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SOS Steering Committee

- **Barbara DiPaolo, St John's, Houston, TX**
- **Pat Hardy, Weatherford ISD, Weatherford, TX**
- **Mary Lee Karl, El Paso ISD, El Paso, TX**
- **Joan Linsley, Houston ISD (retired), Houston, TX**
- **Dagoberto Ramirez, La Joya ISD, La Joya, TX**
- **Debbie Robertson, College Station ISD, College Station, TX**
- **Kim Stucker, HEBISD, Hurst-Euless-Bedford, TX**

Technology Advisor: Gillian Acheson, ITS, Texas A&M University

SOS Administrative Assistant: Julia Belknap

SOS Teacher Consultants

Louise Bergdahl, Lincoln Middle School, El Paso, TX
Linda Giesen, John S. Armstrong Elementary School, Highland Park, TX
Linda Hammon, W. Charles Akins High School, Austin, TX
Freda Johnson, Kingwood high School-9th Grade Campus, Kingwood, TX
Clifford Kinder, Bowie High School, Arlington, TX
Jeffrey Lash, University of Houston-Clear Lake, Houston, TX
Jennifer Leadbetter, Bammel Middle School, Spring, TX
Ann Linsley-Kennedy, Bellaire High School, Houston, TX
Judy Lucas, Clear Brook High School, Friendswood, TX
Carolyn Martin, LEAP-Kilgore Heights, Kilgore, TX

Susan McCormack, University of Houston-Clear Lake, Houston, TX
Pamella Ochoa, Birdville High School, North Richland Hills, TX
Jo Beth Oestreich, New Braunfels, TX
Hazel Prescott, Kingwood high School-9th Grade Campus, Kingwood, TX
Philip Rodriguez, Holmes High School, San Antonio, TX
Hagen Streckel, Copperas Cove High School, Copperas Cove, TX
Barbara Woolsey, Grandfalls-Royalty ISD, Grandfalls, TX



Thinking about the Environment...

Respond to each statement twice: once before this workshop session and again after the workshop.

Write A if you agree with the statement.

Write B if you disagree with the statement.

Response Before		Response After
	Earth's physical resources are for all practical purposes inexhaustible.	
	The environment has a virtually infinite ability to absorb human impacts.	
	Poverty is the result of inadequate growth which, in turn, results in inadequate capital investment.	
	Earth's physical resources are finite.	
	Governments, by nature, give priority to the interests of those who control power.	
	Human systems and physical systems are connected, interact with each other, and influence each other.	
	When the people control the local environmental resources on which their lives and those of their children depend, they are more likely than absentee owners to exercise responsible stewardship	
	Teaching about the environment can be difficult and controversial because of conflicting attitudes and values.	
	Texas faces many environmental management issues.	
	Sustainable development, defined as <i>development that meets the needs of the present without compromising the ability of future generations to meet their needs</i> is a worthy goal.	
	The TEKS support education about resources, conservation, and human-environment interaction.	
	SOS is a cry for help; this project, if successful, will help future generations of Texans live in a richer, healthier environment.	



THE ISLAND¹

Instructions

Read the following questions and discuss your answers.

1. Discuss your interpretation of the following quotation:

I had a dream that was not all a dream. I heard the sound of a big machine—civilization, driven by a hunger and need that was unimaginably powerful. It was never satisfied, always wanting more and more and more. The Earth was being eaten alive, consumed by the machine, consuming itself.

2. What images (scenes) were shown in the video to develop the above metaphor?

3. Is the civilization-machine metaphor effective in this video?

4. How would you describe the relationship between technology and civilization?

¹ Adapted from an activity suggested by the National Geographic Society

5. What is the message in the quotation below?

It's so easy to think about the world's problems in the abstract—as if they are always somebody else's. But then one day we awaken to find them ours. To find we can no longer ignore them. It's like death—never felt so keenly as when it washes up on the shores of our own lives.

6. Do you agree or disagree with this statement?

Establishing the Knowledge Base

**Download this PowerPoint presentation at
<http://sos.tamu.edu/sosenvironment.ppt>**

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World Geography: 8 (B) compare ways that humans depend on, adapt to, and modify the physical environment using local, state, national, and international human activities in a variety of cultural and technological contexts (Grade 10 TAKS Objective 5)

World History: 12. (B) analyze the effects of physical and human geographic factors on major events in world history (Grade 10 TAKS Objective 5)

Materials/Resources

Handout 1: *Environmental Issues*, one set, cut into strips, for each group of students

Handout 2: *Sorting Categories*, one transparency (for younger students you may wish to make one set of “headings” per group of students.)

Classroom Procedures

Beginning the Activity

1. Begin by asking students to define “the environment.” They should describe a range of physical characteristics such as landforms, soil, weather and climate, plants and animals. Ask students to brainstorm on ways the environment affects them specifically and humans in general. Next, ask them to consider the ways they specifically and humans in general modify and change the environment. This activity should help students to recall what they know about human-environment interaction and to remember that the relations between humans and the environment in which they live is very important and sometimes positive and sometimes negative.

Developing the Activity

2. Divide the class into groups and distribute the strips *Environmental Issues*. The first task is for each group to review the issues and to discuss what they know about each issue. After a few minutes, ask students what concepts/issues they have questions about. Ask students if there are any environmental issues they think are important that are not included. If there are, encourage them to make slips of paper and add them to the mix, particularly local issues that are currently in the news.

3. Next ask students to sort/categorize each issue along a continuum from local to global and in-between. Distribute the *Sorting Categories, Local to Global* or post on the overhead. There is no correct answer here. Some issues are local, some are regional, some are clearly global, with local impacts/effects. At the conclusion of this activity, ask the groups to share their results and to explain why they made the decisions they did. Challenge other students to ask questions about the decisions if they have them. Give students the opportunity to reflect on the slogan, “Act Locally, Think Globally.” What does that mean to them?

As an extension, you may wish to have students identify the location of these issues on maps of the state, nation, and world.

You may also ask students to sort the issues in order of importance. Which present the greatest threat to human health, welfare, safety, and survival? Which are easy to ameliorate and thus not that great a problem? These questions are especially appropriate for use with Gifted students.

4. Now that students know where these environmental issues take place, ask students to consider the nature of the issues—are they the result of natural physical processes such as drought or caused by human actions? Distribute the *Sorting Categories, Natural or Human-Induced* or post on the overhead. Ask students to re-sort the environmental issues into these two

categories. Explain that some issues may be a combination—students can place those in a third category for discussion.

At the conclusion of this activity, ask the groups to share their results and to explain why they made the decisions they did and to justify their choices. Challenge other students to ask questions about the categorization process. Did groups make different decisions? Why? Which category has the most issues? What generalizations can students make about human-environment interaction? What are some ways that humans can minimize their impact on the environment?

Concluding the Activity

5. Depending upon the specific student expectation at the level at which you teach, conclude this activity by asking students to write a summary of the environmental issues facing your local region and the world. The summary should address the causes of the issues, that is, whether they are the result of natural processes, caused by human actions, or a combination.

You may wish to present students with a scenario to motivate their written summary. An example would be:

You and the members of your group have been asked to prepare a State of the Environment report for the Governor (for grades 4, 7)/ the President (grades 5, 8, US History)/ the United Nations (grades 6, World History, World Geography). Using the ideas you have learned here, explain the state of the environment. What are the key environmental issues? Where are they taking place? What are the causes of some of the issues? What trends are evident? As a result of your report, what questions and issues remain unanswered? What big ideas emerge as significant? What ethical considerations play a role in shaping the state of the environment? Use maps, graphs, and brief written pieces to create the report.

Other suggested scenarios could ask students to develop plans for an energy or petroleum company, for an agricultural organization, or in a city or county context.

Handout 1: Environmental Issues

Watershed management
Climate change
Coastal management (preventing erosion, minimizing storm damage, balancing land use and development with recreation)
Deforestation (old growth versus reforestation, changing biodiversity)
Drought
Loss of native plants and other vegetation
Environmental management to conserve resources
Loss of native animals because of changes in habitats
Effects of tourism and other industries on vulnerable environments
Introduced species (non-native species of plants and animals)
Land degradation (any change in the land that reduces its existing or potential productivity)
Overgrazing
Hurricanes
Floods
Cell phone towers
Wind erosion
Water erosion
Natural hazards
Air pollution
Population growth
Expansion of highways and roads
Sustainable development (meeting the basic needs of the present without compromising the ability of future generations to meet their needs)
Technological changes
Ocean pollution

Toxic waste disposal
Draining wetlands
Adequate water supplies
Urban infrastructure (providing adequate transportation, sewage, and other services to support urban life)
Urban sprawl on agricultural lands
Impacts of large-scale agriculture
Water pollution
Aquifer water supplies
Uncapped oil wells
Leaking gas station storage tanks
Subsidence (sinking land)
Wildlife management (controlling wild hogs)
Waste management
Location and creation of landfills/recycling centers

Handout 2: Sorting Categories

Local

Global

**Natural
Physical Processes**

**Human-Caused
Processes**



Gifted Education and the Environment

The Texas State Plan for the Education of Gifted and Talented Students states, “Curriculum and instruction meets the needs of the gifted students by modifying the depth, complexity, and pacing of the general school program.”

Depth

Gifted students can explore the environment in depth through studying both geography/social studies and science. They should be challenged with learning opportunities that require them to drill deeply into issues related to conservation, sustainable development, and general environment-society relations.

Depth can be achieved by requiring students to move

- from the familiar to the unfamiliar,
- from the known to the unknown, and
- from concrete concepts to more abstract ideas.

Gifted students need learning experiences that allow them to go past facts and concepts to discover generalizations, principles, theories, and laws.

Remember that we want to move students from low-level tasks such as knowledge and upwards to synthesis, evaluation, and analysis (see Bloom’s Taxonomy)

Depth can also be achieved by asking students to investigate the layers of experience within a topic through:

- The language related to the topic, that is the vocabulary, skills, and tools used by environmentalists and geographers;
- Details, the factors and variables that scientists and geographers consider;
- Patterns, spatial and temporal, that allow for prediction of events and conditions;
- Trends, such as the forces and processes at work shaping the environment, both natural and human induced;
- Unanswered questions, the mysteries and areas still not understood as they relate to the environment, sustainable development, climate change, etc.;
- Big ideas, that is the principles related to the environment and its conservation; and
- Ethical considerations, such as competing points of view and opinions related to the environment.
-

Complexity

Understanding the environment, how it works, and the relationships among human and physical systems is a complex enterprise encompassing many disciplines. It is not simple, neat, and regular.

Gifted and talented students need to have many opportunities to explore the complete, messy, and ambiguous set of interlocking elements that combine to form ecosystems, physical systems, human systems, and eventually, the environment. They need to look at relationships over time, and to see how humans' expanding technological skills have had an increasingly significant impact on Earth's physical systems. Looking at environmental issues from multiple perspectives and points of view will help students to appreciate complexity as well.

Depth and complexity are interrelated and mutually reinforcing components of Gifted and Talented education.

Categories in the Cognitive Domain: (with Performance-Illustrating Verbs)²

1. Knowledge of terminology; specific facts; ways and means of dealing with specifics (conventions, trends and sequences, classifications and categories, criteria, methodology); universals and abstractions in a field (principles and generalizations, theories and structures): Knowledge is (here) defined as the remembering (recalling) of appropriate, previously learned information.

▫ defines; describes; enumerates; identifies; labels; lists; matches; names; reads; records; reproduces; selects; states; views.

2. Comprehension: Grasping (understanding) the meaning of informational materials.

▫ classifies; cites; converts; describes; discusses; estimates; explains; generalizes; gives examples; makes sense out of; paraphrases; restates (in own words); summarizes; traces; understands.

3. Application: The use of previously learned information in new and concrete situations to solve problems that have single or best answers.

▫ acts; administers; articulates; assesses; charts; collects; computes; constructs; contributes; controls; determines; develops; discovers; establishes; extends; implements; includes; informs; instructs; operationalizes; participates; predicts; prepares; preserves; produces; projects; provides; relates; reports; shows; solves; teaches; transfers; uses; utilizes.

4. Analysis: The breaking down of informational materials into their component parts, examining (and trying to understand the organizational structure of) such information to develop divergent conclusions by identifying motives or causes, making inferences, and/or finding evidence to support generalizations.

▫ breaks down; correlates; diagrams; differentiates; discriminates; distinguishes; focuses; illustrates; infers; limits; outlines; points out; prioritizes; recognizes; separates; subdivides.

5. Synthesis: Creatively or divergently applying prior knowledge and skills to produce a new or original whole.

▫ adapts; anticipates; categorizes; collaborates; combines; communicates; compares; compiles;

²

<http://faculty.washington.edu/krumme/guides/bloom.html>

composes; contrasts; creates; designs; devises; expresses; facilitates; formulates; generates; incorporates; individualizes; initiates; integrates; intervenes; models; modifies; negotiates; plans; progresses; rearranges; reconstructs; reinforces; reorganizes; revises; structures; substitutes; validates.

6. Evaluation: Judging the value of material based on personal values/opinions, resulting in an end product, with a given purpose, without real right or wrong answers.

▣ appraises; compares & contrasts; concludes; criticizes; critiques; decides; defends; interprets; judges; justifies; reframes; supports.



Literature and Geography

Geography is the integrated study of people, places, and environments. What better way for teachers and their students to explore and learn geography together than through reading? This section of SOS will 1) make suggestions on choosing literature rich in opportunities to learn about the environment and geography, and 2) suggest some strategies teachers can use with students to learn about the environment and geography.

Choosing Geographically-Rich Literature

Using children's literature and trade books to teach environmental issues, geography, and the social studies in school contexts has come under attack. Sources often are chosen for appeal and interest and not for opportunities for meaningful learning. Some researchers have, therefore, dismissed the literary approach to learning geography because content "gets lost in the shuffle" (Alleman and Brophy 1994). In a combined environmental geography/social studies and reading program it will be important to select literature that simultaneously engages children and enables them to learn about, understand, and appreciate the environment. The content of the books chosen must be clearly focused so educators (or parents!) can highlight key content-related issues without detracting from the pleasure of reading.

ENVIRONMENT AND SOCIETY INTERACTION/ENVIRONMENTAL GEOGRAPHY

Our world is a single, highly complex and interrelated system produced by the interplay of people and the environment. Humans depend upon the environment, they adapt to it, and they modify it. The environment influences people and their ways of life. At the same time, people affect the environment. This interaction between humans and their environment is the focus of a great deal of children's literature and presents opportunities for teachers, parents, and children to discuss and develop informed and reasoned opinions about human-environment interaction and related issues.

Books that focus on the environment can be linked to physical geography and help students understand the natural world in which they live. Books that describe the environment in vivid terms or which portray the environment (landforms, weather, seasons, and climate, vegetation, soils, natural hazards and disasters, ecosystems (including living creatures) such as a pond, a desert biome, an island, or a beach) in a significant way can be used to introduce key ideas about physical geography.

Especially appropriate are books that:

1) show changes in the human and physical characteristics of environments over time;

- 2) point out the fragility of certain environments, such as deserts, Arctic environments, and some kinds of forests;
- 3) emphasize the essential link between people and the environment in which they live (the concept of unity) and explain cause-and-effect relationships; and
- 4) make clear that environments (including plants and animals) may be limited in their ability to withstand human impacts.

Strategies Educators Can Use to Learn Geography Through Literature

There are a number of ways that literature can be used to teach about the environment. Here is a list of suggestions gleaned from a variety of sources.

Discuss the story geographically.

Children need to be guided to accept anything new and to develop and build empathy for and open-mindedness about others. The key is the enthusiasm and positive attitude of the teacher. Discussing a book with a child is one of the best ways to model how to think like a geographer. Discussion can revolve around simple questions organized around four questions: 1) Where is it? 2) What is it like? 3) How is it changing? 4) What do people think about it?:

WHERE IS IT?

Where is it located?

WHAT IS IT LIKE?

What is the place like?

What is the physical geography?

The environment (human and physical characteristics)?

HOW IS IT CHANGING?

What happened to whom?

What changes occurred? Why?

What things were the same and what things were different as compared with life where you live?

WHAT DO PEOPLE THINK ABOUT IT?

How did the characters in the story feel about what happened?

What did you think about the story?

A more complex and exhaustive set of questions to focus a geographic discussion in a wide variety of books, suitable for older students, could be developed. A few suggestions follow:

- Describe the setting for the book. What is it like in that place? That is, what are the physical characteristics such as landforms, weather and climate, types of trees and shrubs, natural hazards? How do they look compared to where we live?
- Map the setting. Make a map of the places in the story. Create symbols to represent the key elements.
- What are the characteristics of the people in the book? Do they live in a city, town, village, or farm? What do people do for recreation and leisure in this book? How do they earn a living? What is the culture or ethnicity of the book's characters? What, if any, role does that play in the book? What traditions are observed by the book's characters? Do boys and girls have different roles in that place than boys and girls here?

- Does this location have everything the characters need to survive or do they need resources from other places? Give examples.
- What kinds of foods do people eat? How are they prepared?
- What language(s) do the book's characters speak? If it is English, is it like the English spoken in your home?
- What changes take place in the book? What are the forces causing the change? How are the book's characters reacting to the changes? Does the environment affect the lives of the characters? How?

Let students imagine the ending.

Read a book, particularly about an environmental issue, out loud, without sharing the ending of the story. Ask the children to consider a range of outcomes and compare that with the author's conclusion. Children need to feel free to respond in a variety of ways to books.

Cartography.

Make maps, models, diagrams and so on to record and locate places, events, and trips within stories and books. Ask children to draw illustrations that go along with the book. Older children can be asked what additional pictures or diagrams might have been included in the book.

Mental Map.

Record the locations of a range of stories or books on a map to locate the places and to develop an enhanced "mental map" or understanding of locations and characteristics of places on Earth.

Passport.

Devise a kind of world passport which can be "stamped" as students visit a new place, region, environment, culture etc. through books. Keep a record on an outline map for the year or semester.

Similarities.

Discuss similarities as well as differences in people, places, and environments. Use diagrams and charts to organize children's ideas about similarities and differences. Help students to develop their skills of observation in books and in real life as they travel to school, to the store, to a friend's house.

Here is an example of a chart suggested by Tomlinson (1998) based on the book about life in Ghana, *Amoko and Efua Bear* (Macmillan 1988):

Similarities

We live in houses

We live with our families

We play with our friends

We bathe

We have toys we love

I hold Teddy or he rides in a carriage

Differences

Amoko bathes out of doors

Amoko carries Efua in a cloth

References

Alleman, Janet and Jere Brophy. 1994. Trade offs embedded in the literary approach to early elementary social studies. *Social Studies and the Young Learner* 6(3):6-8.

Geography Education Standards Project. 1994. *Geography For Life*. Washington D.C.: National Geographic Society.

Krause, Jeremy. 1994. "Read all about it:" Using children's literature in support of primary geography. In Bill Marsden and Jo Hughes (eds) *Primary School Geography*, pp 136-155. London: David Fulton Publishers.

Krey, DeAn M. 1998. *Children's Literature in Social Studies*. Washington D.C.:National Council for the Social Studies.

Morgan, Wendy. 1998. Geography for all. *Geography* 83(4):301-7.

Singleton, Laurel. 1993. *G is for Geography: Children's Literature and the Five Themes*. Boulder, CO:Social Science Education Consortium.

Tomlinson, Carl M. (ed). 1998. *Children's Books from Other Countries*. Lanham, MD: Scarecrow Press.

Literature, Geography, and the Environment

Here is a summary list of questions designed to focus student attention to key environment/geography/social studies concepts while reading both fictional and non-fictional literature.

For Younger or Less Able Readers

Where is it?

Where is it located?

What is it like?

What is the place like?

What is the physical geography?

The environment (human and physical characteristics)?

How is it changing?

What happened to whom?

What changes occurred? Why?

What things were the same and what things were different as compared with life where you live?

What do people think about it?

How did the characters in the story feel about what happened?

What did you think about the story?

For Older or More Capable Readers

Describe the setting for the book.

What is it like in that place? That is, what are the physical characteristics such as landforms, weather and climate, types of trees and shrubs, natural hazards? How do they look compared to where we live? Make a map.

