



## Turning Up the Heat

### Effects of Global Warming on Fish Habitat

#### ***What is Global Warming?***

Global warming occurs when greenhouse gases in the Earth's atmosphere accumulate to the point where they cause an increase in the planet's temperature. Greenhouse gases, such as carbon dioxide (CO<sub>2</sub>), are not fundamentally bad. In fact, they keep the planet warm and habitable. However, human-produced greenhouse gases are accelerating the warming of the planet, causing temperature changes that are above normal levels. Humans produce excessive amounts of CO<sub>2</sub> (28 billion metric tons per year) primarily through combustion of fossil fuels such as coal, oil and gas in power plants, automobiles, and industrial facilities. Today, the average person in the world will release 11 kg (25 lbs) of CO<sub>2</sub> into the atmosphere, but the average American will emit almost five times this amount. As we continue to release more CO<sub>2</sub> into the atmosphere, the planet will continue to get warmer.

Catastrophic changes are likely to occur as a result of this warming process, including more prolonged droughts, stronger hurricanes, increased flooding of low-lying areas by rising sea levels, the extinction of many species, and a major disruption in the global production of food.

#### ***Global Warming Impacts on the Oceans***

Like humans, aquatic organisms require the maintenance of certain body temperatures to survive. Therefore, small changes in the global temperature can result in huge and sometimes devastating consequences for marine species.

The oceans play an important role in regulating the Earth's temperature. The levels of CO<sub>2</sub> and heat in the oceans rise concurrently with the levels in the atmosphere. The oceans have absorbed half of the human-produced CO<sub>2</sub> (around 150 billion metric tons) and 80% of the heat produced since the industrial revolution. Without the oceans, the effects of global warming would be far worse than seen to date. Unfortunately, the oceans are being overwhelmed by



Source: USFWS

*(continued on page 2)*

## **GETTING YOUR TEMPERATURE RIGHT:**

*Set the thermostat on your water heater to 120° F.*

Each 10° F reduction in water temperature saves 3 to 5% in energy costs. Also, setting your heater to 120° F can help prevent mineral buildup and corrosion in your water pipes.

*Set your refrigerator temperature at 37 to 40° F, and your freezer between 0 and 5° F.*

This will increase energy efficiency. Also, use the power save switch if your refrigerator has one, and make sure the door seals tightly.

*Set heat and cooling temperatures correctly.*

Turn off the thermostat when you are away from home. Air conditioners and heaters generally account for 45% of your utility bill, and the U.S. emits 150 million tons of CO<sub>2</sub> every year because of heating and cooling. Using your equipment wisely can reduce your environmental emissions anywhere from 20 to 50%.

the intense amounts of CO<sub>2</sub> they are absorbing. Recently the oceans have begun to approach their absorption capacity for CO<sub>2</sub> and take up the gas more slowly. This process results in more CO<sub>2</sub> remaining in the atmosphere, which negatively affects the climate.

The absorption of CO<sub>2</sub> is causing oceans to become more acidic, which jeopardizes the future of coral reefs and organisms that produce shells. Furthermore, the warming of the oceans increases the intensity of storms, raises sea levels, and disrupts ecosystems and ocean circulation.

### **1- Ocean Acidification**

While it is highly unlikely that the oceans will ever become actual acid, small changes in pH can result in severe ramifications. For example, corals, clams, oysters, and other organisms will be unable to build new skeletons and shells and those that already exist will begin to dissolve. When marine waters absorb CO<sub>2</sub>, the seawater reacts to form carbonic acid, reducing the amount of available carbonate for building skeletons and shells. Consequently, the acid dissolves the shells, and no carbonate is available to rebuild them.

Another example of organisms affected by acidification are phytoplankton, which also build

their shells out of calcium carbonate. Phytoplankton are the primary producers of the ocean and form the base of the vast majority of marine food chains. Therefore, they are vitally important, and a decrease in abundance due to acidification would be catastrophic to the oceans.

