, J, K;

14.4 Water Conservation
   6.2 C; 6.3 B; 7.2 C; 7.3 B; 8.2 C; 8.3 B;
   Aquatic Science: 2 H, J; 12 B;
   Environmental Science: 2 I, K; 5 B;
Purpose

*Texas Aquatic Science* was developed to help teachers make students aware of the importance of water to life and their part in conserving this valuable resource. This *Teacher Guide* is linked to short videos, which provide an overview of the main ideas in each chapter and to *Texas Aquatic Science* text for students that provides clear concise scientific information in an interesting way with illustrations of important concepts. Videos and student text can be found at [http://texasaquaticscience.org/](http://texasaquaticscience.org/)

The *Texas Aquatic Science* curriculum looks at water from the molecular level to the level of aquatic ecosystems. The *Teacher Guide* includes activities to guide students through the understanding that the characteristics of the water molecule make it unique in its value to all of life, and conservation of water is a priority for all of us. Student are also introduced to the wide variety of aquatic ecosystems through science investigations, games, models, Internet projects, reading the student guides, short videos, and field based assessments of water quality and environmental conditions in a variety of field trips. Students use multiple intelligences to learn and to demonstrate their new knowledge in creative products and performances.

Standards

The activities are aligned with the state curriculum standards, the *Texas Essential Knowledge and Skills* for sixth through eighth grade and for *Aquatic Science* and *Environmental Science* courses for high school.

Educational Perspective

Lessons in each chapter begin with an activity to allow the teacher to assess what students know about the concepts to be studied. Lessons embed higher order thinking skills, provide depth and complexity of learning, and provide a wide variety of hands-on activities that engage students in many contexts and methods. Each lesson includes an opportunity for students to apply what they have learned by synthesizing the information and demonstrating their learning by developing creative products or performances.
Howard Gardner’s *Multiple Intelligences* are integrated throughout the lessons to help meet the needs of all students by providing opportunities for students to learn and demonstrate new knowledge in ways that best fit their learning strengths. Activities are designed to be inexpensive and to use the materials that are already in most classrooms. Teachers will find the activities easy to implement and fun for students. Teaching materials for some lessons such as aquatic organism game cards, posters, and videos are linked to the curriculum guide and easy for teachers to download and print or view. I hope that you find the *Teacher Guide* and *Texas Aquatic Science* useful and your students enjoy the activities and come to understand the importance of water and the need for conservation of our aquatic ecosystems.

### The Importance of Outdoor Learning

Whether turning to the research proof on the effectiveness of learning outdoors, or turning to the faces of happy and engaged students, teachers see the benefits of using the outdoors as a rich, experiential learning environment. The outdoors awakens curiosity and discovery. It sharpens focus and concentration. Outdoor projects bring real-world experiences and relevancy to learning. Students of all ages and abilities find connections to the natural world, and most easily engage in inquiry-based explorations. Learning outdoors works.

But don't just take our word for it. The Texas Natural Resource/Environmental Literacy Plan, launched in 2013 by experts in formal and informal education, encourages learning in outdoor settings. Environmental literacy is the knowledge, skills and ability to understand, analyze and address major natural resource opportunities and challenges. The plan states, "As Texans have fewer direct experiences in the natural world, it becomes increasingly important to educate all citizens about our natural resources through accessible, safe, and enjoyable outdoor experiences. The environment provides an excellent context for this learning."

This curriculum teacher guide includes opportunities to take learning outdoors into the aquatic environments of Texas, or bring elements of the outdoors into the classroom. The partners' experience in the outdoors extends throughout the state. Opportunities available through the *Texas Aquatic Science* partners for experiential learning about aquatic ecosystems include natural habitats, wildlife management areas, state parks, glassbottom boat and kayak tours of Hill Country springs, coastal islands and paddling trails through the estuary, and discovery voyages into the Gulf. In addition to the tips within this guide, there are many wonderful training workshops that will help teachers overcome the barriers to teaching outdoors, including lesson plans, ideas for class management, and safety.

### Components of the Lessons

Lessons have a variety of components. Students use science journals, participate in co-operative learning activities, take part in a number of different modes for assessment, and collect data on a variety of field investigations.
Science Journals

Science journals provide opportunities for students to record their discoveries, questions, experiments, observations, reflections, labeled drawings or diagrams, data tables, and graphs. Systematic records of their work help students develop awareness and understanding of their experiences. Writing down what they see and do helps them to put learning into words, and having the written record helps them review and think about their learning.