What are the characteristics of the people in the book?

Do they live in a city, town, village, or farm? What do people do for recreation and leisure in this book? How do they earn a living? What is the culture or ethnicity of the book's characters? What, if any, role does that play in the book? What traditions are observed by the book's characters? Do boys and girls have different roles in that place than boys and girls here?

What kinds of foods do people eat? How are they prepared?

What language(s) do the book's characters speak? If it is English, is it like the English spoken in your home?

What changes take place in the book? What are the forces causing the change?

How are the book's characters reacting to the changes? What role does the environment play in the story?



Annotated Bibliography Grades 1-4³

ABOUT THE ANNOTATIONS

Each citation contains information about the author, the title of the book, the publisher, year of publication, the book's International Standard Book Number (ISBN), the book's print status, a brief description, and Environmental TEKS connections. Please note that the grade levels are not exclusive; a book useful for grade 4 may be effective at both higher and lower grade levels.

The TEKS Related to the Environment Used in this Bibliography

Grade 1

6) Geography. *The student understands various physical and human characteristics of the environment.*

The student is expected to:

- (A)** *Identify and describe the physical characteristics of places such as landforms, bodies of water, natural resources, and weather;*
- (B)** *Identify examples of and uses for natural resources in the community, state, and nation; and*
- (C)** *Identify and describe the human characteristics of places such as types of houses and ways of earning a living.*

Grade 2

8) Geography. *The student understands how humans use and modify the physical environment.*

The student is expected to:

- (A)** *Identify ways in which people depend on the physical environment including natural resources to meet basic needs;*
- (B)** *Identify ways in which people have modified the physical environment such as building roads, clearing land for urban development, and mining coal;*
- (C)** *Identify consequences of human modification of the physical environment such as the use of irrigation to improve crop yields; and*
- (D)** *Identify ways people can conserve and replenish natural resources.*

³ Collected by Kim Stucker, HEB ISD, with help from her friends and colleagues in the Texas Alliance for Geographic Education, HEB ISD, and Plano ISD.

Grade 3

4) Geography. *The student understands how humans adapt to variations in the physical environment.*

The student is expected to:

- (A) describe and explain variations in the physical environment including climate, landforms, natural resources, and natural hazards;*
- (B) compare how people in different communities adapt to or modify the physical environment;*
- (C) describe the effects of physical and human processes in shaping the landscapes; and*
- (D) identify and compare the human characteristics of selected regions.*

Grade 4

(9) Geography. *The student understands how people adapt to and modify their environment.*

The student is expected to:

- (A) describe ways people have adapted to and modified their environment in the United States, past and present;*
- (B) identify reasons why people have adapted to and modified their environment in the United States, past and present, such as the use of human resources to meet basic needs; and*
- (C) analyze the consequences of human modification of the environment in the United States, past and present.*

Grade 1

Barton, Byron. **MACHINES AT WORK.** Crowell, 1987. ISBN 0-694-00190-2. The text and illustrations show a busy day at a construction site as workers and machines knock down a building, bulldoze a tree, dig up a road, load a truck, dump the rubble, dig a hole, mix the cement, and build a building. This book could introduce a discussion about the requirements for various jobs and the human environment interaction that take place in development of a building. Grade 1-6B and C

Burton, Virginia Lee. **THE LITTLE HOUSE.** Houghton Mifflin, 1943, 1971, 1978. ISBN 0-395-18156-9. (1944 Caldecott Medal). This classic in children's literature focuses on change brought about by urban expansion. It shows what happens when the little house is surrounded by the approaching city. Grade 1-6C

Cherry, Lynne. **THE GREAT KAPOK TREE: A TALE OF THE AMAZON RAIN FOREST.** Harcourt/Gulliver, 1990, ISBN 0-15-200520-X. Grade 1-6A, B, and C.

Coats, Laura Jane, **THE ALMOND ORCHARD.** Macmillan, 1991. ISBN 0-02-719041-2. A woman remembers her experiences as a child growing up on an almond farm in California. She tells how the chores changed with the seasons and how technology affected the process of tending the trees. Grade 1-6B

Darling, Kathy. AMAZON ABC, Lothrop, 1997. ISBN 0-688-13779-2. Young children will find this alphabet book an intriguing way to learn about the animals of the Amazon rain forest. Clear, often striking photos illustrate the simple, informative text. Grade 1-6A.

Dunphy, Madeleine. HERE IS 0-7868-0162-X. The art is extraordinary in this series—in this case on the savanna. Other books in the series include the coral reef, wetlands, rain forest, arctic winter, and Southwest desert. Grade 1-6A.

Earthworks Group. 50 SIMPLE THINGS KIDS CAN DO TO SAVE THE EARTH. Illustrations by Michele Montez. Scholastic, 1991. ISBN 0-590-44249-X. This book is full of things kids can do to help protect our planet. Grade 1-6 B

Emberley, Rebecca. CITY SOUNDS. Scholastic, 1989. ISBN 0590443402. The book pictures many of the sounds found in urban areas. Students could try to locate similar sounds in their own environments and compare the sounds in the book with those they discover. Grade 1-6C.

Gibbons, Gail. NATURE'S GREEN UMBRELLA: TROPICAL RAIN FORESTS. Morrow, 1994. ISBN 0-688-12353-8. Simply written and colorfully illustrated, this book not only explains the complex ecosystem of tropical rain forests and their importance to the global ecology but also explores related issues concerning preservation and protection of the forest. Grade 1-6 A,B, and C.

Glori, Debi. THE SNOW LAMBS. Scholastic, 1996. ISBN 0-590-20304-5. A sheep dog proves that a boy's belief in the dog is justified when the dog brings a ewe home during a stormy night and saves the lambs. The story can stimulate a discussion about the influence of storms and actions that allow people to live safely in various climates. Grade 1-6A,

Grupper, Jonathan. DESTINATION: RAINFOREST. National Geographic, 1997. ISBN 0-7922-7018-5. Written in the second person, the brief text carries readers through different times of day, observing the habits of particular rain-forest animals, most from Central and South America and the rest from Southeast Asia and Africa. Meanwhile, the photos steal the show: a brilliantly colored tree frog clings to a leaf, a grasshopper sits on a leaf, camouflaged to near-invisibility, and a viper seizes and eats a lizard. Grade 1-6 Aand B.

Hall, Donald. OX-CART MAN. Illustrated by Barbara Cooney. Viking, 1979. ISBN 0-670-53328-9. (1980 Caldecott Medal). This book is set in early 19th century New England and tells the story of a family exchanging products they made for store-bought goods. The illustrations depict daily chores, travel, and seasonal change, and can stimulate discussions about history, economics, and changes over time. Grade 1-6C

Hardy, Ann. MY STICKER ATLAS OF THE UNITED STATES. Derrydale Books, 1995. ISBN 0-517-12082-8. A simple introduction to landscape features in the United States. Grade 1-6A

Hartman, Gail. AS THE CROW FLIES: A FIRST BOOK OF MAPS. Simon & Schuster, 1993. ISBN 0-689-70762-8. This book provides a look at different geographical areas from the perspectives of an eagle, rabbit, crow, horse, and gull. Grade 1-6A.

Holling, Clancy. PADDLE TO THE SEA. Houghton Mifflin Company, 1941. A small, carved canoe makes its way through the Great Lakes to the Atlantic Ocean. Grade 1-6 A.

Johnson, Stephen T. ALPHABET CITY. Viking, 1995. ISBN 0-670-85631-2. (1995 Caldecot Honor Book) Scenes from city streets depict the various letters of the alphabet in this wordless book. The book provides interesting motivation for searching through the environment to locate additional examples of letters formed by objects such as traffic signs, lights, and patterns on buildings. Grade 1-6C.

Knowlton, Jack. GEOGRAPHY FROM A TO Z: A PICTURE GLOSSARY. Illustrated by Harriet Barton. Harper, 1988. ISBN 0-690-04616-2. The entries describe the Earth's physical geography. Grade 1-6A

Lesser, Carolyn. SPOTS: COUNTING CREATURES FROM SKY TO SEA. Harcourt, 1999. ISBN 0-15-200666-4. More than just a number book, this is also a book that introduces the concept of biomes. Grade 1-6 A,B, and C.

Levinson, Riki. OUR HOME IS THE SEA. Dutton, 1988. A young boy and his family live in Hong Kong. His mother wants him to be a teacher, but he feels his home is the sea and he wants to be a fisherman like his father and grandfather. Grade 1-6 A, B, and C.

Locker, Thomas. THE BOY WHO HELD BACK THE SEA. Dial Brooks, 1987. A favorite tale of old Holland, a young boy saves his town from destruction by the sea. Grade 1-6 A.

McCloskey, Robert. TIME OF WONDER. Viking, 1957. ISBN 0-670-71312-3. OP. A family explores an island in the spring, during a hurricane, and after the storm has passed. The illustrations provide an excellent source for comparisons and discussions about the impact of storms. Grade 1-6A.

Malnig, Anita. WHERE THE WAVES BREAK: LIFE AT THE EDGE OF THE SEA. Carolrhoda, 1985. A nature book that introduces students to various types of tide pool life. Grade 1-6A

Orr, Katherine Shelley. MY GRANDPA AND THE SEA. Carolrhoda, 1990. ISBN 0-87614-409-1. Grandpa, a traditional fisherman, finds it difficult to compete with the modern technology that helps people catch more fish. Grandpa cannot make a living off the depleted supply. After he loses his fishing business, he creates an ecologically sound solution: a sea moss farm. Grade 1-6B and C.

Patent, Dorothy Hinshaw. FLASHY FANTASTIC RAIN FOREST FROGS. Walker, 1997. ISBN 0-8027-8615-4. This simple, well-written introduction to rain-forest frogs tells how they are like North American frogs, how some of them are unique, and how they are suited to their habitats. Colorful pictures show the frogs in the wild. Grade 1-6A and B.

Peters, Lisa. THE SUN, THE WIND AND THE RAIN. Illustrated by Ted Rand. Holt, 1990. ISBN 0-8050-1481-0. The illustrations compare the forces of nature, using a child's sand structure, and mountains that are influenced by sun, wind, and rain over thousands of years. The illustrator places these illustrations on opposite pages, so that readers can compare the short and long-term influences of nature. Grade 1-6A

Polacco, Patricia. BOAT RIDE WITH LILLIAN TWO BLOSSOM. Philomel Books, 1988. ISBN 0-399-21470-4. William and Mabel take a boat ride with a mysterious Indian woman and find answers to their questions about the wind, the rain, and the changing sky. Grade 1-6A

Rey, H.A. CURIOUS GEORGE GETS A MEDAL. Houghton Mifflin, 1957. A longtime favorite of young children, this book can be used to demonstrate geographic themes. George's escapades take him from place to place; he uses all kinds of transportation and the reader observes man's interaction with the environment along the way. The setting changes from a rural to an urban region. Grade 1-6 A,B, and C.

Schmid, Eleonore. THE LIVING EARTH. North-South, 1994. ISBN 1-55858-298-3. In detailed pictures and simple words, the author introduces the complex ecosystem beneath our feet. Grade 1-6A

Shannon, George. SEA GIFTS. David R. Godine, 1989. A story about a quiet man who lives on the Alaskan coast and he collects driftwood and other gifts from the sea, then carves figures from them and gives them back to the sea as his gift. Grade 1-6 A and B.

Wilcox, Charlotte. TRASH. Carolrhoda, 1988. A photo-essay detailing the difficulties in dealing with the trash that is deposited outside of building and homes every day. Grade 1-6 C.

Williams, Geoffrey T. TREASURES OF THE GREAT BARRIER REEF. Price Stern Sloan, 1987. A young boy and his mother go on an expedition into the strange and beautiful world of the barrier reef. Grade 1-6 A and B.

Williams, Vera. THREE DAYS ON A RIVER IN A RED CANOE. Greenwillow Books, 1981. ISBN 0-688-80307-5. Mother, Aunt Rosie, and two children make a three day camping trip by canoe. The story offers a step by step narrative of what a canoe trip requires. The book includes maps, diagrams for pitching a tent, and a list of supplies. Grade 1-6B

Williams, Shirley Anne. WORKING COTTON. Illustrated by Carole Byard. Harcourt Brace, 1992. ISBN 0-15-299624-9. (1993 Caldecott Honor Book and Coretta Scott King Honor Book). This story about a migrant farming family is set in central California. The pictures and story follow an African-American family as they experience the work in the cotton fields. Grade 1-6C

Wood, John Norris. NATURE HIDE & SEEK-OCEANS. Knopf, 1985. A flap book that shows sea life in its natural habitat. Grade 1-6A.

Grade 2

Asch, Frank. THE EARTH AND I. Gulliver, 1994. ISBN 0-15-200443-2. This is the story of a friendship that one child has with the Earth. Grade 2-8 A, B, C and D

Bailey, Donna. WHAT WE CAN DO ABOUT LITTER and WHAT WE CAN DO ABOUT GARBAGE. Franklin Watts, 1991. Photos and text lead children to think about litter and its problems. Grade 2-8 C and D

Baker, Jeannie. WHERE THE FOREST MEETS THE SEA. Greenwillow, 1987. ISBN 0-688-06363-2. The setting is the Great Barrier Reef and the wilderness between the Daintree River and Bloomfield in North Queensland, Australia. It is the largest rainforest left in Australia. Collage illustrations depict the setting that includes both past and potential changes. A "possible future" shows what might happen if hotels, swimming pools, and other types of development are

allowed in the area. It provides a good start for discussions about the influences of changes on the land. Grade 2-8A, B, C, and D

Bash, Barbara. ANCIENT ONES: THE WORLD OF THE OLD-GROWTH DOUGLAS FIR. Sierra, 1994. ISBN 0-87156-561-7. The illustrations and the text present the ecology of the old-growth forests of the Pacific Northwest. A time frame that extends from grasses to old growth introduces the text. Large colored illustrations present the forests and the various insects and animals that live in the forest. The book could accompany an ecology study of forest environments. Grade 2-8A, B, C and D

Brenner, Barbara IF YOU WERE THERE IN 1776. Bradbury, Simon & Schuster, 1994. ISBN 0-02-712322-7. Brenner focuses on how people's lives changed as a result of the American Revolution. She includes information on the founding fathers, the Continental Congresses, and the opening battles of the war, and she shows how colonists, Native Americans, and slaves lived during the time period. She discusses food and how people coped with shortages caused by the British blockade. Grade 2-8A, B and C

Burningham, J. HEY! GET OFF OUR TRAIN. Crown Publishing, 1989. A boy and his dog take a train around the world. As they travel, they meet animals that are endangered. A strong message comes through about how important it is to protect and treat our animals and their habitats well. Grade 2-8 A, B, C, and D.

Center for Environmental Education, THE OCEANS: CONSIDER THE CONNECTIONS. 624 9th Street, Washington, D.C. 20001, 1985. Excellent teaching reference and tool.

Cherry, L. THE GREAT KAPOK TREE: A TALE OF THE AMAZON RAIN FOREST. Harcourt Brace Jovanovich, 1990. A natural habitat of the tropical rainforest animals that live in the Kapok tree is threatened when man comes along to chop the great tree down. The human impact on the Amazon rainforest's environment is emphasized. Grade 2-8 C and D.

Cole, J. THE MAGIC SCHOOL BUS AT THE WATERWORKS. Scholastic, 1986. Ms. Frizzle and her class travel on the Magic School Bus through the water cycle, making a detailed stop at the water purification plant—an inventive combination of fact and fiction which kids love. Grade 2-8 A, B, C, and D.

Cooney, Barbara. ISLAND BOY. Viking, 1988. ISBN 0-670-81749-X. The book, set in early New England, follows the life of a boy as he matures on Tibbetts. Island. The illustrations depict new families arriving and industry coming to the bay. A map of the island and Great Broad Bay are found in the book. Readers can consider how the environment influenced life on the island, and how life influenced the environment. Grade 2-8 A, B, C, and D

Dunphy, Madeleine. HERE IS THE TROPICAL RAIN FOREST. Hyperion, 1994. ISBN 1-56282-636-9. A cumulative rhyme similar to "This is the house that Jack built" firmly links plants, animals, and climate in the rain forest ecosystem. The artwork, too, stresses the connectedness of plants and animals. The distinctive, rhythmic word patterns and large, well-composed paintings make this a good choice for reading aloud. Grade 2-8 A, B, C, and D.

Earthworks Group. 50 SIMPLE THINGS KIDS CAN DO TO SAVE THE EARTH. Illustrations by Michele Montez. Scholastic, 1991. ISBN 0-590-44249-X. This book is full of things kids can do to help protect our planet. Grade 2-8B, C, and D

Forsyth, Adrian. HOW MONKEYS MAKE CHOCOLATE: FOODS AND MEDICINES FROM THE RAINFORESTS. Firely, 1995. ISBN 1-895688-45-0. A Canadian biologist combines a sense of wonder with a wealth of factual information as he writes about rain forests around the world, each a unique web of plants and animals and people depending on each other for survival. The large volume is designed like a glossy magazine, with fully captioned color photos and framed insets in the detailed text. Grade 2-8 A, B, C and D.

George, Michael. RAIN FOREST. Creative Education, 1992. ISBN 0-88682-483-4. Exceptionally fine, large-scale photographs make this a stunning visual presentation, accompanied by a brief, descriptive text. Look here for a surprisingly rare illustration of a rain forest in the rain. Grade 2-8 A, B, C, and D.

Haddinham, Evan and Janet. GARBAGE: WHERE IT COMES FROM, WHERE IT GOES. Simon & Schuster, 1990. This book documents the growing problem of waste disposal through photographs, activities, and “amazing garbage facts”. Grade 2-8A, B, C, and D.

Hare, Tom. RECYCLING. Gloucester Press, 1991. This book stresses the importance of recycling as a means of combating further pollution and as a conservation measure. Grade 2-8 B, C, and D.

Landau, Elaine. TROPICAL FOREST MAMMALS. Children’s Press, 1996. ISBN 0-156-20044-5. This True Book series title features five rain-forest mammals from around the world: jaguars, howler monkeys, sloths, tapirs, and orangutans. The large type, short text, and color photographs will appeal to children beginning to read nonfiction on their own. Grade 2-8 A, B, C, and D.

Lasky, Kathryn. SUGARING TIME. Photographs by Christopher Knight. Macmillan, 1983. ISBN 0-02-751680-6 (1984 Newberry Honor Book) The photos show and the text describes the process for collecting and processing maple sap. Grade 2-8 A and D.

Lasky, Kathryn. SHE’S WEARING A DEAD BIRD ON HER HEAD. Illustrated by Catrow. Hyperion Books, 1995. ISBN 0-7868-0065-8. This book explains the origin of the Massachusetts Audubon Society from the perspective of its co-founders Minna Hall and Harriet Hemenway, two Bostonians who became so disgusted by the use of feathers and even complete birds as adornment on ladies hats that they formed a conservation movement. Students can compare the fashion trends of the 1890s and the 1990s and understand the role women played in effecting legal change to protect the natural environment. Grade 2-8A and D

Leedy, Loreen. THE GREAT TRASH BASH. Holiday House, 1991. The story of a town that solves its garbage problems through a cooperative effort. Grade 2-8 D.

Madden, Don. THE WARTVILLE WIZARD. Macmillan, 1986. A man with power over trash commands that each piece of litter goes back to stick with the person who threw it. Grade 2-8 C and D

Marzollo, Jean. I AM WATER. Illustrated by Judith Moffatt. Scholastic, 1996. ISBN 0-590-26587-3. The text and illustrations show the various forms of, and uses for, water, such as snow for sledding and ice for cooling. The text is written in simple language with considerable

repetition. The text could motivate a search for and uses of water in the local community. It could also lead to comparisons of forms and uses for water in different parts of the state and nation. Grade 2-8A,B,C, and D

O'Dell, S. **THE TREASURE OF TOPO-EL-BAMPO**. Houghton Mifflin, 1972. A recounting of the story of a poor Mexican village in a mountainous region perched above a silver mine. Silver bars from the mine had to be transported by burro down to the harbor at Mazatlan. The geography of the region is described vividly in the text and in excellent two-color tempera illustrations by Lynd Ward. Grade 2-8 A, B, C, and D.