Even non-shell forming organisms will be threatened by the increasing acidity of the oceans. For example, squid, a key prey for many marine mammals, require high levels of oxygen for high-energy swimming, and the amount of oxygen that a squid can carry is negatively impacted by increasing ocean acidity. Additionally, ocean acidity may impede development of fish eggs and larvae, which would effect populations across the world. The only way to stop ocean acidification is to reduce the amount of CO<sub>2</sub> that we release into the atmosphere.

### **2- Sea Level Rise**

In 2006, the first inhabited island, Lohachara in the Bay of Bengal, was lost to rising sea levels.

Both warming oceans and melting ice cause rising sea levels. As the oceans heat up, they expand and therefore rise. Additional contributors to rising seas include the melting of glaciers, ice caps, and the Greenland and Antarctic ice sheets, due to both increasing atmospheric and ocean temperatures. It has been suggested that

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sea level could rise between 18 and 59 cm (7 and 23 inches) by the end of this century, not including the full effects of a complete melting of the Greenland or West Antarctic ice sheets, which would contribute an additional 12 m (39 feet) combined. Oceans will flood developed and developing countries alike; some of the most economically important and heavily populated cities, such as New York, London, and Bangkok, are at risk of disappearing under the rising waters.

### ***3- Ocean Circulation and the Marine Food Web***

The circulation of water through the oceans is very important for the transportation of heat and nutrients. Many organisms rely on this transport system for nourishment. The input of large amounts of freshwater from melting glaciers and ice caps may hinder the cycling of the oceans. This could lead to a collapse of marine food webs, affecting marine mammals (e.g., whales, seals, and dolphins), sea birds (e.g., albatross), and important commercial fish species (e.g., cod, salmon, and tuna).

### ***4- Depleted Marine Ecosystems***

According to the predictions of many scientists, global warming will greatly alter or completely collapse many ecosystems. A consequence for humans and animals alike will be the increased spread of diseases due to the warmer climate. Some species may be forced to change migration patterns to stay within their temperature tolerance range, or they may find that their food sources no longer exist in the same areas. They may also be unable to adapt quickly enough, or they may be too stressed to face other threats. Unfortunately, by 2050, one quarter of the world's species may face extinction.

### ***5- Harsher Storms***

As evidenced by Hurricanes Katrina, Rita, and Wilma, harsh storms are becoming more prevalent and more intense. Scientists believe that



Source: NASA/Jeff Schmaltz, MODIS Land Rapid Response Team

this trend will continue as global warming increases. With increasing temperatures comes increasing water evaporation and atmospheric moisture, which is a fuel for storms. The intensity of storms increase as they pick up energy from the warm ocean surface. As storms increase in frequency and strength, so will devastation to coastal areas around the world.

### ***How Can We Stop Global Warming?***

Because most global warming pollution comes from burning fossil fuels, any serious effort to deal with global warming must involve changes in the way we use and produce energy.

The most recent report by the Intergovernmental Panel on Climate Change (IPCC) concluded that the world could slow and then reduce global warming pollution over the next several decades through more efficient energy use and by investing in and using current and emerging technologies. Currently, the United States uses fossil fuels to produce about 70% of its electricity, but only 2% comes from renewable sources, such as sun, wind, and hydrokinetics. As long as concentrations of CO<sub>2</sub> continue to increase, reducing the effects of global warming will become more difficult, and the economic costs will greatly increase.

Source: Adapted from [www.oceana.org/climate](http://www.oceana.org/climate)

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**What You Can Do to Help Stop Global Warming:**

- Keep your car in good condition and keep tires inflated to the maximum recommended pressure.
- Cut driving miles and carpool more.
- Turn off the lights whenever you are not in the room.
- During periods of inactivity, turn off computers at home and work and enable the sleep mode.
- Wash only full loads of dishes.
- In summer, keep the shades drawn to keep the cool in. In winter, open the shades to allow sunlight to help warm rooms.
- Clean or replace the air filter in your air conditioner.
- Install low-flow shower heads and toilets.
- Plant trees around your house.
- Use energy efficient appliances with the Energy Star label.
- Choose refrigerators with freezers on top.
- Choose a dishwasher with light wash and air dry cycles.

