



## Alabama Teacher's Supplement

### Introduction

*Confronting Climate Change in the Gulf Coast Region: Prospects for Sustaining Our Ecological Heritage* describes likely climate changes and potential consequences for ecosystems spanning the region from the southern tip of Texas to the Florida Keys. Alabama's Gulf Coast lies in the central subregion of the Gulf Coast Region and has a warm-temperate and humid climate. Against a backdrop of significant variability over the past century, Alabama has experienced a warming trend since the 1960s, and extreme rainfall events have become more frequent. Projected changes in climate include an increase in maximum summer temperatures, a northward shift in the freeze line, and changes in precipitation, with a likelihood of less rainfall and reduced soil moisture along the Alabama coast. An increase in summer temperatures is likely to increase the risk of heat-related illnesses and deaths, and exacerbate air quality problems in large metropolitan areas. Changes in precipitation could further stress the state's freshwater supply, particularly the unique floodplain areas and lakes in the northeast region. Alabama's billion-dollar forestry industry is likely to face climate-related management challenges.

The activities in the curriculum guide can easily be adapted to focus on specific ecosystems and places in Alabama. The coastal plain region from the Florida Panhandle to Mobile Bay harbors a diverse array of plants and animals, particularly in the pine flatwood bogs in the upper reaches of the coastal plain. Changes in runoff to Mobile Bay could impact the state's fisheries, and a faster sea-level rise will threaten Alabama's coastal infrastructure for industry, recreation, and tourism.

Internet resources for Alabama natural areas, state agencies, and non-profit organizations provide excellent background information for student research. Three general resources include:

- Alabama Environmental Education Resource Database is an electronic database of environmental education materials, searchable by topic and grade level. <http://www.alenviroed.com/>
- Legacy—Partnership in Environmental Education is devoted to promoting environmental education in Alabama. This web site provides information on educational materials and workshops. <http://www.legacyenved.com/index.html>
- Alabama Water Watch provides an extensive listing of environmental web sites. <http://www.auburn.edu/aww/links/links.htm>

## Alabama Resource List and Teaching Hints by Activity

### Activity 1 – Warming Up to Global Warming

In this activity students research newspaper articles to better understand how global warming is portrayed in the media. Recent articles on the topic can usually be accessed at a newspaper's web page by doing a keyword search for "global warming."

Web sites for newspapers of the Gulf Coast region can be accessed at <http://newslink.org>  
For Alabama see <http://newslink.org/alnews.html>

The Baton Rouge Advocate recently did a series of articles about climate change (10/21/01–10/23/01). These can be accessed at:  
[http://www.theadvocate.com/news/global\\_warming.asp](http://www.theadvocate.com/news/global_warming.asp)

Web sites for Alabama newspapers:

Birmingham News: [www.al.com/birminghamnews/today/](http://www.al.com/birminghamnews/today/)

Mobile Register: [www.al.com/mobileregister/today](http://www.al.com/mobileregister/today)

### Activity 2 – Understanding Climate Change

The goal of the extension exercise (**Extension #2: Contribution from cars alone in the Gulf Coast region**) is to help students appreciate the magnitude of carbon dioxide emissions from motor vehicles. The calculations can be done at any scale, ranging from all the cars in the US to just those for a particular state or county.

Motor vehicle statistics for Alabama are available from the Alabama Department of Revenue. For the year 2000, total state passenger car and pick-up truck registration was 3,818,565 vehicles. Statistics for each county are available at the web site.  
[http://www.ador.state.al.us/motorvehicle/mvd\\_main.html](http://www.ador.state.al.us/motorvehicle/mvd_main.html)

Alabama Energy Data provides additional information on Alabama energy consumption.  
[http://www.eia.doe.gov/emeu/states/main\\_al.html](http://www.eia.doe.gov/emeu/states/main_al.html)

### Activity 3 – Gulf Coast Climate

In this activity students gain an appreciation for the physical and cultural characteristics that define the Gulf Coast region. Alabama's place within the Gulf Coast region—physically, socially, and economically—can be explored through a US atlas, as well as maps available on the Internet. Some websites for Alabama maps are:

Alabama Maps – University of Alabama  
<http://alabamamaps.ua.edu/index.html>

Alabama Maps at University of Texas-Austin Map Library  
<http://www.lib.utexas.edu/maps/alabama.html>

Alabama Historical Maps  
<http://alabamamaps.ua.edu/historicalmaps/index.html>

Alabama Physical Features Maps (soils, elevation, forest types)  
<http://alabamamaps.ua.edu/alabama/physical/index.html>

Several examples of interconnections that may be less familiar to students can be found on “The Energy Market Map of the South Atlantic,” which shows electric transmission lines, gas pipelines, and ports.  
[http://www.eia.doe.gov/emeu/reps/states/maps/so\\_atl.html](http://www.eia.doe.gov/emeu/reps/states/maps/so_atl.html)

Similar maps for the other Gulf Coast states are also available.  
<http://www.eia.doe.gov/emeu/reps/states/maps/>