Paladino, Catherine, selected by. **LAND SEA & SKY:POEMS TO CELEBRATE THE EARTH**. Little, Brown, 1993. ISBN 0-316-68892-4 OP. This poetry anthology is divided according to poems about the land, poems about the sea, and poems about the sky. The poems are illustrated with photos that depict that element in nature. Grade 2-8D

Provensen,, A. and M. **SHAKER LANE**. New York, 1987. The pictures speak of New England but this story could be anyplace in the U.S. As American society advances, the environmental and cultural changes are felt deeply by all. Grade 2-8 A,B, and C.

Ross, Kathy. **CRAFTS FOR KIDS WHO ARE WILD ABOUT RAIN-FORESTS**. Millbrook, 1997. ISBN 0-7613-0117-8. Bright, airy illustrations make the projects look appealing; step-by-step instructions make them practical as well. Where else can you turn when you need directions for making a tree frog beanbag, a necktie snake, or a curly-haired tarantula? Grade 2-8 A,B,C, and D.

Ryder, Joanne. **JAGUAR IN THE RAIN FOREST**. Mor-row, 1996. ISBN 0-688-12991-9. Through the imagination of a boy climbing a tree trunk, children are transported into the world of a jaguar. Large and lush, the paintings recreate the tropical rain forest of French Guiana, and the poetic text follows the jaguar padding along the river, stalking an armadillo, and relaxing in the forest canopy. Grade 2-8 A,B,C, and D.

Smith, Howard E. **ARROWHEADS AND SPEAR POINTS**. Henry Holt and Company, 1989. This book describes the different types of arrowheads and spear points of the Americas, where they may be found, and what they reveal about the life of ancient peoples. Grade 2-8 A and B.

Weller, Frances Ward. **I WONDER IF I'LL SEE A WHALE**. Illustrated by Ted Lewin. Putnam, 1995. ISBN 0-399-22836-5. In the book, a girl and her friend search for humpback whales off the New England coast. The themes in the book suggest the wonder of nature and a kinship between humans and animals. Grade 2-8D

Yolen, Jane. **WELCOME TO THE GREEN HOUSE**. Putnam, 1993. ISBN 0-399-22335-5. Dramatic paintings of tropical rain forest flora and fauna will capture children's attention as the steady rhythm of the brief text evokes the sounds of the "hot green house". This beautiful book makes a quiet plea to protect the environment. Grade 2-8 A, B, C, and D.

Grade 3

Anno, Mitsumasa. **ANNO'S U.S.A.** Illustrated by Mitsumasa Anno. Philomel Books, 1992.

The wordless book features the cities, towns, and countryside of the United States. Anno's illustrations include characters from her other works, historical figures, and elements from famous paintings. The stories told by the images help students understand geography and place in the United States, past and present. Grade 3-4B

Baer, Edith. **THIS IS THE WAY WE GO TO SCHOOL: A BOOK ABOUT CHILDREN AROUND THE WORLD.** Illustrated by Steven Bjorkman. Scholastic, 1994. ISBN 0-590-49443-0. Grade 3-4D

Baker, Jeannie. **WINDOW.** Greenwillow, 1991. ISBN 0-688-08917-8. The illustrations in this almost wordless book show the changes that take place outside a window in Australia. The time span goes from the time a baby is born until the child becomes an adult. The illustrations depict urban expansion and show the influences of these changes in the community and on land forms and vegetation. The book can provide an introduction to the study of other communities and change over time. Grade 3-4A, B, C and D.

Banks, Martin. **CONSERVING RAIN FORESTS.** Steck-Vaughn, 1990. ISBN 0-8114-2
Ada, Alma Flor. **JORDI'S STAR.** Illustrated by Susan Gaber. Putnam, 1996. ISBN 0-399-22832-2. A lonely boy who tends a herd of goats in a rocky area where water is difficult to find, digs a hole and finds it filled with water after a thunderstorm. When he sees the reflection of a star in the pool of water, he brings gifts to the star in the hopes that it will return. Each day he brings more gifts, such as moss and pebbles, to place around the pool until he finally transforms his landscape into something of beauty. This book can introduce a discussion about how people can improve their own landscapes. Grade 3-4 A,B and C

Baylor, B. and P. Parnell. **THE DESERT IS THEIRS.** Macmillan, 1975. A description of the relationship between desert people, the animals, and their land. It describes in words and pictures the Papago Indians respect for their Sonora Desert in the Southwest U.S. Grade 3-4 A, B, C, and D.

Brandenburg, Jim. **AN AMERICAN SAFARI: ADVENTURES ON THE NORTH AMERICAN PRAIRIE.** Walker, 1997. ISBN 0-8027-8319-8. This natural history informational book provides a photographic essay that focuses on the prairie. Grade 3-4A

Brandenburg, Jim. **SAND AND FOG: ADVENTURES IN SOUTHERN AFRICA.** Walker, 1994. ISBN 0-8027-8232-9. This natural history informational book provides a photographic essay about the wildlife, the people, and the landscapes of the Namib desert of South West Africa. The photographs provide and excellent source for comparisons with other areas. Grade 3-4D

Brown, Mary Barrett. **WINGS ALONG THE WATERWAY.** Orchard, 1992. ISBN 0-531-05981-2. This highly illustrated book focuses on the wetlands and 21 birds found in wetlands across the United States. Grade 3-4A 87-5. This well-organized study introduces many facets of rain forests: their makeup, locations, wildlife, importance, and the forces threatening them. Many photos and maps illustrate the book. Grade 3-4 A, B, C, and D.

Cherry, Lynn. **A RIVER RAN WILD.** Harcourt, 1992. ISBN 0-15-200542-0. Cherry traces the environmental history and present condition of the Nashua River which runs through New Hampshire and Massachusetts. Grade 3-4A, B, and C

Cherry, L. THE GREAT KAPOK TREE. Harcourt Brace Jovanovich, 1990. The natural habitat of the tropical rainforest animals that live in the Kapok tree is threatened when man comes along to chop the great tree down. The human impact on the Amazon rainforest's environment is emphasized. Grade 3-4 B and C.

Collier, John. THE BACKYARD. Penguin Books, 1993. A child imagines what has taken place in the backyard, from the present all the way back to the creation of the world. Grade 3-4A,B, and C.

Cone, Molly. SQUISHY, MISTY, DAMP & MUDDY: THE IN-BETWEEN WORLD OF WETLANDS. Sierra Club, 1996. ISBN 0-87156-480-7. Photographs illustrate the nature of the wetlands and the life they support. The text develops the precarious future of the areas and the need for preservation. Grade 3-4A, B, and C

Cosgrove, Brian. WEATHER. Knopf, 1991. ISBN 0-679-80784-5. This book combines an information-rich text with striking full-color photos and diagrams in many of these books can be used even with children too young to read the texts. Grade 3-4 A.

Dorros, Arthur. RAIN FOREST SECRETS. Scholastic, 1990. ISBN 0-590-43369-5. Written in a conversational tone, this picture book introduces rain forests (temperate as well as tropical), describing their special features and importance to the environment. Effective pen-and-wash drawings suggest the lush greenery of the settings. Grade 3-4 A, B, and C

Earthworks Group. 50 SIMPLE THINGS KIDS CAN DO TO SAVE THE EARTH. Illustrations by Michele Montez. Scholastic, 1991. ISBN 0-590-44249-X. This book is full of things kids can do to help protect our planet. Grade 3-4 B, C and D.

Esbensen, Barbara Juster. ECHOES FOR THE EYE: POEMS TO CELEBRATE PATTERNS IN NATURE. Illustrated by Helen K. Davie. HarperCollins, 1996. ISBN 0-06-024398-8. The poems in this collection celebrate patterns in nature. Children may be encouraged to make their own observations about nature and geography. Grade 3-4A and C

George, Jean Craighead. EVERGLADES. Illustrated by Wendell Minor. HarperCollins, 1995. ISBN 0-06-021228-4. This natural history text describes the Florida Everglades as a Native American storyteller covers both the history and the possible destruction of the area. This text could be used as an introduction to ecology and a discussion about what children can do to help preserve the planet. Grade 3-4A, B, and C

George, Jean Craighead. ONE DAY IN THE TROPICAL RAINFOREST. HarperCollins/Crowell, 1990. ISBN 0-690-04767-3. From the author's One Day series, this book creates a vivid portrait of a rain forest through an illustrated narrative written as a logbook noting the interactions between people, animals, and machines over the course of a day. Grade 3-4 A, B, and C.

Goodman, Susan E. BATS, BUGS, AND BIODIVERSITY: ADVENTURES IN THE AMAZONIAN RAIN FOREST. Simon & Schuster/Atheneum, 1995. ISBN 0-689-31942-6. This photo-essay records the experiences of seventh and eighth grade students from Michigan who traveled to the Peruvian Amazon. Clear full-color photos focus on the children's experiences as well as on the environment and people they came to know. Grade 3-4 A, B, C, and D.

Hackwell, J. DESERT OF ICE: LIFE AND WORK IN ANTARCTICA. New York, 1991. Charles Scribner's Sons, 1991. The author describes with sketches as well as text, life in an Antarctic base camp and the scientific research that is taking place there now. Emphasized is the impact humankind has on this environment. Grade 3-4 A, B, and C.

Holling, H.C. PADDLE TO THE SEA. Houghton Mifflin, 1941. Although classified as fiction, the book has so much accurate geographical information it is a valuable source for teaching. It includes many maps and diagrams. Grade 3-4 A, B, C, and D.

Jeffers, S. BROTHER EAGLE, SISTER SKY: A MESSAGE FROM CHIEF SEATTLE. Dial Books, 1991. The words of Chief Seattle spoken over 100 years ago are combined with gorgeous illustrations by Susan Jeffers to communicate the Indian philosophy of the importance of the earth and all creatures that live on it. The message is that our environment is sacred, and we must take care of it. Grade 3-4 C.

Jenike, David and Mark. A WALK THROUGH A RAIN FOREST: LIFE IN THE ITURI FOREST OF ZAIRE. Watts, 1995. ISBN 0-531-11168-7. Readers learn about the indigenous people and the extraordinary plant and animal life of the Ituri Forest as they journey with a young boy and his grandparents from their small village to an outlying fishing camp. The colorful, captioned photos include many closeups of forest animals. Grade 3-4 A, B, C, and D.

Landau, Elaine. TROPICAL RAIN FORESTS AROUND THE WORLD. Watts, 1990. ISBN 0-531-10896-1. Landau offers a good, simple discussion of tropical rain forests and the plants and animals that make up these ecosystems. Grade 3-4 A, B, and C.

Lasky, Kathryn. THE MOST BEAUTIFUL ROOF IN THE WORLD. Harcourt, 1997. ISBN 0-15-100893-4. Lasky's unusually vivid evocation of the rain forest follows biologist Meg Lowman into the canopy as she observes plants and animals and later shows them to her two young sons. Fresh in outlook and intriguing in details, this memorable book features colorful photographs that reflect the you-are-there quality of the text. Grade 3-4A,B,C, and D.

Lauber, Patricia. FLOOD: WRESTLING WITH THE MISSISSIPPI. National Geographic, 1996. ISBN 0-7922-4141-X. This informational book describes the Mississippi River, presents its history, and discusses how it affects the lives of the people living near it. The author discusses both the 1927 and the 1933 floods. Students could conduct additional research using other rivers as examples. Grade 3-4A and B

Lessem, Don. INSIDE THE AMAZING AMAZON. Crown, 1995. ISBN 0-517-59490-0. Illustrated with dramatic paintings on foldout pages, this large format book focuses on the distinct layers of the Amazon rain forest and the plants and animals living in each one. Grade 3-4 A, B, C and D.

Lewington, Anna. ANTONIO'S RAIN FOREST. Carolrhoda, 1993. ISBN 0-87614-749-X. Eight-year-old Antonio Jose describes his home and family, rubber tappers in the Amazon rain forest area called the "extractive reserve." Maps and insets on the history of rubber appear from time to time, but the main focus is the home life, work, and surroundings of these Brazilian rain-forest people. Grade 3-4 A,B,C, and D.

Lewis, T.P. **HILL OF FIRE**. Harper & Row, 1971. An easy to read account of the surprising beginning and subsequent eruption of a volcano in Mexico in 1941. The story explains simply what effects the volcano had on the nearby villages. Grade 3-4.

Parker, Steve. **EYEWITNESS BOOKS: SEASHORE**, Knopf, 1989. Outstanding series with detailed, full-color pictures; a great reference tool. Grade 3-4 A

Patent, Dorothy Hinshaw. **CHILDREN SAVE THE RAIN FOREST**. Dutton/Cobblehill, 1996. ISBN 0-525-65163-2. Patent describes visiting the Children's Rain Forest in Costa Rica, a 42,000 acre region near Monteverde that has been preserved through donations from children around the world. As she discusses rain forests and the importance of preserving them, exceptionally clear photographs offer glimpses of the rain forest's plants and animals. Grade 3-4 A,B,C, and D.

Peters, Lisa Westberg. **OCTOBER SMILED BACK**. Illustrated by Ed Young, Holt, 1996. ISBN 0-8050-1776-3. The text is written in poetic form and the illustrations depict changes over 12 months. The book is good for both sequential development and comparisons within the community across seasons of the year. Grade 3-4B and C.

Provensen, A. and M. **SHAKER LANE**. Viking Kestrel, 1987. The pictures speak of New England, but this story could be anyplace in the U.S. As American society advances, the environmental and cultural changes are felt deeply by all. Grade 3-4 A, B, C, and D.

Silverstein, Shel. **THE GIVING TREE**. Harper & Row, 1973. The story of a love for the boy by the tree who gives her branches for wood, her apples for food, and finally even her trunk to make the boy happy. Grade 3-4C

Grade 4

Anderson, Madelyn K. **OIL SPILLS**. Series: Watts, 1991. ISBN 0-531-10872-4. The importance of oil and its history, use, and production, share time with descriptions of the causes and effects of oil spills. Grade 4-9 B and C.

Asimov, Isaac. **WHAT'S HAPPENING TO THE OZONE LAYER?** Gareth Stevens, 1993. ISBN 0-8368-0795. Explores in simple fashion the different possibilities for this global issue. Grade 4-9 C.

Brandenburg, Jim. **AN AMERICAN SAFARI: ADVENTURES ON THE NORTH AMERICAN PRAIRIE**. Walker, 1997. ISBN 0-8027-8319-8. This informational book emphasizes prairie ecology and prairie animals. Large colored photographs accompany the text and clarify the concepts developed. The book can help students identify characteristics of the prairie and to compare those characteristics with the geography of various parts of Texas. Grade 4-9 A, B, and C

Brisson, Pat. **KATE HEADS WEST**. Bradbury Press, 1990. ISBN 0-027-14345-7. In a series of letters to her relatives and friends, Kate describes her trip through Oklahoma, Texas, new Mexico, and Arizona with her best friend, Lucy, and Lucy's parents. Grade 4-9 A, B, and C

Carter, F. EDUCATION OF LITTLE TREE. University of New Mexico Press, 1976. An autobiographical account of a Cherokee boy growing up in the Appalachians during the Depression. Being in tune with nature and the environment, his Indian heritage shines throughout the book. Grade 4-9 A, B, and C.

Cherry, Lynne. A RIVER RAN WILD. Gulliver Green-HBJ, 1992. An environmental history of the Nashua River, from its discovery by Indians through the polluting years of the Industrial Revolution to the ambitious clean up that revitalized it. Grade 4-6 A, B, and C.

Choron, Sandy and Harry. THE BOOK OF LISTS FOR KIDS. Houghton Mifflin, 1995. ISBN 0-395-70815-X. This book has a useful list of *"Captain Planet's Top Ten Eco-Tips"* on pages 81-82. Grade 4-6 A, B, and C.

Crawford, Anne F. LIZZIE: QUEEN OF THE CATTLE TRAILS. Illustrated by Cheryl G. Fain. Benson, 1990. ISBN 0-87443-091-7. This book recounts the exploits of Lizzie Johnson (1843-1924), one of Texas's most successful cattle dealers. She was one of the first women to ride the Chisholm Trail to St. Louis and diversified her assets, buying real estate in Austin as well as cattle to sell to northern markets. Grade 4-9 A,B, and C

Dudley, William. THE ENVIRONMENT: DISTINGUISHING BETWEEN FACT AND OPINION. Series: Opposing Viewpoints, Juniors. Greenwillow, 1991. ISBN 0-89908-603-9. Students consider various viewpoints related to topics of environmental concern such as the effects of pollution. Grade 4-9 C

Duncan, Dayton. PEOPLE OF THE WEST. Brown, 1996. ISBN 0-316-19627-4. The text focuses on the stories of 15 men and women whose lives provide a representative picture of life on the American frontier. There are several references to Texas within the book. It can introduce an investigation of life on the Texas frontier. Grade 4-9 A,B, and C

Dutton. THE BIG BOOK FOR OUR PLANET. Dutton Children's Book, 1993. Nearly 30 stories, poems, and nonfiction pieces about environmental problems plaguing our planet. Grade 4-9 A, B, and C

Earthworks Group. 50 SIMPLE THINGS KIDS CAN DO TO SAVE THE EARTH. Illustrations by Michele Montez. Scholastic, 1991. ISBN 0-590-44249-X. This book is full of things kids can do to help protect our planet. Grade 4-9 A,B, and C

Freedman, Russell. BUFFALO HUNT. Holiday House, 1988. ISBN 0-8234-0702-0. The text provides an illustrated history of the buffalo that ranged from the Mississippi River westward to the Rocky Mountains, and from Canada to the Rio Grande 150 years ago. The illustrations reproduce paintings created by artists such as George Catlin and Karl Bodmer who traveled the West in the 1800s. Grade 4-9 A, B, and C

Freedman, Russell. INDIAN CHIEFS. Holiday, 1987. ISBN 0-8234-0625-3. This book includes a biography of Quanah, Parker, one of the Comanche war chiefs who influenced Texas history. The text includes a map of "The West of 1840." The map includes the Republic of Texas, as well as topographical borders, territorial borders, and trails. Grade 4-9A, B, and C

George, J. THE TALKING EARTH. Harper & Row, 1983. This adventure is set in the Florida Everglades; contemporary setting, Seminole tribal traditions and beliefs are questioned by a 13-

year old Seminole girl. Billy Wind learns to understand accept her heritage by experiencing the Everglades. The detailed, realistic descriptions of the region enhance the story as Billy Wind discovers the close relationship between humans and their environment. Grade 4-9 A, B, and C.

Heide, F. and J. H. Gilliland. **THE DAY OF AHMED'S SECRET**. Lathrop, Lee, and Shepard, 1990. Modern day Cairo is the setting for this picture/storybook. Outstanding illustrations bring out key geography concepts. Everything from the contrast of old and bustling new in Cairo to Islamic customs and traditions is included. Grade 4-9.

Hendershot, J. **IN COAL COUNTRY**. Alfred A. Knopf, 1987. A realistic story about growing up in a real coal-mining town on the Ohio River in the 1930's. Regional example of human impact on the land. Grade 4-9 A, B, and C.

Jaffe, Mark. **AND NO BIRDS SING**, Simon & Schuster, 1994, OP, ISBN 1-56980-109-6. A true ecological thriller set in a tropical paradise. It's the story of an ecological disaster, but it reads like a mystery. Grade 4-9A, B, and C

Jeffers, S. **BROTHER EAGLE, SISTER SKY: A MESSAGE FROM CHIEF SEATTLE**. Dial Books, 1991. The words of Chief Seattle spoken over 100 years ago are combined with gorgeous illustrations by Susan Jeffers to communicate the Indian philosophy of the importance of the earth and all the creatures that live on it. The message is that our environment is important and we must take care of it.

