Management of Federal Lands Threatened

“In general, resource managers lack specific guidance for incorporating climate change into their management actions and planning efforts. [R]esource managers do not have sufficient site-specific information to plan for and manage the effects of climate change on the federal resources they manage. In particular, the managers lack computational models for local projections of expected changes and detailed inventories and monitoring systems for an adequate baseline understanding of existing local species. Without such information, managers are limited to reacting to already-observed climate change effects on their units, which makes it difficult to plan for future changes.”


Federal Insurance Programs at Risk

“Taken together, private and federal insurers paid more than $320 billion in claims on weather-related losses from 1980 to 2005. Claims varied significantly from year to year largely due to the effects of catastrophic weather events such as hurricanes and droughts—but have generally increased during this period. [and] federal insurers’ exposure has grown substantially. Since 1980, NIPFs’ exposure nearly quadrupled to nearly $1 trillion in 2005, and program expansion increased FCIC’s exposure 26-fold to $44 billion. … [A] strategic analysis of the potential implications of climate change for the major federal insurance programs would help the Congress manage an emerging high-risk area with significant implications for the nation’s growing long-term fiscal imbalance.”

Testimony of Statement of John B. Stephenson, Director Natural Resources and Environment, Government Accountability Office, to the Committee on Homeland Security and Governmental Affairs, U.S. Senate, April 2007

The University of Maryland (UMD) is ideally situated to provide perspective and expertise as the nation begins strengthening its ability to adapt to climate change.

In addition to the CIRUN initiative, UMD has numerous distinctive assets that make it particularly valuable as a national resource:

• UMD has a long history of outstanding research in climate and environmental subjects, marine science and integrated, interdisciplinary investigation of the interactions among atmosphere, oceans, biosystems and human activity.

• Developing world-class decision-support tools will demand a broad range of resources and perspectives beyond climate science. UMD has nationally recognized expertise in economics, public policy, engineering, human health, marine science and agriculture. In addition, UMD’s departments and schools have extensive experience in working with the federal government.

• UMD is nationally recognized for the excellence of its computer science programs, including advanced modeling, visualization and data integration. These abilities will be essential to a successful nationwide effort to anticipate and cope with impacts of climate change.

• UMD has several long-standing collaborations with the nearby NASA Goddard Space Flight Center (which coordinates collection and analysis of satellite climate data), and with NOAA’s Climate Office in Silver Spring, MD.

As a result, decision-makers in business and government cannot plan intelligently for the greatest domestic threat we are likely to face this century. They need an entirely new generation of forecasting tools that produce new kinds of information: localized, customizable predictions that cover multiple relevant variables on the time scales that matter most to commerce and public policy—seasons to decades.

That information simply cannot be obtained from conventional sources, such as seven-day weather forecasts or 100-year global warming models. But thanks to recent progress in climate science, it is now possible to begin creating the sort of predictions necessary to cope with coming conditions.

However, providing those tools will require a comprehensive, integrated national effort that mobilizes NOAA, NASA, a consortium of universities and the private-sector “user community.” Such a collective effort can:

• identify the key questions that companies, industries and jurisdictions need answered, and identify the amount of advance notice—a few weeks, six months, five years, etc.—necessary for each kind of planning,
It quickly became clear that the future has potentially grave consequences for the country’s economy, ecosystems, infrastructure, public health and population distribution—and that the cost of remaining unprepared could easily reach tens of billions of dollars. Some looming problems had already been identified by objective expert groups. (See back page.) Many others emerged in conference discussions.

There was general consensus that the academic community and federal agencies must pool their strengths, and do so soon. The job is too large for any single entity, and will require an original and inventive emphasis on practical research directed at specific anticipated problems.

We must start to make the must of existing knowledge, and identify essential information sources for the future. At a minimum, this will entail finding novel ways to integrate data sets that are now compartmentalized into separate categories: air and water, ocean and land, ground-based and orbital.

This in turn will demand unprecedented cooperation among diverse federal agencies and academic institutions. Information critical to a comprehensive understanding of near-term climate change is now divided among the Departments of Commerce, Interior, Agriculture and Homeland Security, as well as NASA, EPA and, of course, dozens of universities and research centers. Frequently the data are in incompatible formats. Many problems can be separable by aggregation and analyzing that collective information with new kinds of software and visualization techniques.

In addition, we will have to reach a consensus on the most important new suites of terrestrial, atmospheric and marine sensors, satellite observations and data-storage systems to provide crucial measurements we now lack.

And we have to do it soon. Climate change is not some intriguing hypothesis. It is real, it is dangerous and it has already begun.

The Chesapeake Bay Forecast System: A Pilot Project for the Future

One of CIRUN’s major goals is to develop accurate, multi-factor local and regional climate predictions on time scales that business and government decision-makers need. That’s also the objective of the University of Maryland’s Chesapeake Bay Forecast System (CBFS) project, which has just announced a major milestone: development of a new set of 16-day forecasts for the nation’s largest estuary.

CBFS is a prototype demonstration project, begun in the summer of 2007, which will provide interactive decision-support tools to use in creating “if-then” scenarios for the Bay region over intervals of days to decades.

It will permit policy makers, urban development planners, natural resource managers and others to access existing observations and predictions, and then adjust the variables to see the effects of possible future changes in a host of factors, including temperature, sea level, rainfall, demographics, water resources, run-off, nutrient/contaminant loading from agriculture and urban centers, severe storms, land-use change, algal blooms and human pathogens, low-impact developments, reforestation and more.

The project, sponsored by the University of Maryland at College Park, and led by UMCP’s Earth System Science Interdisciplinary Center (ESSIC), uses four different component models of the Earth System to create a comprehensive picture of the bay region and its response to change. These models show connections among atmospheric, oceanic and ecosystem factors, and describe their collective impact on society in the region. Several academic partners have joined ESSIC in the effort: North Carolina State University, University of Maryland Center for Environmental Science, UMCP’s Center for Biotechnology and Computational Biology and UMCP’s University of Maryland Institute for Advanced Computer Science (UMIACS).

CBFS will serve a dual role: as a roadmap for methods whereby analytical climate models—including highly sophisticated and global systems—can be adapted to specific regions to demonstrate coupling of atmospheric, hydrologic, oceanic, and ecosystem models and observations and their interactions. It will incorporate global climate projections, but all impacts of global change will be local and the system will feature “dynamic downscaling” that will be modular and can be adapted to any part of the United States or the world.

The Chesapeake Bay, including its watershed (shared by seven states), is an ideal test bed for such a project. The estuary system has been extensively studied, and substantial data have been collected. But the complex is not fully understood in terms of ecosystem services, expected sea-level change, response to human activities, and actions needed for its sustainable use. As a result, tremendous interest exists in the health and wellbeing of the bay and its environments as well as its influence on the surrounding land and urban areas.

For more information and news about CBFS developments, see the project website at www.climateneeds.umd.edu/chesapeake.