

# Acclimations

Newsletter of the U. S. National Assessment of Climate Variability and Change



## NATIONAL ASSESSMENT NEWSLETTER PREMIER ISSUE

The U.S. Global Change Research Program (USGCRP) is pleased to offer this new bimonthly newsletter that will cover topics related to the U.S. National Assessment of the Potential Consequences of Climate Variability and Change for the United States. The newsletter will be hosted on the USGCRP web site, and will also be made available in hard-copy form to agencies and to regional and sectoral team leaders for distribution to interested stakeholders. Topics that will be covered include synthesis team activities; sectoral plans and accomplishments; regional workshop plans and post-workshop analysis and assessment activities; and related news items from federal agencies and other stakeholders. Your feedback and article submissions are welcome.

### National Assessment Overview

The U.S. National Assessment of the Potential Consequences of Climate Variability and Change for the United States will be conducted under the auspices of the U.S. Global Change Research Program, which is coordination mechanism for partic-

ipation of federal agencies in global change research. The focus of the National Assessment will be on what is known about the potential consequences of climate variability and change for the United States over the next 25-30 years (so one generation) and also over the next 100 years, seeking to analyze and evaluate consequences for the environment, economy, and society. The assessment, which is called for in the "Global Change Research Act of 1990", will focus on the issues of most importance to the United States in the context of other pressures on the public, the environment, and the Nation's resources. Activities have been established to assess the risks and opportunities for the United States--its people, its environment, and its economy--associated with climate variability and climate change.

Fundamental questions that are to be addressed through the assessment include:

- What are the current environmental stresses and issues for the United States that form the backdrop for potential

additional impacts of climate variability and change?

- How might climate variability and change exacerbate or ameliorate existing problems or introduce new stresses or opportunities?

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## ATLANTIC COASTAL/CARIBBEAN WORKSHOP ADDRESSES KEY ISSUES

by Ricardo A. Alvarez

From July 21-23, 1998, the International Hurricane Center at Florida International University hosted the Atlantic Coastal/Caribbean Regional Scoping Workshop ("Climate Change and Extreme Events") to set the foundation for the region's assessment.

No one disputes the interaction of natural cycles and oscillations, ranging from hours to centuries, that provides the complicated, and only partially understood, dynamics driving climate change. Many findings suggest that human intervention already contributes to climate change and alters the natural time scales of such change. A major objective of the workshop is to understand what specific effects climate change may have on the U.S. South Atlantic Coastal and Caribbean region, which comprises 1,000

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## Next Issue

- Sector Plans
- Upcoming Workshop:  
Native Peoples/  
Native Homelands

## NEXT STEPS FOR CALIFORNIA

By Robert Wilkinson

The California regional scoping workshop was held in Santa Barbara on March 9-11, 1998. Since that time there has been ongoing positive feedback from the workshop, and significant efforts are being undertaken in the various sectors. For example, The Water Education Foundation, a well-regarded source of information of water policy issues, has released a special issue of their publication specifically on climate change, with input from the California region "white paper" and the workshop process (<http://www.nceas.edu>). Water resources, one of the main topics covered at the workshop, is a major issue in the west, yet climate has not been on the radar screen for many in the water community.

California is considering two major tasks for the next phase. The first is to complete the workshop effort by following up on critical sectoral components of the regional assessment. This will involve convening smaller meetings of stakeholders and experts on issues that require further analysis. The second is to work with those who are currently conducting research on key elements of the climate impacts issue (e.g. integrating the modeling of climate, water, fire, land-use, etc. and ecosystems and eco-

conomic/social systems research) to coordinate their efforts and focus the outputs on climate impacts.