## **ENERGY UPDATE**

### ***MMS ANNOUNCES RELEASE OF ALTERNATIVE ENERGY EIS***

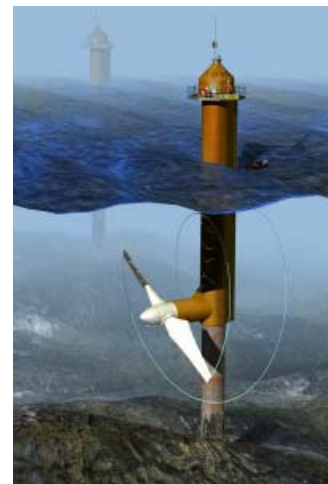
Section 388 of the Energy Policy Act of 2005 (EPAAct) granted the Secretary of the U.S. Department of the Interior (Secretary) discretionary authority to issue leases, easements, or rights-of-way for activities on the outer continental shelf (OCS) that produce or support production, transportation, or transmission of energy from sources other than oil and gas, and are not otherwise authorized by other applicable law (including wind, wave, ocean current, solar, and hydrogen energy). The Secretary delegated this authority to the Minerals Management Service (MMS). The MMS has also been delegated discretionary authority to issue leases, easements, or rights-of-way for other OCS project activities that make alternate use of existing OCS facilities for "energy-related purposes or for other authorized marine-related purposes," to the extent such activities are not otherwise authorized by other applicable law (including offshore aquaculture, research, education, recreation, and support for offshore operations and facilities).

Pursuant to the regulations implementing the National Environmental Policy Act (NEPA), the MMS is announcing the availability of this final programmatic environmental impact statement (EIS). As part of its efforts to develop a regulatory program for alternative energy and alternate use activities, this final programmatic EIS examines the potential environmental effects of the program on the OCS and identifies policies and best management

practices that may be adopted for the program. Several alternatives available to the MMS for implementing an alternative energy and alternate use program on the OCS are analyzed in this final programmatic EIS, including the "no action" alternative.

The MMS intends to prepare a separate NEPA analysis, tiered from this EIS, to evaluate the environmental impacts of the proposed rule for alternative energy and alternate use activities on the OCS. Further, separate lease sale, activity-specific, and proposal-specific NEPA analyses will be prepared as appropriate. This programmatic EIS analyzes the environmental impacts from potential activities that may arise from the establishment of an alternative energy and alternate use program on the OCS in the reasonably foreseeable future, defined in the EIS as five to seven years.

For more information, you may contact Mr. James F. Bennett, Minerals Management Service, Environmental Assessment Branch (MS 4042), 381 Elden Street, Herndon, Virginia 20170, (703) 787-1660. An electronic copy of the final programmatic EIS is available at: [ocsenergy.anl.gov](http://ocsenergy.anl.gov).



Source: Tidal Stream



## SPOTLIGHT ON ACID MINING

Acid mine drainage (AMD) in a watershed can be a consequence of mining coal or mineral deposits. AMD disrupts growth and reproduction of aquatic plants and animals, diminishes valued recreational fish species, degrades outdoor recreation and tourism, contaminates surface and groundwater drinking supplies, and causes acid corrosion of infrastructure like wastewater pipes.

A significant amount of scientific research has been conducted to determine the chemical reactions that create acidity and lead to the precipitation of dissolved metals. However, despite improvements in prediction and prevention methods, AMD problems persist. The acidity of coalmine drainage is caused primarily by the oxidation of the mineral pyrite ( $\text{FeS}_2$ ), which is found in coal, coal overburden, and mine waste piles.



Source: USGS

Many passive and active treatment systems have been developed to treat coalmine drainage in order to raise the pH of the water and to control the precipitation of dissolved metals. However, predicting and preventing AMD from occurring is preferable to having to perform remedial treatment once the problem has occurred; chemical tests have been developed to aid in predicting potentially acidic drainages.

Over 95% of the acid problem is located in western Pennsylvania, almost all of West Virginia, southwestern Virginia, and far western Maryland. Runoff water, polluted by acid, iron, sulfur and aluminum, has often drained away from the mines and into streams.