Kalman, Bobbie. **SETTLER SAYINGS**. Crabtree Publishing, 1994. ISBN 0-86505-498-3. This useful source includes information on settlement in North America and uses period illustrations from newspapers to explain how settlers lived and established homes in new places. Grade 4-9A, B, and C

Kovacs, Deborah and Madin, Kate. **BENEATH BLUE WATERS: MEETINGS WITH REMARKABLE DEEP-SEA CREATURES**. Photographs by Larry Madin. Viking, 1996. ISBN 0-670-85653-3. Studying the ocean and its inhabitants is a logical topic for students living in Texas, a state with a long coastline. The text and photographs present the natural regions that are found beneath the oceans. The text could be used to introduce a study of the ocean along the Texas coast and to compare the ocean off Texas with other bodies of water. Grade 4-9 C

Levine, Ellen. **IF YOU TRAVELED WEST IN A COVERED WAGON**. Illustrated by Elroy Freem. Scholastic, 1992. ISBN 0-590-45158-8. This story explores the items settlers took with them on their journey West, the conditions they encountered, and their mode of transportation. Grade 4-9 A, B, and C

Mattson, Mark. **ENVIRONMENTAL ATLAS OF THE UNITED STATES**. Scholastic, 1993. ISBN 0-590-49354-X. An illustrated atlas featuring United States environmental concerns. Grade 4-9 A,B, and C

Owens, Delia and Mark. **EYE OF THE ELEPHANT**. Houghton, 1993. ISBN 0-395-68090-5. An epic adventure in the African wilderness, which reveals what the authors discovered about poaching when they returned to Africa to study elephants. Grade 4-9 A, B, and C

Pederson, Anne. **THE KIDS' ENVIRONMENT BOOK: WHAT'S AWRY AND WHY**. John Muir Publications, 1991. ISBN 0-945465-74-2. This book describes, in kid language, what's wrong

with the environment, how it got that way, and how problems relate to one another, with suggestions on how to make things better.
Grade 4-9 A, B, and C.

Phillips, Kathryn. **TRACKING THE VANISHING FROGS**. Penguins, 1994. ISBN 0-312-10973-3. An ecological mystery which explores the decline in amphibian species that has alarmed and puzzled scientists for years. Grade 4-9 A, B, and C

Provensen, A. and M. **SHAKER LANE**. Viking Kestrel, 1987. The pictures speak of New England but this story could be anyplace in the U.S. As American society advances, the environmental and cultural changes are felt deeply by all. Grade 4-9 A, B, and C.

Sayre, April Pulley. **TROPICAL RAIN FOREST**. Twenty-First Century, 1994. ISBN 0-8050-2826-9. Illustrated with full-color photos, this lively, informative book explores the complex ecosystem of the tropical rain forest. From the excellent Exploring Earth's Biomes series, the book offers more detail than most of the others listed here and does so in an attractive, accessible format. Grade 3-4 A, B, C, and D.

Siebert, D. **HEARTLAND**. Thomas Y. Crowell, 1989. A picture book of the Plains states. A poem presents the farmers' love of the land and some environmental issues confronting farmers, including urban sprawl and drought. Grade 4-9 A, B, and C.

Silverstein, Shel. **THE GIVING TREE**. Harper & Row, 1973. The story of a love for the boy by the tree who gives her branches for wood, her apples for food, and finally even her trunk to make the boy happy. Grade 4-9C

Tobias, Michael. **NATURE'S KEEPERS**. Wiley, 1998. ISBN 0-471-15728-7. The author takes readers to the front lines in the war against poachers in the U.S. Grade 4-9 A, B, and C



Web Based Mapping: An Annotated Webliography⁴

AMERICAN FACT FINDER

<http://factfinder.census.gov>

System Requirements: IE 5.0 or higher; Navigator 4.76; Browser with JavaScript and style sheets enabled; Browser must accept cookies; display resolution set to 800x600 or higher.

You can create reference maps and thematic maps with Fact Finder. Reference maps display geographic boundaries of states, counties, cities as well as features like rivers, railroads, hospitals, and airports. Thematic maps use Census statistical data to display certain phenomena, such as percent Asian population by county in Texas. (Census nicely distinguishes the two: "Remember—if you have a “where is” question, use a Reference Map. If you have a “how many” or “what percent” question that is related to a specific geographic area, use a Thematic Map.")

The geographic area displayed is easily changed by drop down buttons ("Change Selections Menu") and also by the zoom buttons. The map can be re-centered and zoomed. The "identify" button displays a particular area the user has clicked on in a pop up window, as a map and with some additional information.

For thematic maps users can change the number of classes, the color scheme, and the classing interval.

A legend is included and is updated each time a new theme is added or subtracted.

There is an excellent tutorial on creating and printing maps for the novice user.

AUSTRALIA'S NATURAL RESOURCES ATLAS

<http://audit.ea.gov.au/nlwra/mapping/index.cfm>

This site can create maps on a wide variety of Australia's environmental features. The window opens with some basic data layers but by clicking the add-more data button (a plus sign on top of papers in the top left toolbar, or the same symbol on the lower right side frame), additional data layers can be added. A total of 190 different layers are grouped into nine categories: administrative/regional boundaries; agriculture; base layers; biodiversity and vegetation; climate; coasts; land; rangelands; and water.

The zoom in tool works differently than most of the other sites: by clicking on the icon, the user

⁴ Prepared by Gillian Acheson, ITS and the Department of Geography, Texas A&M University

then draws a box around the desired area to be mapped. When a new map is generated, the toolbar is complemented by an additional button which allows the user to go back to the full extent of the map -- much easier than repeatedly clicking the zoom out icon and then the map in order to get back to the full extent. It is possible to pan to different directions as well. The legend can be viewed by clicking "show legend" on the lower right hand frame. The legend opens in a pop-up window.

Users can: search for town/city names; identify a feature by clicking first on the "identify" icon and then clicking on a particular spot on the map; and, search for a value on the map.

Maps can be printed. To do so, users click on the print button and a window asking for a map title and additional comments pops-up. After completing the fields (they can be left blank if so desired), a printer-friendly map, including legend, pops up in another window.

There is a very good help section, although it is a very user friendly site. The buttons are clear and intuitive. One caveat: the site tends to run a bit slowly at times. As requests are made, a "working" message pops-up though -- this is useful in case you think the site has not registered your request.

The site is regularly being updated so more information, better functioning should be expected. The site makes little use of JavaScript on the user-end, so a 3.2 HTML compliant browser should suffice.

COMMUNITY ATLAS – US ONLY

<http://www-atlas.usgs.gov>

Most data are collected at a scale of 1:2,000,000 and are intended for use at a national or large regional scales. In the map browser, a bar scale appears under the map. From a series of topics, users can select layers to display of the US at various scales. There are a wide variety of layers which are broken down into 10 categories: agriculture, biology, boundaries, climate, environment, geology, people, transportation, water, and reference. Within these categories, users can select multiple layers for display (this, though, is complicated when the same colors are used to display the different layers). The number of layers is truly amazing: everything from the distribution of cotton to butterfly species to ethnic concentrations to airports, roads, and dams.

Users can zoom to a particular state in addition to zooming in/out. Panning is available, as is an index button which allows the user to move a rectangle over the US map to change the map center. An "identify" button allows the user to click on the map and find the latitude and longitude of the location and corresponding data. For example, on a map of butterfly distribution, I clicked on latitude 32° 18' 10" N, longitude 84° 18' 40" W, Schley County, Georgia, where 12 different butterfly species were recorded.

A help button is available which pops-up another window describing each of the available buttons. It is suggested that screen resolution should be set to 800- by 600-pixels or higher. Community Atlas is compatible with Microsoft IE and Netscape Communicator, versions 4.x or higher. Problems with IE 4.x on the Mac have been reported but IE version 5 on the Mac seems to work (Communicator 4.x or 5.x on the Mac works).

CORNELL INTERACTIVE MAPPING AND DATA ANALYSIS

<http://atlas.geo.cornell.edu/ima.html>

This site will run on Netscape 4.07 or later and/or IE 4.0 later. It experiences problems with Netscape, so IE is the recommended browser.

This site was developed as a web-based tool for the site-authors' data sets. The data sets reflect the researchers' interests: data is largely from the Middle East, North Africa, and the US. This tool is geoscience and geology oriented, although you can map transportation networks and towns and cities.

Once created, maps can be downloaded as .jpg or postscript files. Legends cannot be generated (users must remember the data they have mapped and/or create the legends themselves), although you can change the color, size, and shape of symbols as they display on the map. If you are interested in mapping environmental data, this site will be useful. Although, it is not exactly intuitive, good help instructions are provided.

Datasets are grouped into categories (geography, geology, geophysics, images/grids, and CTBT). Available datasets include:

Geography: country borders, states, lakes, rivers

Geology: world geology, US geology, faults, mines

Geophysics: ISC seismicity (by magnitude), seismic stations, CMT focal mechanisms, GPS vectors

Images/grids: topography, ages of the ocean floor, free air gravity

CTBT: IMS seismic station, infrasound stations, known nuclear test sites, nuclear power plant locations

ENVIRONMENTAL PROTECTION AGENCY'S ENVIROMAPPER

<http://maps.epa.gov/enviromapper>

This site allows users to map a variety of layers at a large scale about US environmental features. A diverse set of environmental layers can be mapped, providing a spatial view of human-environment interactions.

The initial map layers offered at a national scale are rather limited: interstates, counties, and states. Users can zoom in to an area by clicking anywhere on the US map; or, users can select a state, county, city, or watershed from a drop-down list.

Users can also enter a zip code to map. Zooming in/out is available, and users can set the magnitude of zooming to 2, 4, 8, or 16 times.

Maps can be printed, by clicking on the "Printable Map" button. This button pops up a window where users can enter a title (or not) and then another window opens with a printer-friendly version, including a legend.

There is an adequate help section which allows users to click on particular layers for definitions (though those definitions are at times rather murky).

This site is fairly popular. On many occasions, I have been unable to reach the EnviroMapper homepage, or have been unable to get beyond the home page and have a request submitted. The popularity of this site can make it difficult to rely on in a classroom setting. However, there are two good reasons to use this site: (1) the business of the site tends to be worse on the weekends than the weekdays so school-time users may not have as many difficulties; and, (2) it is a great site for mapping environmental information, especially at the local level.

ENVIRONMENTAL PROTECTION AGENCY'S ENVIROMAPPER FOR WATER

<http://www.epa.gov/waters/enviromapper>

If users are interested only in water issues than they can use the same, general EnviroMapper just for water issues. It looks exactly the same as original EnviroMapper and functions exactly the same as well. For general information about functionality, see above.

EnviroMapper for water has fewer layers than the general EnviroMapper -- it can only be used to see impaired water or water quality features. These layers though can be viewed in relation to schools, hospitals, and populated places.

Because this site operates on a different server, and probably also because of its very specific nature, EnviroMapper for Water does not have the efficiency issues that EnviroMapper does. I have not experienced problems accessing the site or creating maps at anytime of day that I have used it.

HUD E-MAPS

<http://hud.esri.com/emapsearchFrame.asp>

Healthy Communities Environmental Mapping — HUD E-MAPS — is a free Internet service that combines information on HUD's community development and housing programs with the EPA's environmental data. HUD E-MAPS provide location, type and performance of HUD-funded activities in every neighborhood across the country, and select EPA information on brownfields, hazardous wastes, air pollution and waste water discharges. HUD created this site with community activism in mind: they want to empower local communities to build smarter and healthier neighborhoods.

While users begin with a US outline map, users click (or type in a zip code, city, or state) on a desired area and are able to select layers for viewing. Zooming in to county level provides more data. Definitions of each of the layers are provided, as are detailed instructions on how to use the site. The help section is one of the best you will find of web-based GIS sites. The buttons are clear, easily understandable. Users can zoom, pan, undo selections, refresh the map to update layers, and print. Census information at the state, county, and tract level can be obtained. This site is extremely user-friendly. It's a great site for students to explore the link between human-environment connections.

One caveat: it can run a little slow at times.

The EPA data is updated on a monthly basis; HUD-specific data is current as of March 2000. Version 4 or later of most web browsers is required to use this site.

MAP MAKER

<http://life.csu.edu/au/cgi-bin/gis/map>

This is a rather technical site in that the inputs may be unfamiliar to many people (e.g., map width, minimum bounding rectangle, grid spacing, data set resolution) but it does have both basic and advanced capabilities so the basic allows the user to make a map of some part of the world. The layers are minimal – only rivers, political boundaries, and coastlines. Users can zoom in and out, set resolution from coarse to fine, and choose projection. Map Maker is based on Generic Mapping Tools (GMT) 3.x and a geographic database (this makes it the exception in web mapping – it's not ESRI's IMS). Of GMT's commands, they only make use of psbasemap, pscoast, psxyz, pstext, mapproject. While you cannot make pretty thematic maps on this site, you can make basic, generic maps and most importantly, it allows you to manipulate projection – students can see how projection alters view of the world. Distortion can be illustrated at small scales and by zooming in, students can see that changing projection matters less on large-scale maps (and thus distortion is less of a problem in large scale maps).

You can plot point data (no lines or polygons although they have intent to allow for this eventually). They provide a description of each of the criteria but it is not extensive so I do not understand everything that can be done with Map Maker. System Requirements: No limitations that I can find. At mid-day Monday, the site moved quickly.

NGS MAP MACHINE

<http://www.nationalgeographic.com/mapmachine>

Map machine is a partner-project between NGS & ESRI. Links are provided for more information about GIS, downloading GIS tools for free, obtaining data, and taking on-line courses. It is a simple process to construct basic maps but the site lacks a "help" page or an introduction to the capabilities of the product. There should be some type of information that tells the user what she can and cannot do with the product.

The site has "map categories" which allow the user to select various types of maps (world, US, street, historical, etc.). By clicking on these buttons, drop-down menus allow for further specification (e.g. from world themes, the user can select physical, political and cultural, or climate and weather maps). By selecting a specification, a map is then generated. The map that is generated can then be refined to more specific areas and in some cases, other themes. A particular map can be zoomed in or zoomed out or a map with whatever theme can be generated for a particular area. It does not seem that you can pick multiple themes and overlay them on one map. For example, if a user wanted to combine "earthquakes (historic)" with "earthquakes (recent)", they could not.

Maps can be saved, e-mailed, printed, and customized (symbols can be selected and then placed on the map according to the makers desired location). If a legend is wanted, then "map key"

must be clicked and another window opens up – this is not the friendliest way of displaying the legend. However, the printer-friendly version of the map does display the legend (along with copyright, scale, source of information, and title).

TIGER – US CENSUS BUREAU

<http://tiger.census.gov>

TIGER is an acronym for Topographically Integrated Geographic Encoding and Referencing – it is the system and digital database of the Census Bureau, used for their mapping needs. The **TIGER** database contains data extracted from the Census which has been made available to the public for map creation.

TIGER is a digital database, containing geographic features like roads, political boundaries, water bodies, as well as other datasets for the entire United States. Coordinates, feature names and type, address ranges, and geographic relationships between features are included. **TIGER** was originally created to support the Census' decennial census mapping and related geographic tasks.

Maps can be created at a variety of scales, using a number of different themes, and turning different layers on and off. The maps are largely human-oriented, although some physical layers are available as well. For example, maps reflecting population distribution for a particular area can be created, and then related to some physical features – a good activity for examining human-environment interaction. The maps can be used to discuss a variety of topics like family income and racial/ethnic background from a spatial perspective.

It is an easy-to-use tool but its greatest detractor is its slowness. **TIGER** is a popular site and thus, very busy. With an Ethernet connection at 6 PM on a Monday, I was unable to generate maps because the server was just too busy. This could be a serious impediment to classroom use!

US-ONLY DEMOGRAPHIC DATA VIEWER

<http://plue.sedac.ciesin.org/plue/ddviewer>

The demographic data viewer is similar to the **US-Mexico DDViewer 3.1** described below, except it is just US data. The site works the same. Users can select three different versions (Java-based and not) of the viewer to match their systems' capabilities. Variables to be mapped include population, income, education, employment, housing, and other (which includes two datasets: land area in square miles and mobile homes). These categories differ slightly from those in the **US-Mexico** viewer -- data availability for the US is greater than that of Mexico.

US-MEXICO DDVIEWER 3.1

<http://plue.sedac.ciesin.org/plue/ddviewer/ddv30-USMEX/>

US-Mexico Demographic Data Viewer provides interactive data mapping, viewing, and analysis of more than 200 socioeconomic variables that are congruent between the United States and Mexico. A useful tool for browsing and visualizing patterns at geographic levels ranging from regions to counties/municipios, the **US-Mexico DDViewer** may be used to map population, vital statistics, land area, and household data. This site notes that currently there is not set of

environmental variables that span the US and Mexico at the county level.

This site is still under development, so some problems may be experienced. (The site-authors note that problems mapping county level data exist and, therefore the validity of county-level maps cannot be guaranteed.) In addition, limitations occur when trying to map populous areas (for example, mapping NYC or Los Angeles can prove difficult).

This site is excellent. Users can select a wide variety of demographic data about various regions of the US and Mexico.

While it takes a bit of work to figure out the buttons (but not too much), it is a worthwhile tool, particularly suited for older students. A tutorial is included, as are help instructions. It can take time to draw the maps so patience is necessary.

Because the program is Java-based you cannot print the map – a limitation. Although alternative ways to print the map are offered in the help section for both PCs and Macs.

XEROX PARC MAP VIEWER

<http://mapweb.parc.xerox/map>

This map viewer is similar to Map Maker (above) but perhaps more user friendly. Users can just point and click on different parts of the world to have a map generated. Layers are limited to border, rivers, and coastlines. Color can be added on a limited basis and is not selected by the user. Users can zoom in/out, change the database (the US database has more detail than the world database), alter projection (elliptical, rectangular, sinusoidal, narrow, square). This site is more user friendly, in terms of pointing and clicking, than Map Maker. The graphics are pretty basic and might be boring to those students used to flashy graphics. As noted with Map Maker, this site's utility may lie primarily in showing students how projection alters the look of the world.

The site warns that connections could be slow since each request requires compiling of new data from their server but I did not find it to be overly slow (less than a minute wait time) at midday on a weekday.



ANNOTATED WEBSITES

TEXAS NATURAL RESOURCES

Texas Natural Resource Conservation Commission (TNRCC) (www.tnrcc.state.tx.us/about.html) is the leading environmental agency for Texas. Its mission is to protect the state's human and natural resources consistent with sustainable economic development. They have over 300 publications that can be downloaded or bought at minimal cost. Categories that these publications cover include: air quality, composting and yard care, floods, industrial and hazardous waste, municipal solid waste, pollution cleanup, recycling automotive waste, recycling markets, general reducing and recycling, water availability, water quality and water utilities. They also have 22 publications on these subjects geared for K-12 education, most of which are downloadable.

Brownfields Redevelopment Initiative (www.ci.austin.tx.us/sws/brownfields.htm) is a brief description of an area in Austin that is not being developed because of real or perceived environmental contamination. The Austin Redevelopment Initiative wants to develop this area. The EPA has awarded a grant to help with assessment, cleanup, and redevelopment. The TNRCC is also involved and has a web page devoted to this project (www.tnrcc.state.tx.us/permitting/remed/vcp/brownfields.html).

Houston Audubon Society (www.houstonaudubon.org/) works for the conservation of natural resources and protecting wildlife habitats. This website has a brief history of the organization, details of the various sanctuaries they have, different educational programs and field trips they run, a calendar of current events, and links to other birding websites in this region.

A Natural History of Central Texas (www.dallas.net/~dpierson/main.html) is a website that provides links to websites that cover a whole range of topics such as: animals and wildlife, plants and trees, rocks and landforms, weather and climate, nature study, and natural history. It provides access to a couple of photo galleries. Links are also provided to other resources and organizations concerned about the natural history of Texas.

Texas Parks and Wildlife (www.tpwd.state.tx.us/) has a huge website with lots of information about many natural resource issues. They have articles on various subjects including outdoor wildlife and conservation programs and activities, Texas wildlife, conservation, and the watersheds of Texas and their ecosystems. They also host a kids page with educational activities and a GIS lab with downloadable GIS data and maps of Texas' natural regions, vegetation, and river basins.

Texas Natural Resources Information System (www.tnrrix.state.tx.us/) is the state's clearinghouse for natural resources data. They also serve as U.S. Geological Survey's distribution center for Texas. They have a lot of digital data available for water resources, geology, the Census, and other natural resources. Some of this data can be downloaded at no cost. They also have an education outreach page that provides useful links for teachers on a variety of subjects.