### Task 1: Sectoral Meetings

While the workshop resulted in a good overview of the impacts involved in each sector, we did not have sufficient time to reach the level of detailed discussion that is needed. At least four sectors merit particular consideration and focused follow-on work for the California region:

- Coastal impacts (including natural systems and infrastructure aspects)
- Water (including supply, drought/flooding, and quality concerns)
- Agriculture (looking at both natural systems and market impacts)
- Urban centers (including that larger human infrastructure and support systems)

### Task 2: Research Priorities

There are several research topics which California proposes to be addressed in the next phase. Each research thrust would involve a team of researchers and stakeholders from universities, laboratories, state and federal agencies, the private sector, and other non-government organizations. These teams will build on the successful regional workshop process and add appropriate participants as needed. This work will involve both direct support for certain research efforts and cooperation with research that is already funded but not coordinated. There is already significant funding in place for a number of research projects which can be highly leveraged

for the assessment effort. The four priority research areas are:

### 1. Integrated Regional Impacts Modeling Project

This project will involve coordination of currently-funded work (such as the research at Lawrence Berkeley National Laboratory and Scripps Institution of Oceanography) on climate change at the regional scale. State resource agencies and other organizations, such as the Pacific Institute, also have on-going projects addressing issues such as water planning and fire-fighting. The objective is both coordination of research efforts across critical sectors of interest and sharing of existing information between research projects.

### 2. Ecological Systems Impacts Assessment

Climate-induced changes in ecological systems may involve profound impacts to both natural and managed systems. State interest in ecosystem impacts and links to existing management challenges, from fire fighting - to agriculture - to watershed management, is considerable. State and local agencies will be key stakeholders to involve in this effort.

### 3. Communities and Infrastructure Impacts Assessment

The national assessment effort has determined that urban centers and the general area of communities and infrastructure should be handled at the regional assessment level (vs. developing a national sectoral assessment process). This places a specific and important task before the regional assessment efforts to adequately address those concerns. The California region has significant urban/community infrastructure issues linked to water supply, transportation and communications, fire, sea-level rise, health, and other concerns. System resilience and the capacity to adapt to and mitigate change is a critically important issue for the region. The regional workshop succeeded in bringing together leading stakeholders in this area, including: local government associations, elected officials, planners at the local level, state and federal agencies concerned with these



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Next Steps for California  
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issues (e.g. CalTrans, Department of Water Resources, Bureau of Reclamation), and professional associations such as the American Planning Association (APA) and the American Institute of Architects (AIA). One post-workshop goal is to pull this considerable talent together to assess California region-specific concerns. This process will likely identify additional research questions to address.

#### 4. Business and Economic Impacts

Impacts of climate change and variability on California's trillion dollar economy are complex and critically important to business and the economy. One of the major accomplishments of the California regional workshop and the numerous preparatory meetings was the high quality and diversity of business participation. In follow-up discussions with business participants, workshop organizers have received extremely positive feedback and a strong interest in continuing the assessment. Another post-workshop goal is to move quickly to maintain a valuable and significant level of interest and commitment on the part of the business community.

Based on these preliminary concerns, the overall goals of the California region's follow-on activities are:

- Establish a focus and an expanded network for climate impacts assessment work in the California region and support the National Assessment effort
- Facilitate information exchange among on-going climate change-related efforts in the region
- Provide research coordination and cross-fertilization with interested research centers and link these efforts to stakeholder concerns and priorities
- Produce an integrated assessment of potential impacts of climate variability and change in the California region as input for the national assessment effort

#### For more information, contact:

Robert Wilkinson, California Regional Workshop Coordinator, University of California Santa Barbara, 1428 W. Valerio Street, Santa Barbara, 93101; (805) 569-2590; wilkinso@envst.ucsb.edu

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- What coping options exist that can build resilience to current environmental stresses, and also possibly lessen the detrimental impacts of climate change?
- What are the priority research and information needs (near- and long-term) that must be met to help policy makers to reach wise decisions related to climate variability and change?