Science journals help teachers to be aware of student progress in science process skills as well as science concepts. The journal then becomes a tool for helping parents understand the student’s development over time.

To help students get started journaling, provide specific guidelines. Each entry should include the date, time, weather, and location. This allows comparison of data over a period of time and forms the basis for observations. Using complete sentences for all notes helps to make the meaning clear when students read them later. All drawings and diagrams should be labeled so that they will mean something to the student when they are reviewed at a later date.

Cooperative Learning Activities

A variety of cooperative learning activities are included in the lessons. Some things are as simple as designing and conducting investigations in small groups, where students each have a part in making the work go smoothly. Other activities include a variety of ways for students to help each other by breaking down tasks and each concept apart and teaching it to the rest of the group. Some of these include:

ABC Brainstorming

Students use the alphabet to trigger ideas as they brainstorm on a topic or concept.

Carousel Brainstorming

Student groups are assigned to a poster with a concept or question. Posters are hung around the room. Each group is assigned a different color marker to write ideas, questions, or quotes on the posters. Then groups rotate around the room commenting on each poster’s concept or question or making responses to what other groups have written. To conclude, the class reviews the information on each poster and contributes other ideas.

Jigsaw

Students work in small groups. Each group is assigned some portion of material to learn and then teach to the other students. These “expert” groups decide how to teach their material to the rest of the class. Then one person from each group meets with individuals from all the other groups and they teach one another what they have learned. In the end all students will have learned all of the information.

Numbered Heads

Divide students into small groups give each student in every group a number that corresponds to a question in the student chapter. Students look for the answer to their
questions in the student text. As each number is called and the question is read, each student with that number gives an answer to the question.

**Round Robin Brainstorming**

Assign each small group a question or problem and give them time to discuss and think about answers. Designate one student as a recorder to take down other group members’ responses. Another student is assigned as a reporter to share the group’s responses with the class.

**Team-Pair-Solo**

Have students work on a problem or an idea in small groups, then in pairs, and then work on it individually.

**Think-Pair-Share**

Assign a question or problem to the class. Allow everyone to think about it individually, then have student pair-up and exchange their ideas. Have the pairs share their responses with the class.

**Three-Minute Review**

Stop any time during a lesson and give students 3 minutes to work in small groups to review what has been said, ask clarifying questions, or answer assigned questions.

**Assessments**

Each chapter provides multiple opportunities for assessment. The first lesson in each chapter provides a formative assessment to help teachers plan for appropriate student learning and to help students focus on what is to come. In addition, every lesson has a component to allow students the opportunity to synthesize what they have learned and apply it in creative products and presentations. The student reading also includes questions at the beginning of the chapter, which help students know what to focus on in the reading. These questions help scaffold the reading level for younger students and provide another type of assessment for the teacher to consider. Student science journals are also useful for formative and summative assessments. At the end of each chapter there are a multiple choice and open-ended questions for students along with an answer key. The open-ended questions have many possible answers. The answer key provides only an example of what teachers might expect to find in an answer, but do not exhaust all possibilities. Teachers should also feel free to add to or substitute their own questions for these assessments. Finally, each field trip provides opportunities for performance assessment.

**Field Investigations**

The curriculum includes eight field investigations. The field trips vary in purpose and destination. Teachers may choose to do one or all of the field trips depending on your time, transportation, and financial constraints. In addition, teachers of aquatic science courses in Texas high schools are required in the TEKS to conduct long-term studies of a
local aquatic site with their classes. Those teachers may wish to substitute their local long-term study site as the destination for their field trips. The following information will give you an idea of the types of field investigations included.

*Chapter 1* introduces students to a local creek or pond to use water chemistry testing they have practiced in the classroom.

*Chapter 3* asks students to take a field trip on the school grounds through a scavenger hunt looking for places where water flows, infiltrates, or accumulates and how land use influences the quality of water in their watershed.

*Chapter 4* includes a field trip to a local pond or stream to collect organisms for a native aquarium for observation in the classroom.

*Chapter 6* uses a field trip to a local pond or stream to practice mark and recapture techniques for estimating the population of an aquatic invertebrate.

*Chapter 8* has students conduct a field investigation to use multiple methods of assessing water quality in a local stream or river.

*Chapter 10* includes a field trip to a local wetland such as a playa lake or wetland to look at the unique characteristics of these aquatic ecosystems from soil, to plants, to wildlife species.

*Chapter 12* has a longer field trip to investigate saltwater ecosystems of bays, estuaries, and the Gulf of Mexico.