Natural Resources Conservation Service (www.nrcs.usda.gov/) works with people to conserve and sustain natural resources on private lands. They have information on how to defend against drought, managing aging dams in watersheds, animal husbandry and clean water issues, and buffer strips. Under 'General Information' they have information on conservation-conscious home and gardening tips, how to bring conservation to the backyard, and living in harmony with wetlands. Under 'Teachers and Students' there are conservation education materials that are downloadable for k-12 teachers.

The North Central Texas Council of Governments (www.nctcog.dst.tx.us/) is a voluntary association of local governments that was established to assist local governments in planning for common needs. These needs include environmental issues, transportation issues, and population and development issues. They have good maps and aerial photos of the region, environmental maps, and GIS data.

MAPS

National Atlas.gov (www-atlas.usgs.gov/) delivers easy to use map-like views of America's natural and sociocultural landscapes. It is designed to provide a reliable summary of national scale geographical information. Creating the maps is easy to do.

National Forest Map of the U.S. (www.fs.fed.us/recreation/map.shtml) shows where the national forests and grasslands are located.

Forest Land Distribution Data for the U.S. (www.srsfia.usfs.msstate.edu/rpa/rpa93.htm) has raster data on forest type group and forest density for the 48 contiguous states, Alaska and Hawaii.

National Atlas.com (<http://fia.fs.fed.us/libray/forestcover.pdf>) has a PDF map of the forest cover types of the U.S. This is a huge file and takes a while to download and maneuver.

Texas General Land Office (www.glo.state.tx.us/landoffice.html) has information on coastal issues, energy and natural resources. They also have GIS map products and data available under the "Maps, Research and Data" section.

The National Park Service's Park Guide (www.nps.gov/parks.html) has maps and other information for all of the national parks in the country.

The Conservation Biology Institute (www.consbio.org) has some maps and GIS-based geographical data sources for the Pacific Northwest. They also have a Pacific Northwest Conservation Assessment that includes a good map and reports on each of 40 ecoregions.

ECOSYSTEMS

Caddo Lake Institute (www.caddolakeinstitute.org/) encourages interdisciplinary environmental study. It is the sponsor of Project WET in Texas. This is an interdisciplinary, supplementary education program that promotes the awareness, appreciation, knowledge and stewardship of water resources in Texas.

The Galveston Bay National Estuary Program (<http://riceinfo.rice.edu/armadillo/Galveston/>) has published a book online about the bay's ecosystem. It provides a comprehensive overview of the bay and various aspects of its ecosystem. This book was written with adults in mind, so it would be most appropriate for high school students.

Galveston Bay On-Line (www.rice.edu/armadillo/Galveston/Curriculum) is an interdisciplinary curriculum unit designed for 7th grade students. This unit combines lessons in the language arts, science, health science, technology, mathematics, and social studies. The activities place a heavy emphasis on higher-order thinking skills.

Texas Environmental Center (www.tec.org/) is a non-profit organization that produces Web and CD-ROM based environmental programs. At the bottom of the page there are two graphics: "T.E.C. Environmental Resources" and "Other Environmental and Internet Resources." "T.E.C. Environmental Resources" provides information about Texas water quality, air quality, and lands and wildlife. "Other Environmental and Internet Resources" provides links to other environmental resources on the Internet.

Texas Environmental Studies Institute (<http://chico.rice.edu/armadillo/Ftbend/TESI/tesi.htm>) serves as the Web-based framework to continue explorations on subjects such as Monarch butterflies, Purple Martins, Texas fossils, and Texas rivers. Some of these projects, geared for middle school students, are sketchy while others are more complete.

The Vanishing Species Curriculum (<http://riceinfo.rice.edu/armadillo/Vanishing/index.html>) has four lessons that deal with humans changing the environment, the contributions of the New World to agriculture, adaptations in plants and animals, and the importance of water to life. It is a curriculum framework or guide geared for middle school teachers.

Wildflowers in Texas (<http://chico.rice.edu/armadillo/Wildflowers/wild.html>) was created by Mr. Dettling and his 7th grade class. They photographed many Texas wildflowers and wrote brief descriptions of them. This is a great, visual source of wildflower information.

NASA's Earth Observatory has developed **Mission Biomes** (<http://nasadaacs.eos.nasa.gov/edufeature.html>) to teach 5th through 12th grade students about ecological communities such as rainforests, deserts, and forests. This site includes data and images, news and references, and experiments for student use. There is a teacher resource section that offers tips on how to use the site, as well as the national science, math, and social studies standards involved.

Ecological Education (www.angelfire.com/sk/monkeypuzzle/ecopackage.html) has an "Ecosystems" teaching package that is downloadable. It looks at the differing and the common needs of living things. It is geared for students aged 7-14 years.

Australian Ecosystems (www.gullivermedia.com.au/eco.html) has descriptions and photos of Australia's various ecosystems. This is a good site to compare and contrast ecosystems in different parts of the world with ecosystems in Texas.

Environmental Education (www.blm.gov/education) has been put together by the Bureau of Land Management. They have a number of programs and resources that teachers can use. They also have a feature entitled "Kids Corner" with lots of activities for young learners.

The Chesapeake Bay Program (www.chesapeakebay.net/index.htm) has a lot of information about the bay, its habitats, plants and animals, water quality, watershed profiles, bay stressors, and bay restoration. They also have a Bay atlas, many photos, and a landscape history of the bay from 1.3 billion years ago to 2000.

BIOSPHERE

Trinity Blacklands Urban Forestry Council (www.tbufc.org/tbufcindex.html) is an organization that promotes the protection and development of urban forest resources, and addresses urban forestry needs in the region around Dallas. They have a tree planting and growing guide under "Features" that is worth checking out.

Texas Forest Service (<http://txforestservice.tamu.edu/>) works to provide leadership to ensure that the state's natural resources, especially its forests, are used, nurtured, protected and perpetuated wisely. The major categories they cover include fire protection, forestry education, forest management, landowner assistance, and urban forestry. The "Forestry Education" section has material for students and teachers about various forestry education subjects as well as good links to related websites.

American Forest and Paper Foundation (www.afandpa.org) represents companies that are in the forest, paper and wood products industry. The paper and wood recycling section has a brief description of the amount of recycling the U.S. does. The "Kids and Educators" section has kid-friendly information about trees and paper recycling. The "Teacher Tools" page has quite a few downloadable PDF Action Kit flyers that are geared for K-6 students.

Institute of Paper Science and Technology (www.ipst.edu/amp/museum_virtual_tour.htm) has a virtual museum of papermaking that is worth touring.

Forest History Society's (www.lib.duke.edu/forest/) *If Trees Could Talk* section provides several lessons about the environmental history of forestry and conservation. These lessons are geared for middle school children. They provide all of the materials needed to complete these lessons and they take several class periods to complete. They are also geared to meet the National Council of Social Studies Standards.

National Arbor Day Foundation (www.arborday.org) has a wealth of information about trees. They also have a "Youth Education" section that has classroom activities, games, and tree and forest information geared for elementary school children. They have classroom materials, posters, booklets, flyers and a newsletter that can be bought at low prices.

Society of American Foresters (www.safnet.org/) has two very comprehensive sections of curriculum materials. The Education tab has "Tools for Teachers." This section has

many K-12 lesson plans. The “About Forestry” tab has “Forestry Fun for Kids.” This section has a number of school activities and resources for all students.

The Texas State Tree (www.lsjunction.com/tree.htm) provides a brief page of information about the pecan tree.

HYDROSPHERE

The EPA’s Enviromapper Storefront (www.epa.gov/enviro/html/em/index.html) has good environmental information on the health of watersheds, surface waters, the Superfund sites, the Brownfields Initiative in Austin, and other environmental facts.

The New England Aquarium (www.neaq.org/) has several sections of interest. First, they have an exhibit and virtual tour of Lake Victoria, or Nyanja, that talks about the lake’s ecosystem and the introduction of alien species. They have a section on whale watching that will offer a virtual whale watch, pictures and videos, and whale facts. There are webcams located in their giant ocean tank and their penguin tank. In the Science and Learning section they have a Teacher resources Center with a catalog of materials that can be bought. The Kids section has activities that focus on life in the ocean.

The Alliance of Marine Mammal Parks and Aquariums (www.ammpa.org/) has sections about marine mammals with videos that can be viewed, conservation articles concerning marine mammals, and ready-to-use educational materials and activities for all grade levels.

The San Jacinto River Association (www.neosoft.com/~mtaylor/sjra.htm) is a volunteer organization that is dedicated to preserving the San Jacinto River and its watershed. They have a lot of information about the river including aerial and flood photos from the 1940s to the 1990s, the geology of the San Jacinto, and an article on the October 1994 flood.

The Guadalupe-Blanco River Authority’s (www.gbra.org/index.html) mission is to protect, conserve, reclaim and steward the region around the Guadalupe-Blanco River. Their responsibilities include the supply and quality of the water, and public service and recreation at their hydro lakes. They have sections that contain water quality data, information about the clean rivers program, and maps and recreational information on the hydro lakes.

The Lower Colorado River Authority (www.lcra.org/) is a conservation and reclamation district created by the Texas legislature in 1934. The LCRA supplies electricity to the region, manages floods, protects the quality of the lower Colorado watershed, provides parks and recreational facilities, and provides soil, energy and water conservation programs. This website has a lot of information about the river and their many responsibilities.

UNL-AgNIC’s Web Resources on Water Quality (<http://deal.unl.edu/agnic/youth/>) has information and activities on water, how it is used, and how to conserve and protect it. The information is divided into the following categories: agriculture, groundwater, home use, people, water basics, water protection, water sources, water treatment, watersheds, and wildlife. The activities include coloring pictures and stories, experiments, and games and puzzles.

USGS' Aquifer Basics (<http://sr6capp.er.usgs.gov/aquiferBasics/index.html>) provides general information about the different rock types that form aquifers and has maps that show where aquifers are located in the U.S.

The Groundwater Foundation (www.groundwater.org/index.htm) has two sections that teachers can use. The Groundwater Basics section provides information that is geared for older students. The Kids Corner provides much the same information in an easier to read format.

RESOURCES

Conservation Education (www.na.fs.fed.us/spfo/ce/) is a program that provides structured educational experiences and activities for K-12 students. Their goal is to enable people to realize how natural resources and ecosystems affect each other and how resources can be used wisely.

The UNEP World Conservation Monitoring Centre (www.wcmc.org.uk/data/database/un_combo/html) provides information services on conservation and sustainable use of the world's living resources. They have information for many countries around the world. They also have conservation databases on threatened species, forests, and marine and coastal resources.

The U.S. House of Representatives' Committee on Resources (www.house.gov/resources/106cong/highlights1999.htm) highlights the legislation they worked on in 1999 for protecting natural resources, the environment, and the people.

The U.S. Department of Energy's Energy Efficiency and Renewable Energy Network (www.eren.doe.gov/) has a lot of information on energy efficiency and renewable energy in the Technologies section. The Specialized Resources section has educational materials and links to other sites that have good information and activities for students. They also have a free CD on energy that teachers can order and the President's National Energy Plan that was released May 2001.

The Northern Tallgrass Habitat Preservation Area (<http://midwest.fws.gov/planning/tallgrass/top.htm>) wants to permanently preserve remnant tracts of northern tallgrass prairie in western Minnesota and northwestern Iowa. This site gives a lot of background information about the habitat and the issues involved in preserving it.



Field Studies From the Classroom⁵

This strategy allows students to study the environment from the safety of the classroom. Follow these ten steps.

- 1. CHOOSE a window which has an interesting and/or panoramic view.**
- 2. LOOK AT and identify the general features and aspects of the physical and human environment, for example, hills, trees, fields, industrial areas, roads, and houses.**
- 3. SELECT particular features which seem significant and which attract interest for further study.**
- 4. DISCUSS and ASK QUESTIONS about the elements which have been identified.**
- 5. RECORD the view through the window BY A PHOTOGRAPH OR SKETCH or both for further study.**
- 6. EXPLORE answers for some of the questions and inquire about some of the issues raised in the initial viewing by MAKING A FIELD VISIT to the selected places.**
- 7. INVESTIGATE further by supplementing the field work with research in reference books, websites, and libraries. What environmental issues exist in this window-view?**
- 8. PREPARE ANNOTATIONS for the photograph or field sketch of the window-view, making comments and explaining features as appropriate.**
- 9. PRESENT the geography and associated environmental issues by adding the annotations either directly on the picture or sketch map or around the frame of the view.**
- 10. DISPLAY the finished piece of work. Invite others to view and ask questions about it.**

⁵ Adapted from materials prepared by the Geographical Association, United Kingdom, 1998

Field Studies From the Classroom: Cross Curricular Connections

Ten Steps	Promoting Literacy	Promoting Math Skills
1. Choose a window	<ul style="list-style-type: none"> • Share ideas about which window should be looked through • Express opinions about and give reasons for the final choice • Speak clearly 	<ul style="list-style-type: none"> • What shape is the window? • What 2D and 3D shapes can you see through the window?
2. Look at and identify general features	<ul style="list-style-type: none"> • Explore speaking and listening skills by describing what can be observed • Prepare a written description or report, using and extending geography vocabulary • Use a dictionary when appropriate to check the correct spelling of the key features identified 	<ul style="list-style-type: none"> • Develop mathematical language and communications, e.g., Is the house bigger than the garage? Can you see a triangle in the view? What kind of triangle is it? • Use diagrams and charts to sort and classify a set of key features using criteria related to their size, shape, and height.
3. Select features for further inquiry	<ul style="list-style-type: none"> • Discuss and list the possibilities of further lines of investigation • Sort, select, and reject ideas from your list • Recal and represent key points made in the discussion 	<ul style="list-style-type: none"> • In the buildings you see how common are triangles? • If you can see cars, what is the most common color of car?
4. Discuss and ask questions	<ul style="list-style-type: none"> • Pose pertinent questions about the topics to be investigated • Identify a plan of action • Write letters to key people who could help with the investigations using legible handwriting or word processing skills 	<ul style="list-style-type: none"> • Plan a strategy to pursue your inquiry, e.g., when and how are we going to collect the data? • Display collected data in tables or graphs and seek answers to questions

5. Record by photograph or sketch	<ul style="list-style-type: none"> • Describe the procedure of using a camera List the steps needed to consider when taking a photograph • OR describe the procedure of making a sketch • Identify key features and label the photo/sketch 	<ul style="list-style-type: none"> • From the illustrations describe shapes and patterns • Count and classify the types of items observed • Make models using this information
6. Explore further by making a field visit	<ul style="list-style-type: none"> • Plan a field visit and list the required equipment • Observe and collect a range of evidence, succinct notes and annotated sketches • Interview key people in the field 	<ul style="list-style-type: none"> • Measure specific features • Access and collect data through a purposeful fieldwork inquiry such as measuring angles and areas
7. Investigate further in the classroom	<ul style="list-style-type: none"> • Write an account of the trip to the fieldwork location; write explanations to describe what was discovered • Read and select information in CD-ROMS, books, and documents • Investigate any current environmental issues and explore different points of view 	<ul style="list-style-type: none"> • Use a variety of computer software to explore data • Understand relationships between numbers and develop methods of computation to solve related problems
8. Prepare annotations	<ul style="list-style-type: none"> • Make and use appropriate captions for key features. Use dictionaries to check spelling • Respond through poetry to an unusual aspect of the view • Plan, draft, and revise work for presentation 	<ul style="list-style-type: none"> • Prepare graphs and diagrams to display and interpret results • Discuss the results of your graphs and diagrams

9. Present the geography	<ul style="list-style-type: none"> • Think about features of layout and presentation in order to represent information effectively • Express opinions about likes and dislikes of what can be observed through the window 	<ul style="list-style-type: none"> • Encourage students to search for a variety of patterns in their results • Devise different ways of displaying them
10. Display finished work	<ul style="list-style-type: none"> • Write a diary to explain the sequence of steps taken to complete the project from beginning to end • Present the presentation • Look at, read, and enjoy the completed display 	<ul style="list-style-type: none"> • Choose the most appropriate forms of mathematical presentation to demonstrate conclusions around a copy of the view

Field Studies From the Classroom: Field Sketching

Field sketching is a major data recording technique. Sketching part of the landscape or a feature will:

- **Encourage close observation**
- **Produce a detailed site record**
- **Enable the observer to select and emphasize details**
- **Provide a summary of what has been observed**

HOW TO FIELD SKETCH

- 1. Decide on the boundaries of the scene to be sketched.**
- 2. Sketch in the horizon and other key lines of the landscape.**
- 3. Fill in the details, a section at a time.**
- 4. Add concise labels or notes.**
- 5. Title, date, and locate the sketch. Note the directions on the sketch map and the time of day.**

TEACHING STRATEGIES

Provide students with a pre-drawn sketch. Their task is to observe, to add detail and labels.

Provide students with opportunities to practice skills in the classroom:

- **Demonstrate the technique by projecting a photograph onto a black or whiteboard and sketch out key lines and add labels**
- **Provide students with photographs and ask them to develop sketches**
-

Introduce students to the use of viewing frames to provide boundaries for the sketch.



Field Studies: Landscape Observation

Overview

This activity, adapted from the book *Fieldwork in the Geography Curriculum* (<http://www.ncge.org>), is an effective beginning step for training students to be keen observers of the environment. This is one way to structure an outdoor field experience in a relatively open area where students can see in all directions, such as an open field or top of a hill. Before this activity, review with students the difference between human and physical characteristics. Human characteristics include what people do to earn a living, the houses they live in, settlement patterns, beliefs and ideas, languages, recreation and leisure activities, ethnicity, age distribution and so on. Physical characteristics include landforms, natural resources, vegetation, climate, soil types, bodies of water, and animals. During this activity students will observe and record both physical and human characteristics while facing the different cardinal directions of the field study site.

Grade Level

This activity is designed for students in grades K-5 but would work well with adaptation with older students.

Texas Essential Knowledge and Skills

Kindergarten: 4. Understand the concept of location

Grade 1: 4. Understand the relative location of places

Grade 2: 5. Use simple geographic tools; and 6. Understand the locations and characteristics of places and regions

Grade 3: 4. How humans adapt to variations in the physical environment; and 5. Understand the concepts of location, distance, and direction on maps and globes

Grades 4 and 5: Use geographic tools to collect, analyze, and interpret data

Materials

Large compass arrows for all cardinal directions

Clipboards

Blank paper

8"x10" cardboard frames for viewing the landscape. These can also be made with coat hangers pulled into a viewing square.

Procedures

Grades K-2

1. Make large compass arrows for each child in your class. Mark 1/4th of them North, 1/4th of them South, 1/4th of them East, and 1/4th of them West.
2. Review with the class the difference between human and physical characteristics. Tell them that they will be geo-explorers and make observations (look at) the place you are going as a place and field study site.
3. Choose a location that is in the middle of the field study site. Pass out the arrows to the students. With the aid of a compass, have the group with the North arrows stand in a line and face North. After they are in a line, have students put their arrows on the ground facing North. The rest of the class should sit in front of them and face the same direction. The students that are facing North are to tell the teacher everything that they observe (i.e., type of buildings, signs, plants, animals, transportation routes, water features, building materials, people, etc.). The teacher is to record everything that the students in turn tell him or her. The students that are seated are asked to remain silent and just observe. After the North group is finished, the other students can name things that were not mentioned.
4. Next, have the students with East arrows stand in a line and face East. Repeat the same process as listed above. Do the same for South and West.
5. After this is complete, engage the class in a discussion about what they learned about this place. On a large piece of chart paper, record their answers. Guide them with questions. The questions you ask will depend on the type of area they are observing. In a park, for example, you might use these questions:
 - Do many people use this place? What have you observed that helps you answer this question?
 - What do you see that helps people get to this place?
 - Do you think this place is pretty? Why or why not?
 - What have you seen that people have placed here? What was not put here by people?
 - Do you see anything that shows that this place has changed or is changing?
 - Is this place like other places? How is it different?