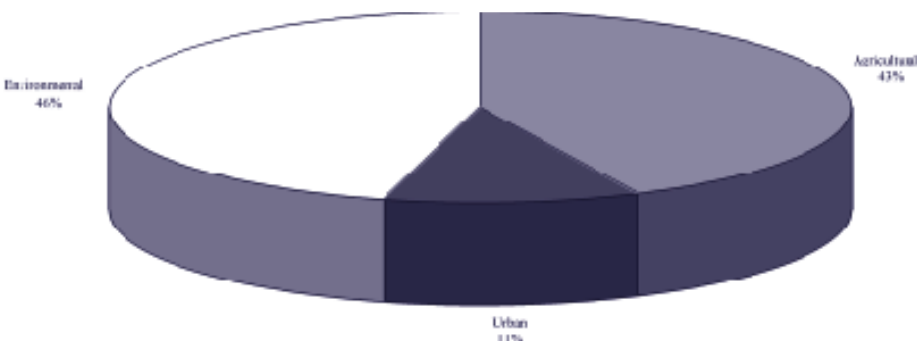
The national assessment has three components: a national synthesis, regional assessments, and sectoral analyses. The national synthesis report will be both synthesis and summary of sectoral and regional analyses, studies, and workshops combined with additional quantitative analysis to provide an integrated national perspective on the consequences and implications of climate change and variability for the United States. The sectoral analyses will consider potential consequences on major economic sectors such as agriculture and forestry; environmental sectors such as the coastal zone; and societal sectors such as human health and water resources. These analyses will be national in scope. The regional analyses will characterize potential consequences of climate variability and change on about twenty geographic regions covering the United States, focusing on issues affecting people where they live.

Specific responsibilities have been defined for oversight of the components of the national assessment and for coordination activities. A federally chartered advisory committee known as the National Assessment Synthesis Team will provide overall intellectual oversight of the national assessment process and has responsibility for the development of the Synthesis Report. The synthesis team members are drawn from academia, government, and the private sector. The interagency National Assessment Working Group under the auspices of the USGCRP has lead responsibility for organizing and sponsoring the sectoral analyses and oversight and coordination responsibilities for the regional analyses. The National Assessment Coordination Office has been established to facilitate coordination of the entire national assessment process. The regional, sectoral, and national synthesis reports are targeted for completion by January 1, 2000 and are intended to serve as part of the U.S. contribution to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

#### For more information:

See the Web site at <http://www.nacc.usgcrp.gov> or contact: Michael C. MacCracken, Executive Director, National Assessment Coordination Office, Suite 750, 400 Virginia Avenue, Washington DC 20024; (202) 488-8630; or email at [mmacracken@usgcrp.gov](mailto:mmacracken@usgcrp.gov).

### California Water Use



Source: California Department of Water Resources Bulletin 160-98 California Water Plan, Public Review Draft, January 1998.

## Alaska

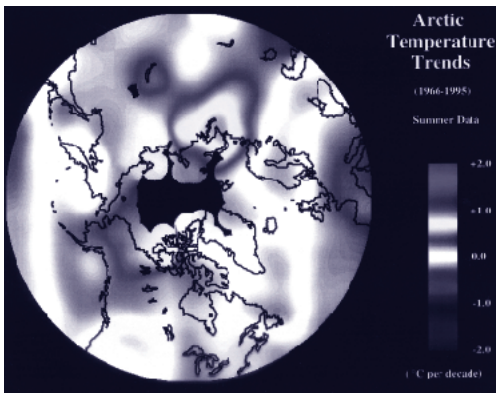


### ALASKA REGIONAL ASSESSMENT CONTINUES

By Gunter Weller

Alaska is important to the nation and the world since it produces about 10% of the world's fish catches and enough oil to supply about 20% of US domestic petroleum consumption. It also has the largest parks, wildlife refuges and preserves in the nation. All of these are at risk due to global climate change, which has resulted in major warming in Alaska in recent decades. Chapman and Walsh (1993) show a warming trend over Alaska that is on the order of 0.75 degree C per decade over the last three decades. Over the ocean areas the warming in the Eastern Bering Sea is on the order of 0.25 degree C per decade but less over the Western Bering Sea. These data are based on meteorological station records in the region.