*Chapter 13* helps students learn fishing techniques and provides opportunities for students to practice fishing while they examine multiple criteria for evaluating a local aquatic ecosystem.

**Making the Most of Field Trips**

To get the most from field trips, prepare students in advance with skills they will be using and with concepts they may encounter. After the field trip, follow up with projects or reports where students can demonstrate what they have learned. Be sure students are aware of behavior expectations and safety precautions.

**Planning**

Field trips require careful planning. If you are lucky enough to have a pond on your school grounds or in a nearby park, using those will help students feel more responsible for taking care of the site. A nearby stream can also provide opportunities for doing a variety of field activities. If you have to travel farther from your school, logistics become more complicated, but can be well worth the effort for the first hand experience that students will have. If you are using a public site, make arrangements well ahead of time and learn about any rules or limitations that you might encounter. Be sure you have permission before you go on private property.
Managing Student Behavior During Field Work

Students know the rules and expectations for indoor behavior and have established routines for focusing attention and are bounded by the limited space available. Outdoors, these well established rules, routines and expectations are quickly “forgotten” among the many distractions.

Your task when teaching outdoors is to work with students’ increased enthusiasm and energy while maintaining focus so that learning occurs and student safety is maintained. Here are some ways to maximize control in the outdoor environment.

Set ground rules about outdoor behavior before leaving the classroom. Make a list of the behaviors, which you believe to be essential such as staying on the path, bringing litter back to the classroom, maintaining personal space, etc. Reinforce this behavior when students are gathered outside, before beginning any activities. Ask you class to help you plan ahead for handling any disruptive behavior. Students should come up with appropriate consequences such as having offenders sit out of activities that they are disrupting. Remind students that safety and learning are the priorities.

Set physical boundaries beyond which students cannot wander. Use clear landmarks such as a specific patch of trees or a path as your boundary markers. Designate a “home base”—usually your debriefing area. If students are scattering to do an activity, set a clear signal such as a sports whistle or a bell to indicate that the activity is over and students should return to home base. Students should always be in sight of the teacher.

Use the buddy system. Students should be paired with a buddy in their group all day. Teachers can assign partners so that compatible students are together. Sometimes a particular student can be partnered with a teacher or other adult. Students should notify their teacher or other adult when they are going to the restroom, and they should take their buddy with them.

Have all students, parents and teachers wear nametags with group number, or class and grade on the nametags. Color-coding each small group’s tag may be helpful in knowing where students should be working.

Gather students in a circle, preferably seated, when debriefing an activity, so that you have everybody’s attention and everyone can participate. Debrief away from competing noises. Ask for eye contact. Avoid speaking to a group with your back to the sun or an interesting distraction. Use your voice levels to set the tone for the type of learning that you want to happen.

Be aware of weather conditions and physical fitness levels of students. Many students will complain about being cold, hot or about the long distance that they have to walk. You need to read when these complaints are serious and need to be heeded or when the student just requires some positive but firm encouragement. Make adjustments for students with physical problems. Students with asthma or other physical problems will need to walk more slowly.

If you are walking for a distance, make sure that one adult leads the group and one adult brings up the rear, encouraging the slower walkers and making sure that no stragglers get left behind. Be vigilant. Be aware of students’ whereabouts and watch behavior.
Safety

The main concern for any field trip is safety. Become familiar with Texas Education Agency Texas Safety Standards (PDF, 20MB). Have plenty of volunteers to help supervise students. Ideally you would have one adult for every 5-10 students, depending on the age of your students. Provide volunteers with a list of students with whom they will be working and with their responsibilities. These responsibilities may include monitoring student behavior, supervising a specific task, or assisting with fishing or other equipment. Maintain all safety procedures for using chemical tests or other equipment including wearing goggles.

Planning for Emergencies

Planning for emergencies is important. Be sure the principal knows where students are going, and ask the school nurse to accompany you, if possible. Take a first aid kit including a buffered eyewash solution, life preservers, a reach pole, and a cell phone. Be sure the bus and driver remain at the site. In case of severe weather, do not seek shelter around water or under trees; return to the bus to take refuge. Help students learn to recognize poisonous plants, venomous snakes, and various biting invertebrates and what they should do if they encounter these.

Other Considerations

Be sure to send home permissions slip forms at least a month in advance and a reminder two weeks prior to the event. Be sure to make arrangements for students with special needs.

Make sure that other teachers know that students will be out on the field trip. They may have a way that students can utilize their field experiences in their other classes.