Grades 3-5

1. Review with the class the difference between human and physical characteristics. Tell them that in the field they will work in teams of two using their powers of observation to study the physical and human characteristics of the field study site.
2. Divide the class into teams of two. Pass out a clipboard with two pieces of sketch paper attached, and 8"x10" cardboard frame, and a pencil to each team of two students.
3. Choose a location that is in the middle of the field study site. With the aid of a compass, locate North. Have 1/4th of the class face North, 1/4th face West, 1/4th face South, and 1/4th face East. Students will sit in that location and take two minutes to observe *only* what is directly in front of their eyes before drawing. At the end of two minutes the teacher will instruct the class to start sketching only what is directly in front of their eyes, taking in as much detail as possible. Make sure that they make a note in the top right hand corner the direction they are facing while they sketch. One student will hold a frame approximately two feet in front of the student that is making the sketch.

NOTE: The frame helps focus the students; without it the eyes tend to wander around a large area. The student holding the frame is not to give verbal prompts to the student sketching. Encourage students to write the colors that they see down on their sketch. Give them a minimum of ten minutes to work on this sketch. After approximately ten minutes have passed have the students exchange places and the other student will sketch. Alternatively, allow students to work in pairs.

4. After this is complete, engage the class in a discussion about what they learned about this place. On a large piece of chart paper record their answers. Guide them with the following questions:
 - How have people changed the landscape here?
 - What do you think the physical land was like before it was changed by humans?
 - What kind of building material is used? Why?
 - What signs of transportation do you see?
 - Are there any indications of how people make their living?
 - Are there any signs of different cultures?
 - Are there any plants? If so, what do you think determined their being in this place?
 - Do animals other than humans use this place? If so, how do they get the things they need to live?
 - Do you see any indications that this place is changing or has changed over time?
 - Why do you think people would like or not like this place?
 - What conclusions can you draw from this experience?
 -
5. When you return to class, divide the class into two parts-the group that sketched first and the group that sketched second. Remind the class which directions in the classroom are North, South, East, and West. Have each group arrange themselves and their pictures in the right order to represent a *picture in the round* of the field study site. If wall space is available, have students tape their sketches to the appropriate wall in the correct order. This will generate discussion about how we all see things differently.

Extensions for Higher Grade Levels:

Older students in urban or rural landscapes can complete this activity. In addition to observing and analyzing what they see, they can speculate on future changes in the landscape or look for correlations between models studied in class and the patterns they observe in the field.



The State of Our State⁶

Introduction

In this activity students compare the past and current status of the wildlife and plants in Texas. The health and welfare of our ecosystem is vital to the health and welfare of all Texans. Humans have played a role in changing the environment in ways that have been positive for some species but not others. Information about the role of biodiversity in environmental health is provided in the Educator Background at the end of this lesson.

Grade Level

This activity can be adapted for a variety of grade levels down to Grade 3 and up to high school. As written it works best for Grades 3-7.

Gifted and Talented Connections

This activity provides students with multiple opportunities to explore issues at depth and in complex ways. The suggested activity asks students to explore unanswered questions as they relate to the state of the environment.

Texas Essential Knowledge and Skills

Grade 3: 4. (C) describe the effects of physical and human processes in shaping the landscape

Grade 4: 9. (A) describe ways people have adapted to and modified their environment in Texas, past and present

Grade 5: 9. (A) describe ways people have adapted to and modified their environment in the United States, past and present

Grade 6: 7. The impact of interactions between people and the physical environment...

Grade 7: 10. (A) identify ways in which Texans have adapted to and modified the environment and analyze the consequences of the modifications

Each grade level: Social studies skills related to mapping, critical thinking and problem solving, and communication.

Materials/Resources

State maps, encyclopedias, educational resource materials, access to Internet

Classroom Procedures

Beginning the Activity

1. Begin by asking students to demonstrate what they already know about the physical geography and natural history of Texas. Ask students to draw sketch maps of the state and work

⁶ This is adapted from the activity "What's the State of Your State?" featured in the 1996 Geography Awareness Week *Teacher's Handbook*, National Geographic Society.

in small groups to draw in natural features that belong on the map. What ecosystems can students recall—and add to the map? Mountains? Major rivers? Wetlands? Dry regions/deserts? Lakes? Wetlands? Forests? Other physical features? Develop a key for each feature. Alternatively you may wish to distribute outline maps of the state or draw an outline of the state on a black/white board and invite students to add details as they remember them. Include state and national parks and major cities—including your hometown.

Developing the Activity

2. As a class project have students—individually or in small groups—research the status of nature in Texas. Ask students to consider these questions as a start:

- How built up is Texas in comparison with neighboring states?
- Has our state changed greatly in the last 100 years? Two hundred years?
- What was the environment of Texas like in 1800? 1900? What is it like now?
- Do parks in Texas protect a particular ecosystem? More than one ecosystem?

Ask students to suggest additional questions they might like to research related to nature in Texas. They may be interested in changes in animals, plants, water, and other environmental features. Which animals lived in Texas but are no longer here? Why did they disappear?

You may wish to share with students some of the information provided in Educator Background to help them focus.

3. Have students create maps, pictures with captions, diagrams, graphs, posters, stories, addressing these questions and others they wish to research. One suggestion is to create an environmental time line for Texas, illustrated with maps of the state at particular periods of time up to the present. For example, students might develop a series of maps showing the growth of cities in the state by decade. As Texas becomes more urbanized and the population (and cities) grow, what is the effect on the environment? Add pictures of animals and plants that have become endangered or extinct to the timeline. What is the population of Texas at each time period?

Concluding the Activity

4. Ask students to develop a list of generalization summarizing the state of the environment in Texas supported by the graphics students have created. Students may wish to report their findings formally to the class or to an assembly of parents.

Educator Background

Biodiversity Every ecosystem sustains a delicately balanced and intricate web of life. Its plants and animals are interdependent in complex ways. Each species plays a role in the workings of the ecosystem as a whole contributing to the maintenance of that ecosystem. **Species diversity** is vital to the health of an ecosystem. Plant and animal species function critically in food chains, providing sources of food to other species or consuming other species—and sometimes both. Ecosystem diversity—having a variety of healthy, intact ecosystems, themselves rich in species and genetic diversity—is critical to Earth’s general welfare.

e.g., A healthy forest contributes oxygen to the atmosphere, helps to regulate the water cycle by absorbing rainfall and releasing it slowly back to the atmosphere through transpiration, and shades the ground, cooling Earth.

Wetlands sponge up rainwater, preventing flooding and filtering land pollution before waters reach oceans. Sometimes they are called “nature’s kidneys.”

One way to talk about major threats to biodiversity is through the acronym HIPPO:

- H** **Habitat Loss**—a stand of trees is cut for a mall or a farm. A wetland is filled in for housing or an airport. A forest is cleared for subsistence farming. Loss of habitat is the biggest cause of species extinction.
- I** **Introduced Species**—in 1890 European starlings were introduced in New York. These seemingly harmless little black birds are too successful for their own good. They have proliferated all across the US, including Texas, kicking out native birds and using their nests for their own. Starlings were introduced innocently but deliberately. Other species have hitchhiked unnoticed on the hulls of ships and in people's suitcases. Alien species wreak havoc on local populations not equipped to compete with so-called exotics. (See the list of Texas's Dirty Dozen: Most Damaging Alien Species).
- P** **Pollution**—is a by-product of many human activities. Logging of hillsides may cause erosion and damage streams and rivers. Pesticides and fertilizers washing off of farms, suburban homes, and golf courses can build up in the food chain, directly or indirectly harming birds, fish, and humans. Chlorofluorocarbons (CFCs) used in refrigeration escape to the upper atmosphere and destroy the ozone layer that protects Earth from ultraviolet radiation. Smog from cars and industry damage forests and the quality of the air we breathe.
- P** **Population Growth**—Every year about 80 million people are added to Earth's population. There are now more than 6 billion people on our planet. That number has grown dramatically in the last 75 years. All of us require food, clothing, shelter, and energy—scarce commodities in many part of the world. Growing population places pressure on natural resources, hastening destruction of habitat and increasing pollution.
- O** **Overconsumption**—People in industrialized nations such as the United States and Japan together make up only one-quarter of the world's population yet use three-quarters of its resources. The population of the US makes up 1/20th of the world's population yet produces 1/3rd of Earth's pollution. Many people suggest that if people in the industrialized world lived more simply and learned to live with less—fewer cars, luxury goods, less land per house, etc. it would reduce stress on natural resources.

TEXAS BACKGROUND

The economic health of Texas depends upon the integrity of the natural resources of the state. Texas. Texas is doing some things well to conserve its environment:

- Since 1972 pollution discharge in wastewater released by Texas cities and towns has decreased by 70 percent.
- While the population grew from 14 million in 1980 to 20 million in 2000, the amount of water consumed in Texas declined.
- Texas industries have reduced their release of toxic compounds into the air by 42 percent since 1987.

But we could do a better job:

- Texas industries inject more hazardous wastes and toxic chemicals underground than any other state in the nation.

- Texas industries release more toxic waste into the air, land, and water combined than any other state.
- Texas industries generate more hazardous wastes than any other state.
- More than 30 percent of Texas river and stream miles do not comply with set water quality standards.
- More than half of Texas's population lives in areas that do not meet federal clean air standards for ozone.
- An estimated 27,000 acres of Gulf shoreline were lost to erosion between the mid-1800s and the mid-1980s and continues to erode at a rate of 225 acres per year.
- Texas has lost 63 percent of its original bottomland hardwood and forested wetlands since European settlement.
- Texas has more cropland than any other state—28 million acres—and leads all other states in total wind and water erosion of cropland.
- Between 1982 and 1992 Texas lost more high quality farmland to urban development than any other state—we will have to see if that rate remained the same when the Agriculture Census is conducted in 2002.
- Texas has seen a dramatic increase in the extinction of native species, ranking 6th among the states for federally listed endangered and threatened species.

One hundred years ago the challenge was to protect people from the environmental elements. Today, the challenge is to protect the environment. Now, more than ever, the economy of the state is aligned to the health of its environment.

Source: Texas Environmental Almanac, 2000

PARTIAL LIST OF SPECIES THAT NO LONGER OCCUR IN TEXAS

MAMMALS

Jaguar—common in Texas during the 1800s; last reported in South Texas in the early 1950s.
Red Wolf—last found in Texas and the US in 1979; believed to extinct as a pure species in the wild.

Mexican Wolf—believed to have been hunted out in Texas; some may exist in Mexico.

Black-footed Ferret—last seen in Texas in 1963; extinct elsewhere in the US since the mid-1980s.

Grizzly Bear—disappeared from Texas about 1890.

Louisiana Vole—last reported in East Texas around 1900.

Bison—gone from Texas before 1900; some exist in private herds/

Desert Bighorn Sheep—gone from Texas by 1959 but being reintroduced.

Elk—gone from Texas before 1900; different subspecies have been reintroduced.

BIRDS

Sharp Tailed Grouse—last noted in northwest corner of the Panhandle in about 1906.

Passenger Pigeon—last one reported in the US died in 1914 and last reported sighting in Texas before that. Extinct worldwide.

Carolina Parakeet—last reported one killed in Bowie County in about 1987.

Ivory Billed Woodpecker—extinct in the US since 1972; last seen in East Texas early in the 1900s.

Texas Henslow's Sparrow—extinct in Texas and US since 1983.

Plomado Falcon—endangered in the US but being reintroduced in Texas.

FISHES

Amistad Gambusia—last seen in 1968

San Marcos Gambusia—last seen in 1982

Phantom Shiner—last seen in 1975 in the Rio Grande

Bluntnose Shiner—last seen in 1975.

PLANTS

These plants have not been seen for 20-30 years and are therefore considered possibly extinct: Boyton's Oak, Nickel's Cory Cactus, Terlingua Bickel Bush, Old Blue Penny Royal, Small Fixed-Wort, Grand Prairie Evening Rose, Young's Snowbell, Short-fruited Spikes Edge, Rose Meadow Bush

MOST ENDANGERED ECOSYSTEMS IN THE US FOUND IN TEXAS

Longleaf pine forest and savanna (Southeastern US including Texas)

Caves and karst (region underlain by limestone) systems (including caves and karst systems in Texas)

Southern forested wetlands (including Texas's forested wetlands)

Southwestern riparian forests

Large streams and rivers

Tallgrass prairie

TEXAS DIRTY DOZEN: MOST DAMAGING ALIEN SPECIES⁷

- 1. Red imported fire ant. Entered the state via freight from South America in the 1930s. Cost lots of money to control (estimated \$90 million per year). Damage electrical lines, kill wildlife and livestock, some humans highly allergic.**
- 2. Chinese tallow tree. This tree grows quickly but its leaves produce a toxin that alters the soil chemistry harming native vegetation. First introduced in Texas in the early 1900s, the tallow has invaded stream corridors and pastures as well as tallgrass coastal prairie systems, the most imperiled plant community in Texas. Spread by birds.**
- 3. Feral hog. First released by settlers and Spanish explorers. Roots up and destroys native plants, crops, and agricultural equipment. Carries diseases that can spread to humans and wildlife. Reproduce rapidly and can range over five miles in 24 hours.**
- 4. Feral dogs and cats. While not technically alien, free-range cats and dogs damage wildlife. Cats prey on ground nesting birds, songbirds in trees, and small mammals. Dogs run down deer and livestock and small children.**
- 5. Turf grasses. Lawn and pasture grasses are pretty but they invade native prairie areas and outcompete and dominate native plant communities. Offenders include coastal Bermuda, St. Augustine, KR bluestem, and tall fescue.**
- 6. Johnson grass. Introduced from Europe as a cultivated forage grass, this species is more commonly known to Texans as a pesky weed in low roadsides and ditches, croplands, and in natural areas where it outcompetes native bluestems. It can also poison livestock and wildlife.**
- 7. Salt cedar. The "salt cedar" or tamarisk is a big problem in West Texas and the Gulf Coast because it displaces native hardwoods and consumes tremendous amounts of water. It also exudes salt from its leaves making the soil uninhabitable for some native species.**

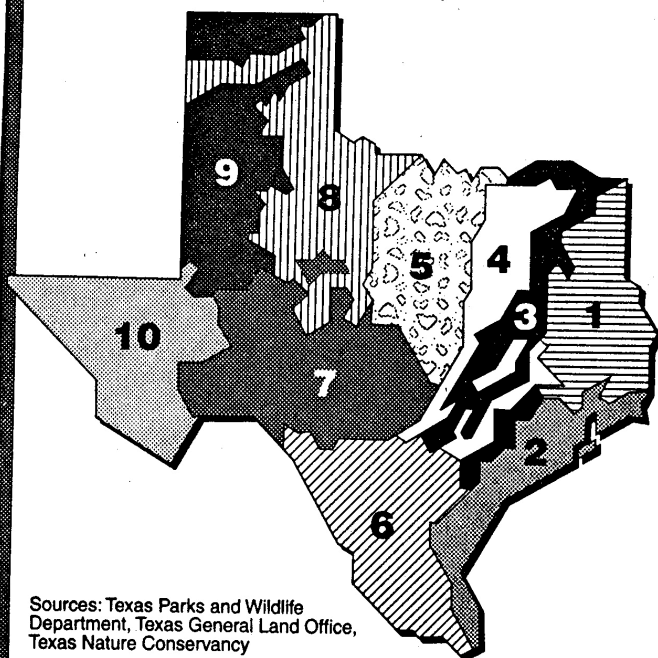
⁷ *Source: Houston Chronicle, December 30, 1996*

It was originally introduced by settlers in the 1800s as a source of wood, shade, and erosion control.

8. **Nutria.** A rat by any other name, these animals were brought from Louisiana as part of the fur industry but some escaped during a storm and had many, many offspring. The nutria are now found everywhere in Texas and are voracious herbivores, eating tremendous amounts of wetland plants in a single day, changing the dynamics of the wetlands dramatically over time. They also burrow into canals and road embankments causing dangerous situations and damage.
9. **European starling.** Cute, but too successful for their own good. Victims of the starling include wood ducks, purple martins, bluebirds, and barn owls. In large numbers in cities starling droppings can pose a health hazard.
10. **Water hyacinth.** Introduced as an ornamental water garden plant, the water hyacinth has spread throughout East Texas reservoirs, coastal freshwater wetlands, and South Texas. It spreads rapidly, doubling its surface area every week under good growing conditions. It forms impenetrable mats of floating plants that can shade out native submerged plants and cause water quality problems.
11. **Grass carp.** Introduced to control aquatic plants, this tough little fish escaped and proliferated. Grass carp can deplete a wetland of vegetation, affecting water quality and the habitat of native largemouth bass, bluegill, and other fish.
12. **Africanized honey bees.** Killer bees compete with and displace the native honey bee, potentially threatening the native plants that rely upon them for pollination. They are aggressive, attack people if provoked, and are moving north.

Texas biodiversity: landscape of change

Scientists say human activities have reduced biological diversity in Texas' 10 "biogeographic" regions, as changes in native plant communities pressured animals that depend on those habitats. A few examples:



Sources: Texas Parks and Wildlife Department, Texas General Land Office, Texas Nature Conservancy

■ Row-crops and grazing reduced 12 million acres of tallgrass prairie to less than 5,000 acres in the Blackland Prairies (4).

■ Native grasses were replaced by grain, cotton and cattle in the Rolling Plains (8) and High Plains (9). Soil erosion followed cultivation in parts of the Post Oak Savanna (3).

■ Exotic plant species and native woody plants invaded the Gulf Prairies (2) after intensive grazing. Woody plants replaced native grasses suppressed by cattle in the Cross-Timbers and Prairies (5). Prairie animals declined throughout Texas' grasslands.

■ Plant and animal diversity contracted in the Pineywoods (1), as people replaced loblolly pine and hardwoods with other pines. Subtropical trees and shrubs gave way to farms and cities over much of the Rio Grande Plain (6).

■ Urbanization, agriculture, industry and navigation reduced fertile wetlands in the Coastal Marshes (2).

■ Rocky soils partly limited landscape changes in the Edwards Plateau (7), but spring- and cave animals are threatened by cities' increased pumping of underground water.

■ Isolated ecological niches sustain the state's greatest number of rare species in the Trans-Pecos (10), though grazing has removed most edible grasses from this one-time grassland.

Chronicle

SUSTAINING OUR STATE

-a project of the Texas Alliance for Geographic Education • <http://sos.tamu.edu>



Sustainable Development: Where Do You Stand?

Introduction

The purpose of this activity is to challenge students to understand the concept of sustainable development and ways that the values and beliefs of a culture influence its environmental relations. Students review statements about sustainable development to see the varying points of view expressed about this key concept.

Grade Level

Grades 6-12 with some adaptations up and down

Gifted and Talented Connections

This activity provides students with multiple opportunities to explore issues at depth and in complex ways. Students develop vocabulary related to sustainable development, and identify multiple points of view.

Texas Essential Knowledge and Skills

Grade 6: 7. Impact of interactions between people and the physical environment on the development of places and regions

Grade 7: 10. (A) identify ways in which Texans have adapted to and modified the environment and analyze the consequences of the modifications

(B) explain ways in which geographic factors have affected the political, economic, and social development of Texas

Grade 8: 12. (B) describe the consequences of human modification of the physical environment of the United States

US History: 11. The relationship between population growth and modernization on the physical environment

World Geography: 12. (C) evaluate the geographic and economic impact of policies related to the use of resources such as regulations for water use or policies related to the development of scarce natural resources (Grade 10 TAKS Objective 5)

World History: 12. (B) analyze the effects of physical and human geographic factors on major events in world history (Grade 10 TAKS Objective 5)

Materials/Resources

Handout 1, Aspects of Sustainability

Handout 2, Aspects of Development

Handout 3, Values Continuum

Handout 4, Sustainable Development Statement Cards

Colored pencils

Classroom Procedures

Beginning the Activity

1. To introduce students to sustainable development, you may wish to ask them to “Take a stand...” Create a continuum as suggested in Figure 1 across a wall of the classroom. Ask students to express an opinion to a series of statements by positioning themselves along the continuum. After each statement, ask two or three students to explain the reasons behind their decision. Why have they positioned themselves as they have?