The Alaska regional scoping workshop, held at the University of Alaska in June, 1997, examined the consequences of this documented climate change in the region, and assessed present and future impacts due to climate change on forests, tundra, wildlife and fisheries, the coastal zone, per-



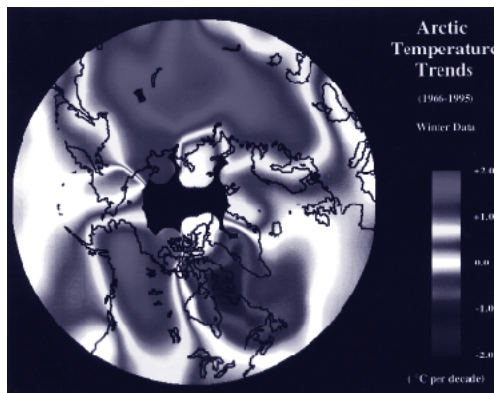
Observed trends of arctic mean temperatures from 1966-1995 for winter (a) and summer (b) - (Chapman and Walsh, unpublished)

mafrost regimes, social and cultural systems and lifestyles, resources, and man-made infrastructure (Weller and Anderson, 1998). It listed and discussed major impacts already experienced, both positive and negative in relation to human activities, and projected future changes if present climate trends continue. Some of the observed impacts (positive +, or negative -) include:



Photo: Kurt Byers

- Major changes in fisheries catches in recent years, due to both longer-term climate change and El Nino conditions (+ and -).
- Accelerated permafrost thawing, leading to costly increases in road damage and road maintenance (-).
- Major landscape changes from forest to bogs, grasslands and wetland ecosystems, due to permafrost thawing, affecting land use (-).



- Increased forest fire frequency and insect outbreaks with reduced economic forest yields (-).
- Alengthening of the growing season for agriculture and forestry by up to 20%, producing higher yields (+).
- Increased coastal erosion and inundation, due to less sea ice in the Bering Sea and more severe storm surges, causing threats to structures (-).
- Impacts on Native subsistence lifestyles

as snow and sea ice changes affect land and marine animals used in hunting / fishing (-).

The assessment so far has been successful in summarizing recent changes in climate and their effects on the physical environment, including the snow and ice features that are so important in Alaska. Less successful have been attempts to synthesize quantitatively the impacts on ecosystems and biota since many other factors are important here. This area of research needs additional attention. Least successful so far have been attempts to quantify the impacts of global change on economic activities, including fisheries, forestry, transportation, and subsistence. These latter topics will be the focus of the next step in the Alaska regional assessment at a workshop that will take place at the University of Alaska Fairbanks on 29-31 October 1998.

#### References:

Chapman, W. L., and J. E. Walsh, 1993. Recent variations of sea ice and air temperatures in high latitudes. *Bull. of Am. Met. Soc.* 74 (1), 33-47. Weller, G., and P. Anderson (eds.), 1998. Implications of Global Change in Alaska and the Bering Sea Region. Proceedings of a Workshop at the University of Alaska Fairbanks on 3-6 June, 1997. Center for Global Change and Arctic System Research, University of Alaska Fairbanks, 155 pages, 1998.

#### For more information, contact:

Gunter Weller, University of Alaska Fairbanks, Fairbanks, AI

## Arizona



### SOUTHWEST CLIMATE SYMPOSIUM SPINS OFF NEW PROJECTS

By Barbara Morehouse and William Sprigg

The Southwest regional scoping workshop, held in September, 1997, had more momentum behind it than even many participants may have suspected. That very successful event quickly led to funding and establishment of the Southwest Climate Assessment Project, and set the stage for participation in the National Assessment process.