Source: EPA and USGS

## AROUND THE COAST: ADOPT-A-WETLAND IN GEORGIA

Georgia has approximately 384,000 acres of biologically diverse and productive estuarine wetlands along its one hundred miles of South Atlantic shoreline. These wetlands face increased threats from accelerating commercial and residential coastal development. Engaging the community on the important flood control, water quality, habitat, aesthetic, and recreational functions that these wetlands perform is a critical step towards their preservation and conservation. Adopt-A-Wetland is a coast-wide volunteer based water quality monitoring program that serves as the marine counterpart to the statewide, freshwater Adopt-A-Stream program developed by the Georgia Department of Natural Resources. The program's goals are to increase public awareness of wetland and water quality issues and to encourage responsible stewardship by involving citizens in ecological monitoring.

Educational materials emphasize the connection between inland uses, stormwater runoff, and water resources. Since receiving Coastal Incentive Grant funding in 2003, over 1,000 individuals have been trained to evaluate water quality and to identify and assess plants and animals living in these ecosystems. Water quality data is available online ([www.riversalive.org/aas\\_google\\_earth.htm](http://www.riversalive.org/aas_google_earth.htm)) and plans are currently underway to develop a new website to display all volunteer collected water quality data in Georgia and provide summary reports, certifications, charts, photos, and maps. In addition, a coastal wetland educational curriculum is currently being completed that will be promoted at several teacher workshops throughout 2007.

Volunteers have played an important role reporting problems including marsh die-off events, poaching, illegal dumping, non-indigenous species, and fish kills, in addition to forming an Adopt-A-Wetland Emergency Response Team. Additionally, volunteers have been a tremendous asset by participating in bi-annual clean-up events along selected waterways. To request an Adopt-A-Wetland manual or brochure, to schedule a presentation at your school or organization, or to check the schedule for upcoming training workshops, please contact Adopt-A-Wetland Educator Angela Bliss ([acbliss@uga.edu](mailto:acbliss@uga.edu), 912-598-2348) or visit their website ([www.marex.uga.edu/shellfish](http://www.marex.uga.edu/shellfish)).

**Source: Dr. Alan Power, University of Georgia Marine Extension Service, *The Georgia Sound***

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## HABITAT HOTLINE ATLANTIC

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## IN THE NEWS

### Atlantic Coastal Fish Habitat Partnership Receives Multi-State Conservation Grant

This fall the Atlantic Coastal Fish Habitat Partnership's (ACFHP) proposal for funding from the Association of Fish and Wildlife Agencies was approved under the Multi-State Conservation Grant. The ACFHP will receive \$521,520 split between 2008 and 2009. The funds will be used to complete essential activities needed to become recognized as an official partnership under the National Fish Habitat Action Plan. Some of these activities include: hiring a full-time ACFHP Coordinator, completing an assessment of existing information on Atlantic coastal habitats, generating a conservation strategic plan for the Atlantic coast, creating a website and other public information materials, establishing the management structure of the partnership, conducting meetings, and otherwise laying the basic groundwork for on-the-ground habitat protection and restoration projects along the Atlantic coast. The ACFHP's Interim Steering Committee, Science and Data Working Group, and Communications Working Group have already begun to develop action plans for completion of these obligations. Look for an announcement for the ACFHP Coordinator position to be posted on the American Fisheries Society website soon.

### NOAA Develops Habitat Priority Planner

The Habitat Priority Planner is a new tool from the NOAA Coastal Services Center. It was developed to make conservation choices a little easier by helping participants understand and prioritize their options. Users can map important landscape features in an area and consider various scenarios, allowing them to better visualize potential impacts. Sample uses include considering where to place conservation boundaries, where to place a road to minimize the impact on natural resources, and where to conserve or restore habitat to provide the greatest benefit for an endangered species. The idea for the tool came from coastal resource managers who were making decisions like these. Those who have used the tool so far have given it high marks, because it is easy to use, it is not data hungry, and it is interactive. All conservation efforts are collaborative in nature. This tool is used to generate various graphs, reports, and "what if" scenarios on the fly, which is very important when working on an issue through a group or public process. For more information, contact [Danielle.Bamford@noaa.gov](mailto:Danielle.Bamford@noaa.gov). The tool is available at [www.csc.noaa.gov/hpp/](http://www.csc.noaa.gov/hpp/).