STRONGLY AGREE

AGREE DISAGREE

STRONGLY DISAGREE

Figure 1: Continuum

Alternately, you may wish to give students a graphic of the continuum and have them note the number of each statement beneath their position. Select statements that students in your context are likely to take a personal stand. Suggestions include:

1. I prefer to ride a bicycle.
2. I prefer to be driven places in an automobile.
3. I like to eat McDonalds and other fast food.
4. I prefer to eat home made food rather than fast food.
5. I like my hometown just the way it is.
6. I would like to see more stores and people in my hometown.
7. I always recycle aluminum cans and paper.
8. I think a clean environment is a healthy environment.
9. I am willing to change my way of life for a cleaner and healthier environment.
10. There are too many people in the world.
11. I try to conserve resources like energy by turning off lights.
12. Earth's resources are for all practical purposes inexhaustible.
13. People can have both a positive and negative affect on the environment.

Debrief this activity by asking students to reflect on the reasons why they agree or disagree with each statement.

Developing the Activity

2. Tell students that they are going to complete an activity that will help them to develop a more complete understanding of sustainable development. Begin by asking students to suggest a definition for sustainable development. Give them time to brainstorm and write all responses without comment. It may help to break the term into parts: what does sustainability mean? Are there different types of sustainability? What does development mean?

3. Divide the class into groups (three students is ideal) and distribute Handout 1, *Aspects of Sustainability* and Handout 2, *Aspects of Development*. Ask students to read these resources and refine their definitions. Discuss the explanations of sustainability and development outlined here to clarify student questions about concepts and vocabulary.

4. Distribute a set of Handout 4, *Sustainable Development Statement Cards*, to each group of students. The cards represent the point of view of different people. Instruct students to place the cards face down. Ask students, in turn, to select a card and read it to the rest of the group.

Referring to Handouts 1, 2, and 3, instruct students to discuss each statement and answer the following questions:

- A. Which of the aspects of sustainability does this person favor?
- B. Which of the aspects of development does this person favor?
- C. Are there any contradictory statements made by this person?
- D. Who do you think this person is? For example, might this person be a politician, a member of an industrial group, a scientist, an economist, or an environmentalist?

You may wish to clarify definitions of several terms listed in Educator Background with students as they work through the statements.

Concluding the Activity

5. After the cards have been discussed and points of view and values clarified, distribute Handout 3 the *Values Continuum* and ask students to mark where they think each of the statements should be by putting the number of the statement at the appropriate point. Work through one of the statement cards as a whole group to mark its position on the continuum and to make sure students understand the task.

6. Have students join each of the numbers placed on the Continuum in Step 5 with a different colored pencil. Is there any common pattern? What can you say about the different values that are behind the statements made by each person? Discuss with the group the range of points of view and the principles involved in the concept of sustainable development

7. Check student responses to Question D “Who do you think this person is?” with the answers provided here:

- 1. Ariana Willis: Government policy maker
- 2. Fred Smiens: Scientist
- 3. April Morrill: Economist
- 4. Roberto Sanchez: United Nations policy maker
- 5. Loretta Bossinger: Environmentalist
- 6. Chris McLeod: Government policy (Principle 1, Rio Declaration)
- 7. Leo Koski: Economist
- 8. Michel Redcliff: Environmentalist
- 9. David Montefiore: Economist
- 10. Thomas Chong: Industry representative

Conclude the activity by asking students to revisit their definitions of sustainable development. Ask them to write their own statements including in it the main elements of sustainable development and a discussion of the elements.

Extension

Students can use the Values Continuum to judge the views of candidates for office, and for specific issues such as drilling for oil in environmentally vulnerable areas, subsidy payments to large agricultural corporations, regulations on cattle feedlots and pig farms in relation to water supplies and so on.

Educator Background

Carrying capacity: Carrying capacity refers to the number of individuals who can be supported in a given area within natural resource limits, and without degrading the natural social, cultural and economic environment for present and future generations. The carrying capacity for any given area is not fixed. It can be altered by improved technology, but mostly it is changed for the worse by pressures which accompany a population increase. As the environment is degraded, carrying capacity actually shrinks, leaving the environment no longer able to support even the number of people who could formerly have lived in the area on a sustainable basis (<http://www.carryingcapacity.org/>)

References

Reid, Alan. 1996. Exploring values in sustainable development. *Teaching Geography*, 21(4):168-171.

Handout 1: Aspects of Sustainability

What is sustainability? A complete definition of sustainability would include all the following aspects, but some definitions may only include one or two.

Economic Sustainability

Economic sustainability means that development is economically efficient and that the benefits of such development are distributed between generations of people. Growth now will not place people living in the future in danger. Economic efficiency means that processes and projects undertaken must give the greatest output per unit of input.

Social Sustainability

Social sustainability requires that development does not cause social conflict. In practice this means that development should increase people's control over their own lives—that all social groups should have the opportunity to participate in decision making, a hallmark characteristic of democracy.

Cultural Sustainability

Cultural sustainability requires that any development should take into account the values and beliefs affected by it. In addition, the range of cultural groups should be maintained and encouraged and the value of their heritage, traditions, and points of view recognized.

Ecological Sustainability

Ecological sustainability means that development should take into account the maintenance of ecological processes, biological diversity, and environmental resources. To achieve this our society needs to recognize that the survival and well-being of other species are also important. All things, both living and non-living, are part of the Texas heritage.

Handout 2: Aspects of Development

What is development? The word development means a process of change. But what is it that is changing? What are people's vision of change and development? Here are some ideas representing different perspectives and points of view:

Development is helping others to help themselves.

Development is the process by which all humanity moves to live with dignity and a just share of the world's resources.

Development is progress towards a higher standard of living for every person in a region or nation.

Development is a form of imperialism whereby the rich, core nations exploit the poor, peripheral nations.

Development is the attempt to ensure that as nations change and increase their production per person, there is a better distribution of wealth so that every person has his or her basic needs met and as many as possible of his/her wants satisfied.

Development is the growing capacity of a society to incorporate change.

Development is sharing the world's wealth more equitably. It is sharing our world.

Development is economic growth measured in terms of the improvement in gross national product, that is, how many goods and services are produced by a nation each year.

Handout 3: Values Continuum

Mark below where you think each of the statements in Handout 4 should be by putting the number of the statement at the appropriate point.

Supports the preservation of the natural environment	<table border="1" style="width: 100%; height: 40px; border-collapse: collapse;"> <tr><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td></tr> <tr><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td></tr> </table>											Encourages the use of the natural environment for human needs
Supports limited economic growth	<table border="1" style="width: 100%; height: 40px; border-collapse: collapse;"> <tr><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td></tr> <tr><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td></tr> </table>											Supports high economic growth
Supports fairness between all species for the present generation (intragenerational equity)	<table border="1" style="width: 100%; height: 40px; border-collapse: collapse;"> <tr><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td></tr> <tr><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td></tr> </table>											Does not support intragenerational equity
Supports fairness for future generations (intergenerational equity)	<table border="1" style="width: 100%; height: 40px; border-collapse: collapse;"> <tr><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td></tr> <tr><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td><td style="width: 20%; height: 20px;"></td></tr> </table>											Does not support intergenerational equity

Handout 4: Sustainable Development Statement Cards

<p style="text-align: center;">1. Ariana Willis</p> <p>Sustainable development can be described as working for economic growth without cheating on our children and shortchanging their future by using up all the resources now.</p>	<p style="text-align: center;">6. Chris Macleod</p> <p>Human beings are at the center of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature</p>
<p style="text-align: center;">2. Fred Smiens</p> <p>Sustainability means the capacity to satisfy current need without jeopardizing the prospects of future generations... This entails protecting the ozone layer, stabilizing the climate, conserving soils, stabilizing forests and population.</p>	<p style="text-align: center;">7. Leo Koski</p> <p>Sustainable development means reconciling two basic aspirations of society:</p> <ul style="list-style-type: none"> • Achieving economic development to secure rising standards of living both now and for future generations; • Protecting and enhancing the environment now and for the future.
<p style="text-align: center;">3. April Morrill</p> <p>For development to be sustainable, it must follow paths that allow for the renewing of renewable resources, whether those be local firewood or a global climate matched to current agricultural systems. Sustainable development, by definition, is environmentally sound development.</p>	<p style="text-align: center;">8. Michel Redcliff</p> <p>Sustainable development means more than seeking a compromise between the natural environment and the pursuit of economic growth. It means a definition of development which recognizes that the limits of sustainability have structural political and social aspects as well as natural origins.</p>
<p style="text-align: center;">4. Roberto Sanchez</p> <p>Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs...and extending to all the opportunity to fulfill their aspirations for a better life.</p>	<p style="text-align: center;">9. David Montefiore</p> <p>Sustainable development is economic development that lasts.</p>
<p style="text-align: center;">5. Loretta Bossinger</p> <p>Sustainable development... means improving the quality of human life while living within the carrying capacity of supporting ecosystems.</p>	<p style="text-align: center;">10. Thomas Chong</p> <p>The concept of sustainable development implies balancing environmental protection with the generation of increased opportunities for employment and improved livelihoods.</p>



TEXAS ESSENTIAL KNOWLEDGE AND SKILLS

TRACING THE THEME OF ENVIRONMENT AND SOCIETY RELATIONS (HUMAN ENVIRONMENT INTERACTION)

GRADE 1

6) Geography. The student understands various physical and human characteristics of the environment.

The student is expected to:

- (A) identify and describe the physical characteristics of places such as landforms, bodies of water, natural resources, and weather;
- (B) identify examples of and uses for natural resources in the community, state, and nation; and
- (C) identify and describe the human characteristics of places such as types of houses and ways of earning a living.

GRADE 2

8) Geography. The student understands how humans use and modify the physical environment.

The student is expected to:

- (A) identify ways in which people depend on the physical environment including natural resources to meet basic needs;
- (B) identify ways in which people have modified the physical environment such as building roads, clearing land for urban development, and mining coal;
- (C) identify consequences of human modification of the physical environment such as the use of irrigation to improve crop yields; and
- (D) identify ways people can conserve and replenish natural resources.

GRADE 3

(4) Geography. The student understands how humans adapt to variations in the physical environment.

The student is expected to:

- (A) describe and explain variations in the physical environment including climate,

- landforms, natural resources, and natural hazards;
(B) compare how people in different communities adapt to or modify the physical environment;
(C) describe the effects of physical and human processes in shaping the landscape; and
(D) identify and compare the human characteristics of selected regions.

GRADE 4

- (9) Geography. The student understands how people adapt to and modify their environment.

The student is expected to:

- (A) describe ways people have adapted to and modified their environment in Texas, past and present;
(B) identify reasons why people have adapted to and modified their environment in Texas, past and present, such as the use of natural resources to meet basic needs; and
(C) analyze the consequences of human modification of the environment in Texas, past and present.

GRADE 5

- (9) Geography. The student understands how people adapt to and modify their environment.

The student is expected to:

- (A) describe ways people have adapted to and modified their environment in the United States, past and present;
(B) identify reasons why people have adapted to and modified their environment in the United States, past and present, such as the use of human resources to meet basic needs; and
(C) analyze the consequences of human modification of the environment in the United States, past and present.

GRADE 6

- (6) Geography. The student understands the impact of physical processes on patterns in the environment.

The student is expected to:

- (A) describe and explain how physical processes such as erosion, ocean circulation, and earthquakes have resulted in physical patterns on Earth's surface;
(B) describe and explain the physical processes that produce renewable and nonrenewable natural resources such as fossil fuels, fertile soils, and timber; and
(C) analyze the effects of physical processes and the physical environment on humans.

- (7) Geography. The student understands the impact of interactions between people and the physical environment on the development of places and regions.

The student is expected to:

- (A) identify and analyze ways people have adapted to the physical environment in selected places and regions;
(B) identify and analyze ways people have modified the physical environment; and
(C) describe ways in which technology influences human capacity to modify the physical environment.

(20) Science, technology, and society. The student understands the relationships among science and technology and political, economic, and social issues and events.

The student is expected to:

(A) give examples of scientific discoveries and technological innovations, including the roles of scientists and inventors, that have transcended the boundaries of societies and have shaped the world;

(B) explain how resources, belief systems, economic factors, and political decisions have affected the use of technology from place to place, culture to culture, and society to society; and

(C) make predictions about future social, economic, and environmental consequences that may result from future scientific discoveries and technological innovations.

GRADE 7

(10) Geography. The student understands the effects of the interaction between humans and the environment in Texas during the 19th and 20th centuries.

The student is expected to:

(A) identify ways in which Texans have adapted to and modified the environment and analyze the consequences of the modifications; and

(B) explain ways in which geographic factors have affected the political, economic, and social development of Texas.

(20) Science, technology, and society. The student understands the impact of scientific discoveries and technological innovations on the political, economic, and social development of Texas.

The student is expected to:

(A) compare types and uses of technology, past and present;

(D) evaluate the effects of scientific discoveries and technological innovations on the use of resources such as fossil fuels, water, and land;

(E) analyze how scientific discoveries and technological innovations have resulted in an interdependence among Texas, the United States, and the world; and

(F) make predictions about economic, social, and environmental consequences that may result from future scientific discoveries and technological innovations.

GRADE 8

(12) Geography. The student understands the physical characteristics of the United States during the 18th and 19th centuries and how humans adapted to and modified the environment.

The student is expected to:

(A) analyze how physical characteristics of the environment influenced population distribution, settlement patterns, and economic activities in the United States during the 18th and 19th centuries;

(B) describe the consequences of human modification of the physical environment of the United States; and

(C) describe how different immigrant groups interacted with the environment in the United States during the 18th and 19th centuries.

US HISTORY

(11) Geography. The student understands the relationship between population growth and modernization on the physical environment.

The student is expected to:

(A) identify the effects of population growth and distribution and predict future effects on the physical environment; and

(B) trace the development of the conservation of natural resources, including the establishment of the National Park System and efforts of private nonprofit organizations.

WORLD GEOGRAPHY

(8) Geography. The student understands how people, places, and environments are connected and interdependent.

The student is expected to:

(A) explain the interrelationships among physical and human processes that shape the geographic characteristics of places such as connections among economic development, urbanization, population growth, and environmental change;

(B) compare ways that humans depend on, adapt to, and modify the physical environment using local, state, national, and international human activities in a variety of cultural and technological contexts;

(C) describe the impact of and analyze the reaction of the environment to abnormal and/or hazardous environmental conditions at different scales such as El Niño, floods, droughts, and hurricanes; and

(D) analyze statistical and other data to infer the effects of physical and human processes on patterns of settlement, population distribution, economic and political conditions, and resource distribution.

(12) Economics. The student understands the economic importance of, and issues related to, the location and management of key natural resources.

The student is expected to:

(A) compare global trade patterns at different periods of time and develop hypotheses to explain changes that have occurred in world trade and the implications of these changes; (B) analyze how the creation and distribution of resources affects the location and patterns of movement of products, capital, and people; and

C) evaluate the geographic and economic impact of policies related to the use of resources such as regulations for water use or policies related to the development of scarce natural resources.

(15) Citizenship. The student understands how different points of view influence the development of public policies and decision-making processes on local, state, national, and international levels.

The student is expected to:

- (A) identify and give examples of different points of view that influence the development of public policies and decision-making processes on local, state, national, and international levels;**
- (B) explain how citizenship practices, public policies, and decision making may be influenced by cultural beliefs; and**
- (C) compare different points of view on geographic issues.**

WORLD HISTORY

(12) Geography. The student understands the impact of geographic factors on major historic events.

The student is expected to:

- (B) analyze the effects of physical and human geographic factors on major events in world history such as the effects of the Suez Canal on world trade patterns;**
- (C) interpret historical and contemporary maps to identify and explain geographic factors such as the control of the Straits of Hormuz that have influenced people and events in the past.**



Texas Essential Knowledge and Skills

Tracing the Theme of the Environment in Science

KINDERGARTEN

K.1 Scientific processes The student participates in classroom and field investigations following home and school safety procedures.	<i>The student is expected to:</i> A. demonstrate safe practices during classroom and field investigations; and B. learn how to use and conserve resources and materials.
K.2 Scientific processes The student develops abilities necessary to do scientific inquiry in the field and the classroom.	<i>The student is expected to:</i> A. ask questions about organisms, objects, and events; B. plan and conduct simple descriptive investigations; C. gather information using simple equipment and tools to extend the senses; D. construct reasonable explanations using information; and E. communicate findings about simple investigations.
K.3 Scientific processes The student knows that information and critical thinking are used in making decisions.	<i>The student is expected to:</i> A. make decisions using information; B. discuss and justify the merits of decisions; and C. explain a problem in his/her own words and propose a solution.

K.4 Scientific processes The student uses age-appropriate tools and models to verify that organisms and objects and parts of organisms and objects can be observed, described, and measured.	<i>The student is expected to:</i> A. identify and use senses as tools of observation; and B. make observations using tools including hand lenses, balances, cups, bowls, and computers.
K.6 Science Concepts The student knows that systems have parts and are composed of organisms and objects.	<i>The student is expected to:</i> A. sort organisms and objects into groups according to their parts and describe how the groups are formed; B. record observations about parts of plants including leaves, roots, stems, and flowers; C. record observations about parts of animals including wings, feet, heads, and tails; D. identify parts that, when separated from the whole, may result in the part or the whole not working, such as cars without wheels and plants without roots; and E. manipulate parts of objects such as toys, vehicles, or construction sets that, when put together, can do things they cannot do by themselves.
K.7 Science concepts The student knows that many types of change occur.	<i>The student is expected to:</i> D. observe and record stages in the life cycle of organisms in their natural environment.
K.9 Science concepts The student knows that living organisms have basic needs.	<i>The student is expected to:</i> A. identify basic needs of living organisms; B. give examples of how living organisms depend on each other; and C. identify ways that the Earth can provide resources for life.
K.10 Science concepts The student knows that the natural world includes rocks, soil, and water.	<i>The student is expected to:</i> A. observe and describe properties of rocks, soil, and water; and B. give examples of ways that rocks, soil, and water are useful.

FIRST GRADE

1.9 Science concepts The student knows that living organisms have basic needs.	<i>The student is expected to:</i> A. identify characteristics of living organisms that allow their basic needs to be met; and B. compare and give examples of the ways living organisms depend on each other for their basic needs.
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SECOND GRADE

2.5 Science concepts The student knows that organisms, objects, and events have properties and patterns.	<i>The student is expected to:</i> A. classify and sequence organisms, objects, and events based on properties and patterns; and B. identify, predict, replicate, and create patterns including those seen in charts, graphs, and numbers.
2.9 Science concepts The student knows that living organisms have basic needs.	<i>The student is expected to:</i> A. identify the external characteristics of different kinds of plants and animals that allow their needs to be met; B. compare and give examples of the ways living organisms depend on each other and on their environments; and C. identify uses of natural resources.

THIRD GRADE

3.8 Science concepts The student knows that living organisms need food, water, light, air, a way to dispose of waste, and an environment in which to live.	<i>The student is expected to:</i> A. observe and describe the habitats of organisms within an ecosystem; B. observe and identify organisms with similar needs that compete with one another for resources such as oxygen, water, food, or space; C. describe environmental changes in which some organisms would thrive, become ill, or perish; and D. describe how living organisms modify their physical environment to meet their needs such as beavers building a dam or humans building a home.
3.9 Science concepts The student knows that species have different adaptations that help them survive and reproduce in their environment.	<i>The student is expected to:</i> A. analyze how adaptive characteristics help individuals within a species to survive and reproduce.

FOURTH GRADE

4.5 Science concepts The student knows that complex systems may not work if some parts are removed.	<i>The student is expected to:</i> A. identify and describe the roles of some organisms in living systems such as plants in a schoolyard, and parts in nonliving systems such as a light bulb in a circuit; and B. predict and draw conclusions about what happens when part of a system is removed.
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4.10 Science concepts The student knows that certain past events affect present and future events.	<i>The student is expected to:</i> A. identify and observe effects of events that require time for changes to be noticeable including growth, erosion, dissolving, weathering, and flow.
4.11 Science concepts The student knows that the natural world includes earth materials and objects in the sky.	<i>The student is expected to:</i> A. test properties of soils including texture, capacity to retain water, and ability to support life; B. summarize the effects of the oceans on land; and C. identify the Sun as the major source of energy for the Earth and understand its role in the growth of plants, in the creation of winds, and in the water cycle.