Housed at The University of Arizona's Institute for the Study of Planet Earth (ISPE) and focused primarily on the states of Arizona and New Mexico, the Southwest Climate Assessment Project seeks to identify and assess the impacts of climate variability and climate change at seasonal, interannual, decadal, and longer time scales on human and natural systems in the region. The project also seeks to provide climate information people need to respond to climate conditions that pose significant threats, or significant opportunities. Because individuals and organizations in the area are the ultimate beneficiaries of the effort, the project is designed to integrate stakeholder participation in research projects all the way from the initial design phases through to development of final products.

With a three-year seed money grant from NOAA, the project provides an excellent platform for ISPE's participation in the National Assessment. The southwestern regional assessment, sponsored by the Department of the Interior, will provide information on the vulnerability of parts or all of California, Arizona, New Mexico, Nevada, Utah, and Colorado. These states share many environmental, social, and economic resources and the issues surrounding them. The September 1997 workshop participants noted that

the most important of these resources is water; and that one of the most underappreciated areas where potential impacts of climate variability could be significant is human health.

The Southwest Climate Assessment Project's first-year research agenda focuses on southern Arizona. For example, a vulnerability analysis will be conducted in the ranching sector, which was identified as one of the economic sectors of the region most affected by climate changes. Other research activities slated for the first year include an integrated assessment of a selected community in southeastern Arizona, an analysis of the sensitivity of existing policies and procedures in Arizona's urban water sector to climate variability and change, compilation of information on the climate history and current climate, and a cataloguing and evaluation of climate and hydrologic forecasts issued for the southern half of Arizona. In subsequent years, research will be expanded into the rest of Arizona and New Mexico. Interim discussion papers on the first year's research activities will be produced in early fall of 1998, and formal reports, databases, and other products will be available in spring, 1999.

An extensive and broadly based survey of stakeholders in southern Arizona has already produced information about what kinds of climate information individuals such as farmers, government land managers, urban planners, and others use, and what sorts of information they would like to use if such information were available, or available in useful formats. Interviewers have gathered information on the purposes to which the climate information is put, and the time spans over which information is needed, and particular events that spurred use of climate information. A workshop to discuss climate forecasting has been scheduled for early July.

Crucial to achieving the goals of the project is developing strong teamwork among the participants and ongoing affiliations with other organizations, agencies and projects having common or overlapping interests. Integration at the

researcher level in one key component of this process. For example, the first-year research draws upon University of Arizona social and physical science experts from areas such as the Laboratory for Tree Ring Research, Department of Hydrology and Water Resources, Department of Geography and Regional Development, Bureau of Applied Research in Anthropology, Arizona State Museum, Udall Center for Studies in Public Policy, and Latin American Area Studies. In subsequent years, networks will be extended to researchers in other disciplines and academic institutions in Arizona, New Mexico and elsewhere. Interactions have also been initiated with a number of other entities such as the National Weather Service to the Arizona State Office of Climatology, and water managers. The stakeholder survey process has opened doors to further interactions with individuals in the private and non-profit sectors as well, ranging from private economic development offices to farmers, ranchers, urban water companies, and others.

In parallel with the implementation of the initial research projects, the Climate Project Core Office has introduced a web site (<http://www.ispe.arizona.edu/swclimate>) and has been actively involved in communicating information about the assessment and soliciting participation in its activities at conferences, professional and business meetings, and in other venues.

#### **For information on the Southwest Climate Project, contact:**

Barbara Morehouse, Program Manager, Institute for the Study of Planet Earth, University of Arizona, 1439 E. Helen Street, Tucson, AZ 85721; (520) 621-9010; [morehoub@u.arizona.edu](mailto:morehoub@u.arizona.edu)

#### **For information on ISPE's involvement in the southwestern portion of the national assessment, contact:**

William Sprigg, Deputy Director, Institute for the Study of Planet Earth, University of Arizona, 1439 E. Helen Street, Tucson, AZ 85721; (520) 621-9010; [wsprigg@u.arizona.edu](mailto:wsprigg@u.arizona.edu)

*Atlantic/Coastal/Caribbean*  
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miles of Atlantic coastal regions from North Carolina through South Florida, and a veritable archipelago of more than 250 islands including Puerto Rico, the U.S. Virgin Islands, the Florida Keys and more than 26% of the total acreage of barrier islands of the East and Gulf coasts.