#### **Activity 4 – Know Thy Ecological Homes**

In this activity students develop their knowledge of the plants and animals and physical processes characteristic of Gulf region ecosystems. Students will gain a better understanding of the biological diversity of the region if natural areas from several different Gulf States are studied. The Gulf Ecological Management Sites (GEMS) Program web site is the best resource for quick access to regional natural areas: <http://www.epa.gov/gmpo/gem2.html>. If the teacher chooses to focus on Alabama ecosystems, there are several web resources specific to Alabama that are appropriate starting points, or are useful for more extensive student research. One recommended starting point is the Panhandle and Apalachicola Bay case study in the Alabama-Florida-Georgia tri-state region and discussed in more detail in the Gulf Report (pp.48-49).

#### Alabama Natural Areas

South Alabama GEMS sites are described at:  
<http://www.sarpc.org/gems/index.html>

Alabama Environmental Council provides short descriptions of some of Alabama's natural areas.  
<http://www.aconline.ws/natural.htm>

Alabama State Parks  
[http://www.dcnr.state.al.us/parks/parks\\_1a.html](http://www.dcnr.state.al.us/parks/parks_1a.html)

Nature Conservancy of Alabama describes its preserves.  
<http://nature.org/wherewework/northamerica/states/alabama/preserves/>

Alabama National Wildlife Refuges  
<http://southeast.fws.gov/maps/al.html>

Audubon Society guide to Alabama Wildlife Refuges  
<http://www.audubon.org/campaign/refuge/refuges/alabama.html>

Alabama River Alliance  
<http://www.alabamarivers.org/index.htm>

Weeks Bay National Estuarine Research Reserve – detailed description of the plants and animals and habitats of this estuarine reserve off of Mobile Bay.  
<http://inlet.geol.sc.edu/WKB/sitedescription.html>

Mobile Bay National Estuary Program  
<http://www.mobilebaynep.com/>

### Alabama Climate

Climate maps, including annual average rainfall and temperature and frost dates.  
<http://alabamamaps.ua.edu/alabama/climate/index.html>

Alabama Annual Precipitation Map  
<http://www.ocs.orst.edu/pub/maps/Precipitation/Total/States/AL/al.gif>

Alabama Office of the State Climatologist  
<http://vortex.nsstc.uah.edu/aosc/>

### Other

EPA Alabama state atlas  
<http://www.epa.gov/ceisweb1/ceishome/atlas/stateatlas/alabama.html>

Alabama Rivers Map  
<http://www.dcnr.state.al.us/agfd/rivers.html>

Alabama Wildlife Federation  
<http://www.alawild.org/>

Alabama Forestry Association  
<http://www.alaforestry.org/>

Alabama Museum of Natural History  
<http://museums.ua.edu/history/index.html>

Dauphin Island Sea Lab  
<http://www.disl.org/>

### Activity 5 – Nature's Bounty

This activity introduces to students the concept of “ecosystem goods and services,” the societal benefits received from the natural environment.

The Alabama GEMS website provides descriptions of the ecological functions of the three GEMS sites.

<http://www.sarpc.org/gems/index.html>

The web site of the Mobile Bay Estuary Program includes a description of the services and values of estuaries to Alabama.

<http://www.mobilebaynep.com/estuaryworth.htm>

Alabama Geological Survey

<http://www.gsa.state.al.us>

### Activity 6 – What Could Happen Here?

In this activity students explore how climate change might affect plants and animals of the Gulf Coast region. Teachers can choose a local ecosystem—such as a lake, river, wetland, or forest near their school—or a specific natural area of significance, such as a wildlife refuge, or state or national park. If possible, the activity should be accompanied by a field trip, so that students have a better understanding of the ecological characteristics of the study area. As an alternative, a visit to a managed ecosystem such as managed forest, aquaculture facility, or farm is an opportunity for students to consider the vulnerability of economic activities to climate and land use changes.

Natural areas in or near Alabama that would serve as good case studies for detailed analysis of climate change impacts include:

- Weeks Bay National Estuarine Research Reserve, an estuarine embayment that is a critical nursery for fish, crustaceans, and shellfish.  
<http://inlet.geol.sc.edu/WKB/sitedescription.html>
- Bon Secour National Wildlife Refuge, home to the endangered Alabama beach mouse and stopover point for migratory birds.  
<http://bonsecour.fws.gov/index.html>
- Choctaw National Wildlife Refuge, home to herons, raptors, otters, beavers, deer, turkeys, raccoons, squirrels, wood ducks, wintering waterfowl, and endangered/threatened species (American alligators, bald eagles and wood storks).  
<http://choctaw.fws.gov/index.html>

- Additional Alabama Wildlife Refuges can be found on the Fish and Wildlife Services list.  
<http://southeast.fws.gov/publications/pubref.html>
- Gulf Islands National Seashore, a mosaic of barrier beaches, coastal marshes, and maritime forests that includes nesting areas for loggerhead turtles.  
<http://www.nps.gov/guis/GuisHome.htm>
- The Panhandle and Apalachicola Bay case study in the Alabama-Florida-Georgia tri-state region  
See Gulf Report, pp.48-49.