FIFTH GRADE

5.5 Science concepts The student knows that a system is a collection of cycles, structures, and processes that interact.	<i>The student is expected to:</i> A. describe some cycles, structures, and processes that are found in a simple system; and B. describe some interactions that occur in a simple system.
5.6 Science concepts The student knows that some change occurs in cycles.	<i>The student is expected to:</i> A. identify events and describe changes that occur on a regular basis such as in daily, weekly, lunar, and seasonal cycles; B. identify the significance of the water, carbon, and nitrogen cycles; and C. describe and compare life cycles of plants and animals.
5.9 Science concepts The student knows that adaptations may increase the survival of members of a species.	<i>The student is expected to:</i> A. compare the adaptive characteristics of species that improve their ability to survive and reproduce in an ecosystem; B. analyze and describe adaptive characteristics that result in an organism's unique niche in an ecosystem; and C. predict some adaptive characteristics required for survival and reproduction by an organism in an ecosystem.
5.10 Science concepts The student knows that likenesses between offspring and parents can be inherited or learned.	<i>The student is expected to:</i> A. give examples of learned characteristics that result from the influence of the environment.

SIXTH GRADE

6.8 Science concepts The student knows that complex interactions occur between matter and energy.	<i>The student is expected to:</i> A. define matter and energy; B. explain and illustrate the interactions between matter and energy in the water cycle and in the decay of biomass such as in a compost bin; and C. describe energy flow in living systems including food chains and food webs.
6.9 Science concepts The student knows that obtaining, transforming, and distributing energy affects the environment.	<i>The student is expected to:</i> C. research and describe energy types from their source to their use and determine if the type is renewable, non-renewable, or inexhaustible.
6.10 Science concepts The student knows the relationship between structure and function in living systems.	<i>The student is expected to:</i> C. identify how structure complements function at different levels of organization including organs, organ systems, organisms, and populations.

SEVENTH GRADE

7.5 Science concepts The student knows that an equilibrium of a system may change.	<i>The student is expected to:</i> A. describe how systems may reach an equilibrium such as when a volcano erupts; and B. observe and describe the role of ecological succession in maintaining an equilibrium in an ecosystem.
7.9 Science concepts The student knows the relationship between structure and function in living systems.	<i>The student is expected to:</i> A. identify the systems of the human organism and describe their functions; and B. describe how organisms maintain stable internal conditions while living in changing external environments.
7.11 Science concepts The student knows that the responses of organisms are caused by internal or external stimuli.	<i>The student is expected to:</i> B. identify responses in organisms to external stimuli found in the environment such as the presence or absence of light.
7.12 Science concepts The student knows that there is a relationship between organisms and the environment.	<i>The student is expected to:</i> A. identify components of an ecosystem; B. observe and describe how organisms including producers, consumers, and decomposers live together in an environment and use existing resources; C. describe how different environments support different varieties of organisms; and D. observe and describe the role of ecological succession in ecosystems.

7.14 Science concepts The student knows that natural events and human activity can alter Earth systems.	<i>The student is expected to:</i> A. describe and predict the impact of different catastrophic events on the Earth; B. analyze effects of regional erosional deposition and weathering; and C. make inferences and draw conclusions about effects of human activity on Earth's renewable, non-renewable, and inexhaustible resources.
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EIGHTH GRADE

8.6 Science concepts The student knows that interdependence occurs among living systems.	<i>The student is expected to:</i> C. describe interactions within ecosystems.
8.14 Science concepts The student knows that natural events and human activities can alter Earth systems.	<i>The student is expected to:</i> A. predict land features resulting from gradual changes such as mountain building, beach erosion, land subsidence, and continental drift; B. analyze how natural or human events may have contributed to the extinction of some species; and C. describe how human activities have modified soil, water, and air quality.

INTEGRATED PHYSICS AND CHEMISTRY

6. Science concepts The student knows the impact of energy transformations in everyday life.	<i>The student is expected to:</i> D. investigate and compare economic and environmental impacts of using various energy sources such as rechargeable or disposable batteries and solar cells.
9. Science concepts The student knows how solution chemistry is a part of everyday life.	<i>The student is expected to:</i> C. simulate the effects of acid rain on soil, buildings, statues, or microorganisms.

BIOLOGY

9. Science concepts The student knows metabolic processes and energy transfers that occur in living organisms.	<i>The student is expected to:</i> D. analyze the flow of matter and energy through different trophic levels and between organisms and the physical environment.
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11. Science concepts The student knows that organisms maintain homeostasis.	<i>The student is expected to:</i> B. investigate and identify how organisms, including humans, respond to external stimuli; C. analyze the importance of nutrition, environmental conditions, and physical exercise on health; and D. summarize the role of microorganisms in maintaining and disrupting equilibrium including diseases in plants and animals and decay in an ecosystem.
12. Science concepts The student knows that interdependence and interactions occur within an ecosystem.	<i>The student is expected to:</i> A. analyze the flow in energy through various cycles including the carbon, oxygen, nitrogen, and water cycles; B. interpret interactions among organisms exhibiting predation, parasitism, commensalism, and mutualism; C. compare variations, tolerances, and adaptations of plants and animals in different biomes; D. identify and illustrate that long-term survival of species is dependent on a resource base that may be limited; and E. investigate and explain the interactions in an ecosystem including food chains, food webs, and food pyramids.
13. Science concepts The student knows the significance of plants in the environment.	<i>The student is expected to:</i> A. evaluate the significance of structural and physiological adaptations of plants to their environments; and B. survey and identify methods of reproduction, growth, and development of various types of plants.

ENVIRONMENTAL SYSTEMS

1 Scientific processes The student, for at least 40% of instructional time, conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices.	<i>The student is expected to:</i> A. demonstrate safe practices during field and laboratory investigations; and B. make wise choices in the use and conservation of resources and the disposal or recycling of materials.
2 Scientific processes. The student uses scientific methods during field and laboratory investigations.	<i>The student is expected to:</i> A. plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology; B. collect data and make measurements with precision; C. organize, analyze, evaluate, make

	<p>inferences, and predict trends from data; and</p> <p>D. communicate valid conclusions.</p>
<p>3 Scientific processes.</p> <p>The student uses critical thinking and scientific problem solving to make informed decisions.</p>	<p><i>The student is expected to:</i></p> <p>A. analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information;</p> <p>B. make responsible choices in selecting everyday products and services using scientific information;</p> <p>C. evaluate the impact of research on scientific thought, society, and the environment;</p> <p>D. describe the connection between environmental science and future careers; and</p> <p>E. research and describe the history of environmental science and contributions of scientists.</p>
<p>4 Science concepts.</p> <p>The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes.</p>	<p><i>The student is expected to:</i></p> <p>A. identify indigenous plants and animals, assess their role within an ecosystem, and compare them to plants and animals in other ecosystems and biomes;</p> <p>B. make observations and compile data about fluctuations in abiotic cycles and evaluate the effects of abiotic factors on local ecosystems and biomes;</p> <p>C. evaluate the impact of human activity such as methods of pest control, hydroponics, organic gardening, or farming on ecosystems;</p> <p>D. predict how the introduction, removal, or reintroduction of an organism may alter the food chain and affect existing populations; and</p> <p>E. predict changes that may occur in an ecosystem if biodiversity is increased or reduced.</p>
<p>5 Science concepts.</p> <p>The student knows the interrelationships among the resources within the local environmental system.</p>	<p><i>The student is expected to:</i></p> <p>A. summarize methods of land use and management;</p> <p>B. identify source, use, quality, and conservation of water;</p> <p>C. document the use and conservation of both renewable and non-renewable resources;</p> <p>D. identify renewable and non-renewable resources that must come from outside an</p>

	<p>ecosystem such as food, water, lumber, and energy;</p> <p>E.analyze and evaluate the economic significance and interdependence of components of the environmental system; and</p> <p>F.evaluate the impact of human activity and technology on land fertility and aquatic viability.</p>
<p>6 Science concepts.</p> <p>The student knows the sources and flow of energy through an environmental system.</p>	<p><i>The student is expected to:</i></p> <p>A.summarize forms and sources of energy;</p> <p>B.explain the flow of energy in an ecosystem;</p> <p>C.investigate and explain the effects of energy transformations within an ecosystem; and</p> <p>D.investigate and identify energy interactions in an ecosystem.</p>
<p>7 Science concepts.</p> <p>The student knows the relationship between carrying capacity and changes in populations and ecosystems.</p>	<p><i>The student is expected to:</i></p> <p>A.relate carrying capacity to population dynamics;</p> <p>B.calculate exponential growth of populations;</p> <p>C.evaluate the depletion of non-renewable resources and propose alternatives; and</p> <p>D.analyze and make predictions about the impact on populations of geographic locales, natural events, diseases, and birth and death rates.</p>
<p>8 Science concepts.</p> <p>The student knows that environments change.</p>	<p><i>The student is expected to:</i></p> <p>A.analyze and describe the effects on environments of events such as fires, hurricanes, deforestation, mining, population growth, and municipal development;</p> <p>B.explain how regional changes in the environment may have a global effect;</p> <p>C.describe how communities have restored an ecosystem; and</p> <p>D.examine and describe a habitat restoration or protection program.</p>

CHEMISTRY

9.000 Science concepts The student knows the processes, effects, and significance of nuclear fission and nuclear fusion.	<i>The student is expected to:</i> D. evaluate environmental issues associated with the storage, containment, and disposal of nuclear wastes.
12.00 Science concepts The student knows the factors that influence the solubility of solutes in a solvent.	<i>The student is expected to:</i> C. evaluate the significance of water as a solvent in living organisms and in the environment.
14.00 Science concepts The student knows the properties and behavior of acids and bases.	<i>The student is expected to:</i> A. verify the law of conservation of energy by evaluating the energy exchange that occurs as a consequence of a chemical reaction; and B. relate the rate of a chemical reaction to temperature, concentration, surface area, and presence of a catalyst.

AQUATIC SCIENCE

ALL OF THE COMPONENTS IN AQUATIC SCIENCE ARE APPLICABLE.

PHYSICS

1.000 Scientific processes The student, for at least 40% of instructional time, conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices.	<i>The student is expected to:</i> B. make wise choices in the use and conservation of resources and the disposal or recycling of materials.
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ASTRONOMY

1.000 Scientific processes The student, for at least 40% of instructional time, conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices.	<i>The student is expected to:</i> B. make wise choices in the use and conservation of resources and the disposal or recycling of materials.
10.00 Science concepts The student knows how life on Earth is affected by its unique placement and orientation in our solar system.	<i>The student is expected to:</i> A. compare the factors essential to life on Earth such as temperature, water, mass, and gases to conditions on other planets; B. determine the effects of the Earth's rotation, revolution, and tilt on its environment; and C. identify the effects of the moon on tides.

GEOLOGY, METEOROLOGY, AND OCEANOGRAPHY

1.000 Scientific processes The student, for at least 40% of instructional time, conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices.	<i>The student is expected to:</i> B.1 make wise choices in the use and conservation of resources and the disposal or recycling of materials.
4.000 Science concepts The student knows the Earth's unique characteristics and conditions.	<i>The student is expected to:</i> B.1 analyze conditions on Earth that enable organisms to survive.
8.000 Science concepts The students knows the processes and end products of weathering.	<i>The student is expected to:</i> A.1 distinguish chemical from mechanical weathering and identify the role of weathering agents such as wind, water, and gravity; B.1 identify geologic formations that result from differing weathering processes; and C.1 illustrate the role of weathering in soil formation.
9.000 Science concepts The student knows the role of natural energy resources.	<i>The student is expected to:</i> B.1 analyze issues regarding the use of fossil fuels and other renewable, non-renewable, or alternative energy resources.
10.00 Science concepts The student knows the interactions that occur in a watershed.	<i>The student is expected to:</i> A.1 identify the characteristics of a local watershed such as average annual rainfall, run-off patterns, aquifers, locations of river basins, and surface water reservoirs; B.1 analyze the impact of floods, droughts, irrigation, and industrialization on a watershed; and C.1 describe the importance and sources of surface and subsurface water.
11.00 Science concepts The student knows characteristics of oceans.	<i>The student is expected to:</i> A.1 identify physical characteristics of ocean water including salinity, solubility, heat capacity, colligative properties, and density; B.1 evaluate the effects of tides, tidal bores, and tsunamis; and C.1 compare the topography of the ocean floor to the topography of the continents.

<p>12. Science concepts The student knows the characteristics of the atmosphere.</p>	<p><i>The student is expected to:</i> A. identify the atmosphere as a mixture of gases, water vapor, and particulate matter; B. analyze the range of atmospheric conditions that organisms will tolerate including types of gases, temperature, particulate matter, and moisture; and C. determine the impact on the atmosphere of natural events and human activity.</p>
<p>13. Science concepts The student knows the role of energy in governing weather and climate.</p>	<p><i>The student is expected to:</i> A. describe the transfer of heat energy at the boundaries between the atmosphere, land masses, and oceans resulting in layers of different temperatures and densities in both ocean and atmosphere; B. identify, describe, and compare climatic zones; and C. describe the effects of phenomena such as El Niño and the Jet Stream on local weather.</p>

Social Studies TEKS Related to Environment and Society Relations

GRADE 1

6) Geography. The student understands various physical and human characteristics of the environment.

The student is expected to:

(A) identify and describe the physical characteristics of places such as landforms, bodies of water, natural resources, and weather;

(B) identify examples of and uses for natural resources in the community, state, and nation; and

(C) identify and describe the human characteristics of places such as types of houses and ways of earning a living.

GRADE 2

8) Geography. The student understands how humans use and modify the physical environment.

The student is expected to:

(A) identify ways in which people depend on the physical environment including natural resources to meet basic needs;

(B) identify ways in which people have modified the physical environment such as building roads, clearing land for urban development, and mining coal;

(C) identify consequences of human modification of the physical environment such as the use of irrigation to improve crop yields; and

(D) identify ways people can conserve and replenish natural resources.

Social Studies TEKS Related to Environment and Society Relations

GRADE 3

(4) Geography. The student understands how humans adapt to variations in the physical environment.

The student is expected to:

- (A) describe and explain variations in the physical environment including climate, landforms, natural resources, and natural hazards;**
- (B) compare how people in different communities adapt to or modify the physical environment;**
- (C) describe the effects of physical and human processes in shaping the landscape; and**
- (D) identify and compare the human characteristics of selected regions.**

GRADE 4

(9) Geography. The student understands how people adapt to and modify their environment.

The student is expected to:

- (A) describe ways people have adapted to and modified their environment in Texas, past and present;**
- (B) identify reasons why people have adapted to and modified their environment in Texas, past and present, such as the use of natural resources to meet basic needs; and**
- (C) analyze the consequences of human modification of the environment in Texas, past and present.**

GRADE 5

(9) Geography. The student understands how people adapt to and modify their environment.

The student is expected to:

(A) describe ways people have adapted to and modified their environment in the United States, past and present;

(B) identify reasons why people have adapted to and modified their environment in the United States, past and present, such as the use of human resources to meet basic needs; and

(C) analyze the consequences of human modification of the environment in the United States, past and present.

Social Studies TEKS Related to Environment and Society Relations GRADE 6

(6) Geography. The student understands the impact of physical processes on patterns in the environment.

The student is expected to:

(A) describe and explain how physical processes such as erosion, ocean circulation, and earthquakes have resulted in physical patterns on Earth's surface;

(B) describe and explain the physical processes that produce renewable and nonrenewable natural resources such as fossil fuels, fertile soils, and timber; and

(C) analyze the effects of physical processes and the physical environment on humans.

(7) Geography. The student understands the impact of interactions between people and the physical environment on the development of places and regions.

The student is expected to:

(A) identify and analyze ways people have adapted to the physical environment in selected places and regions;

(B) identify and analyze ways people have modified the physical environment; and

(C) describe ways in which technology influences human capacity to modify the physical environment.

(20) Science, technology, and society. The student understands the relationships among science and technology and political, economic, and social issues and events.

The student is expected to:

(A) give examples of scientific discoveries and technological innovations, including the roles of scientists and inventors, that have transcended the boundaries of societies and have shaped the world;

(B) explain how resources, belief systems, economic factors, and political decisions have affected the use of technology from place to place, culture to culture, and society to society; and

(C) make predictions about future social, economic, and environmental consequences that may result from future scientific discoveries and technological innovations.

Social Studies TEKS Related to Environment and Society Relations GRADE 7

(10) Geography. The student understands the effects of the interaction between humans and the environment in Texas during the 19th and 20th centuries.

The student is expected to:

(A) identify ways in which Texans have adapted to and modified the environment and analyze the consequences of the modifications; and

(B) explain ways in which geographic factors have affected the political, economic, and social development of Texas.

(20) Science, technology, and society. The student understands the impact of scientific discoveries and technological innovations on the political, economic, and social development of Texas.

The student is expected to:

(A) compare types and uses of technology, past and present;

(D) evaluate the effects of scientific discoveries and technological innovations on the use of resources such as fossil fuels, water, and land;

(E) analyze how scientific discoveries and technological innovations have resulted in an interdependence among Texas, the United States, and the world; and

(F) make predictions about economic, social, and environmental consequences that may result from future scientific discoveries and technological innovations.

Social Studies TEKS Related to Environment and Society Relations GRADE 8

(12) Geography. The student understands the physical characteristics of the United States during the 18th and 19th centuries and how humans adapted to and modified the environment.

The student is expected to:

(A) analyze how physical characteristics of the environment influenced population distribution, settlement patterns, and economic activities in the United States during the 18th and 19th centuries;

(B) describe the consequences of human modification of the physical environment of the United States; and

(C) describe how different immigrant groups interacted with the environment in the United States during the 18th and 19th centuries.

Social Studies TEKS Related to Environment and Society Relations

US HISTORY

(11) Geography. The student understands the relationship between population growth and modernization on the physical environment.

The student is expected to:

(A) identify the effects of population growth and distribution and predict future effects on the physical environment; and

(B) trace the development of the conservation of natural resources, including the establishment of the National Park System and efforts of private nonprofit organizations.

Social Studies TEKS Related to Environment and Society Relations

WORLD GEOGRAPHY

(8) Geography. The student understands how people, places, and environments are connected and interdependent.

The student is expected to:

(A) explain the interrelationships among physical and human processes that shape the geographic characteristics of places such as connections among economic development, urbanization, population growth, and environmental change;

(B) compare ways that humans depend on, adapt to, and modify the physical environment using local, state, national, and international human activities in a variety of cultural and technological contexts;

(C) describe the impact of and analyze the reaction of the environment to abnormal and/or hazardous environmental conditions at different scales such as El Niño, floods, droughts, and hurricanes; and

(D) analyze statistical and other data to infer the effects of physical and human processes on patterns of settlement, population distribution, economic and political conditions, and resource distribution.

(12) Economics. The student understands the economic importance of, and issues related to, the location and management of key natural resources.

The student is expected to:

(A) compare global trade patterns at different periods of time and develop hypotheses to explain changes that have occurred in world trade and the implications of these changes; **(B)** analyze how the creation and distribution of resources affects the location and patterns of movement of products, capital, and people; and

C) evaluate the geographic and economic impact of policies related to the use of resources such as regulations for water use or policies related to the development of scarce natural resources.

(15) Citizenship. The student understands how different points of view influence the development of public policies and decision-making processes on local, state, national, and international levels.

The student is expected to:

(A) identify and give examples of different points of view that influence the development of public policies and decision-making processes on local, state, national, and international levels;

(B) explain how citizenship practices, public policies, and decision making may be influenced by cultural beliefs; and

(C) compare different points of view on geographic issues.

Social Studies TEKS Related to Environment and Society Relations

WORLD HISTORY

(12) Geography. The student understands the impact of geographic factors on major historic events.

The student is expected to:

(B) analyze the effects of physical and human geographic factors on major events in world history such as the effects of the Suez Canal on world trade patterns;

(C) interpret historical and contemporary maps to identify and explain geographic factors such as the control of the Straits of Hormuz that have influenced people and events in the past.