At the end of 1997 the population of this region hit 15.5 million permanent residents. To them we add some 5.0 million seasonal residents, and more than 30.0 million tourists visiting these areas in a given year. This results in a regional population ranging from 20.0 to 24.0 million and continuing to grow. The region also harbors unique and irreplaceable ecosystems such as the Everglades, coral reefs, forests, wetlands and Lake Okeechobee, the second largest reservoir of freshwater entirely within the borders of the contiguous 48 states.

The region is home to our spaceport in Cape Canaveral, the largest single-dish radio telescope in the world in Arecibo, Puerto Rico, the Southern and Central Florida Flood Control Project, perhaps the largest public works projects of its kind. In addition, important commercial ports, airports, numerous academic institutions and a myriad business and public institutions linking the U.S.A. to huge developing markets in Latin America, are also in the region.

In addition to human and technological hazards, this region is vulnerable to hurricanes, drought, sea-level rise, coastal and riverine flooding, flash floods, severe lightning, wild fires, beach erosion, saltwater intrusion, sink holes, coral reef bleaching, and other natural hazards. This vulnerability creates stresses on regional systems that may be aggravated by climate change. The workshop will focus on these vulnerabilities, with special emphasis on the impacts of climate change on hurricanes and on water resources.

### **Climate Change and Hurricanes:**

This entire region is within hurricane alley. The historical record shows a large number of intense hurricanes have made landfall in the coastal areas of this region. Puerto Rico and the U.S. Virgin Islands have also experienced several impacts.

Empirical data indicate continued global warming will provide more favorable physical parameters for cyclogenesis. Sea-surface [SST] temperatures exceeding 26 C, a deep thermocline, high relative humidity, and atmospheric conditional instability are all prevalent results of global warming that promote tropical cyclones. Global circulation models have been used to simulate changes in hurricane intensities in a global climate warmed by increases in atmospheric CO<sup>2</sup>. Results indicate increases of 5% to 12% (3-7 m/s) in wind speeds, and drops in central pressures in the order of 7 to 20 mb; and both of these indicators point to higher intensity hurricanes. Others have also used these models to investigate potential changes in hurricane activity due to climate change resulting from higher CO<sup>2</sup>, but with mixed results. So it is clear that uncertainties remain and model refinement is needed to improve the reliability of results.

Against this background of empirical data and of tentative, but still inconclusive, results of scientific modeling of tropical cyclone variability, the population and development of our coastal and island areas continue to grow, increasing the region's vulnerability to extreme events. This issue of increasing vulnerability must be paramount in our analysis of responses to the potential consequences of climate change on this region.

### **Water Resources:**

Another interesting case-study of potential regional consequences of climate change is the effects on regional water resources. Florida coastal counties depend on a combination of surface/ground water sources for municipal uses, agriculture, industry, recreation, and natural ecosystems. These competing demands for water and the continuous urbanization/development trend has already placed significant stress on the regional water resources.

Regional water sources include the following: a) natural drainage from the Appalachian mountains, b) 1,700 rivers/streams and 7,800 fresh water lakes including Lake Okeechobee, c) the Florida Aquifer estimated to contain 1x10<sup>14</sup> gallons of freshwater, d) local rainfall, and e) the Everglades. Stresses result from demands of a coastal population of 8.6 mil-

lion (1997), and from flood control measures draining an average of 1.8 million gallons of freshwater per day into the sea. This has reduced the Everglades by 2.0 million acres, reducing its ability to resupply the aquifer. Recent studies also suggest a decline in rainfall has occurred since 1960. This could be the consequence of urbanization, related wetland draining and flood control measures, which result in a reduced rate of evapotranspiration and thus precipitation.