Additional resources for important plant and animal species:

US Fish and Wildlife Service Region 4 includes Alabama.

<http://southeast.fws.gov/>

Endangered species lists by county for Alabama can also be accessed.

[http://ecos.fws.gov/webpage/webpage\\_usa\\_lists.html?state=AL](http://ecos.fws.gov/webpage/webpage_usa_lists.html?state=AL)

### **Activity 9 – Reducing Our Impact on the Global Environment**

For this activity students research possible solutions to reduce the amount of greenhouse gases emitted into the atmosphere and thus slow global warming. The emphasis is that global problems need local solutions and activities, and that individual actions do matter.

The Alabama Department of Economic and Community Affairs supports the development of energy educational materials. Several CD-ROMs on energy topics are available.

<http://isl-garnet.uah.edu/adeca/index.html>

The US Department of Energy provides information on current renewable energy projects in Alabama and links to additional resources.

[http://www.eren.doe.gov/state\\_energy/mystate.cfm?state=al](http://www.eren.doe.gov/state_energy/mystate.cfm?state=al)

### **Activity 10 – Reducing Our Impact on the Local Environment**

This activity and its extensions emphasize that climate change will amplify our present use of land, water, and air resources. Students should be aware of the complexity of environmental issues—a result of the complex interactions within ecosystems, and between nature and humanity.

Several Alabama organizations focus on environmental issues:

Alabama Commission on Environmental Initiatives – a report to the Governor of Alabama giving information and recommendations on environmental issues important to the state.

<http://www.jsu.edu/depart/epic/ACEIreport.htm>

Alabama Grassroots Clearinghouse – an extensive listing of organizations in Alabama concerned with environmental issues.

<http://www.ag.auburn.edu/grassroots/>

Alabama Department of Environmental Management

<http://www.adem.state.al.us/>

Alabama Rivers Alliance

<http://www.alabamarivers.org/index.htm>

Alabama Environmental Council

<http://www.aeonline.ws>

Cahaba River Society

<http://www.cahabariversociety.org>

Discovering Alabama - Alabama Museum of Natural History

<http://www.discoveringalabama.com>

Mobile Baywatch

<http://www.mobilebaywatch.org>

Nature Conservancy – Alabama

<http://nature.org/states/alabama>

Sierra Club – Alabama

<http://alabama.sierraclub.org>

South Alabama Birding Association

<http://www.alaweb.com/~kenwood/saba/index.html>

Wolf Bay Watershed Watch

<http://www.wolfbay.org>

## Ties to Alabama Learning Standards

Activity	SCIENCE									SOCIAL STUDIES (Grade Level)				
	Nature, Habits, and Skills					Biology				9th	11th	12th		
	2	4	7	8	12	39	42	45	46	27	24	15	18	19
1	√	√						√		√	√	√	√	√
2					√			√	√	√				
3						√				√	√			
4			√	√	√		√							
5			√	√	√	√				√	√			
6		√	√	√	√	√				√				
7		√	√	√	√	√								
8								√			√			
9								√	√	√		√		√
10								√	√	√		√		√

**SCIENCE****Nature, Habits, and Skills of Science (Grades 9-12)**

Standard 2. Discuss science as a body of knowledge and investigative process

Standard 4. Exhibit attitudes and habits appropriate to the scientific enterprise

Standard 7. Apply basic science process/thinking skills

Standard 8. Apply integrated science process/thinking skills

Standard 12. Use written and oral communication skills to explain scientific phenomena and concepts in appropriate technical and non-technical language

**Biology Core**

Standard 39. Discuss factors that might affect the dynamic equilibrium of ecosystems

Standard 42. Describe biomes

Standard 45. Discuss the mutual influences of science, technology, and society

Standard 46. Identify trade-offs that individuals and society must consider when making decisions concerning the use or conservation of resources

## **SOCIAL STUDIES**

### **9<sup>th</sup> Grade**

Standard 27. Critique new boundaries and problems in science, technology, economics, and culture (human impact on the environment).

### **11<sup>th</sup> Grade**

Standard 24. Examine significant changes in contemporary American society from a geographic, political, cultural, and economic perspective. (Examples: migration, immigration, information revolution, international treaties)

### **12<sup>th</sup> Grade**

Standard 15. Examine the various roles of the citizen in a participatory democracy. (Examples: voter, juror, activist)

Standard 18. Evaluate America's role in the world community.

Standard 19. Analyze the costs and benefits of public policy decisions.

### **References:**

*Alabama Course of Study: Science* (Bulletin 2001, No.20) Alabama State Department of Education]

*Alabama Course of Study: Social Studies* (Bulletin 1998, No. 18), Alabama State Department of Education.

Available at: [http://www.alsde.edu/html/sections/section\\_detail.asp?section=54](http://www.alsde.edu/html/sections/section_detail.asp?section=54)