Should climate change result in an increase of hurricanes and rainfall, current stresses could be aggravated due to the need to increase drainage related to flood control, the combination of sea-level rise, storm surge and beach erosion leading to salt water infiltration of the aquifer, and the consequential loss of some ground water sources. If the regional consequence should be less rainfall, the aggravation of stresses would result from freshwater supply management cutbacks. This would adversely impact the Everglades Agricultural Area, as well as the supply for drinking, industry, recreation and ecosystems. Other consequences of changes to regional freshwater water resources include alteration of salinity in estuaries, decreased biodiversity, and interruption of food chain systems leading to loss of fishing habitats.

The July 1998, workshop will be one step in the process of understanding these potential consequences. There is a need for continued research on direct causal links of human activity and climate change, and on using technological tools for more accurate and timely data acquisition to model our coastal and island regions. We need to look at ways to improve our built environment to reduce the damage from extreme events. Above all, we must increase our efforts to educate all sectors of society, from children to adults, practitioners to academics, business leaders to our political leadership, in the need for considering adaptive actions now.

### **For more information, contact:**

Ricardo Alvarez, Associate Director, International Hurricane Center, Florida International University, (305) 348-1607, alvarez@fiu.edu

# Q&A

**Q: Who is the audience for the National Assessment?**

A: There are multiple audiences for the Assessment. In general, the Assessment is focused on providing information for various users of information - such as people working in areas sensitive to natural resources (water managers, farmers, ranchers, etc.) and people positioned to implement or make decisions about coping strategies at local, state and federal levels. The regional assessments are primarily for regional audiences; the sectoral assessments and Synthesis are primarily for national audiences. Congress is the primary audience for the Synthesis Report, as a surrogate for the American people.

**Q: What is the relationship between this National Assessment and activities related to implementing the Kyoto Protocol?**

A: These are separate activities. The National Assessment is looking at vulnerability and coping strategies ("impacts") while Kyoto-related activities are looking at emissions reductions ("mitigation"). Within the National Assessment process, regional stakeholders have been encouraged to develop "win-win" strategies that simultaneously reduce emissions and enhance the resilience of the particular sector in an effort to be flexible of ideas and initiatives that emerge. However, the focus of this effort has never been on mitigation.

**Q: What is the relationship between this National Assessment and the Intergovernmental Panel on Climate Change (IPCC)?**

A: The National Assessment is being timed to provide input into the Third Assessment Report of the IPCC. The IPCC itself has been developing a regional focus and published a Special Report on Regional Impacts of Climate Change in 1997. However, IPCC regions are much larger than National Assessment regions: in the IPCC Special Report, the United States was merged with Canada in a North American chapter. In the National Assessment, the United States is divided into 20 regions.

## Upcoming Meetings

Caribbean/Southern Atlantic Coast  
Regional Scoping Workshop  
July 21-23, 1998  
Miami, FL

Summer Workshop for National  
Assessment Leaders  
July 27-31, 1998  
Monterey, CA

Synthesis Team Meeting  
August 23-28, 1998  
Woods Hole, MA

Southern Great Plains Regional Scoping  
Workshop  
September 14-16, 1998  
Austin, TX

Water Resources Sector Workshop  
September 14-16, 1998  
West Palm Beach, FL

Native Peoples/Native Homelands  
Workshop  
October 29-November 1, 1998  
Albuquerque, NM

## Mid-Atlantic



### MID-ATLANTIC REGIONAL ASSESSMENT BUILDS ON SEPTEMBER '97 WORKSHOP

By Ann Fisher and Andrea Soltysik

The September 9-11, 1997 Mid-Atlantic regional scoping workshop, held at Penn State University, was a first step in assessing how communities might be affected and how their residents might cope with or take advantage of impacts from increased climate variability and change. A large interdisciplinary team of faculty members and students at The Pennsylvania State University (Penn State) is now using the workshop results to build a Mid-Atlantic Regional Assessment (MARA).

The September workshop focused on the Chesapeake Bay Region and the Delaware River Basin. It provided a preliminary overview of: 1) the region's current stresses and issues; 2) how climate change might affect these stresses; 3) information available and research needed to make wise decisions about such impacts; and 4) strategies to cope with negative impacts and take advantage of opportunities created by climate change. Participants represented academia, business and industry, environmental organizations and public interest groups, and state and federal government. Although the invitation process demonstrated the difficulty of engaging stakeholders, participants were enthusiastic about the process described for assessing climate change impacts. The working groups expressed concern about potential water and health impacts and emphasized the need for education and information dissemination. A detailed report is available at <http://www.essc.psu.edu/ccimar>.

Penn State now has initiated a more formal Mid-Atlantic Regional Assessment (MARA). The regional coverage has been expanded to include parts or all of New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, North Carolina, and the District of Columbia. This larger region makes it easier to account for more of the geographic and socioeconomic linkages and diversity within the Mid-Atlantic Region. The Mid-Atlantic Integrated Assessment (MAIA) has a wealth

of data for this larger region. Penn State's integrated assessment process is designed to be open, with substantial stakeholder involvement and researcher interaction.

A June, 1998 planning meeting at Penn State included researchers from several universities, federal agencies, and other organizations. One objective was to identify inputs that can be used in MARA, including databases, analytical approaches, and existing assessments. In response to this need, Penn State's Water Resources Impacts Group is supporting by providing access to on-line data for water resources, climate, land and agriculture, census, and other socioeconomic data sets for the mid-Atlantic region.

A second objective of the June meeting was to get feedback on the planned assessment approach and process, including setting priorities about which issues to cover and identifying any key gaps in the assessment plan. During the final session of the meeting, participants gave their advice about our approach, about finding available data and assessments, and about locating additional expertise. They stressed the need to establish ground rules for data and methods to be used, keeping in mind the available time frame and the target audience. They emphasized the need to prioritize and subdivide, and to select focal issues or areas that are amenable to case study analysis yet have the potential for demonstrating an integrated approach (even if it cannot be a fully integrated assessment for the first round). They urged involvement of stakeholders early and often, including those at the local level. Stakeholder interest may be stimulated by connecting climate change to what people care about locally, such as extreme weather conditions, and by using water as the main integrating factor. They recommended a matrix approach, perhaps similar to that used in the Mid-Atlantic Integrated Assessment. This would be helpful for identifying interesting case studies and important research gaps, as well as serving as the basis for a report-card summary of results. The meeting agenda, panelists' overheads, and summaries of each panel--with specific information about the Mid-Atlantic Region--are available on <http://www.deasy.psu.edu/mara>.

A companion to the June meeting is being planned for September, 1998, with a focus on stakeholder involvement. Regional stakeholders will be selected from a list that

currently has about 900 names. About 25 participants will be asked to help identify regional issues and case studies that might be particularly relevant. Many of them will be part of a larger set of correspondents who provide feedback on the approaches used and interim results. Perhaps most important, they will be involved in designing and disseminating information about the MARA process and results.

#### For more information about, or involvement in, MARA, contact:

Ann Fisher, Penn State University, 107 Armsby Building, University Park, PA 16802; (814) 865-3143; [fisherann@psu.edu](mailto:fisherann@psu.edu)

#### "ELEMENTS OF CHANGE" AVAILABLE FROM ASPEN INSTITUTE

Elements of Change 1997 is now available from the Aspen Global Change Institute (AGCI). The book contains the report of the August 1997 meeting held at AGCI, "Planning for the U. S. National Assessment of the Consequences of Climate Change," chaired by Mike MacCracken and Bill Easterling. It includes summaries of presentations about the first four regional workshops, working group reports from the AGCI session, and reflections by Tom Wilbanks, Tony Socci, Chris Bernabo, and others.

The book also includes the report of another AGCI session held in the summer in 1997, "Scaling from Site-Specific Observations to Global Model Grids," chaired by Danny Harvey. This report includes summaries of presentations by the 20 participants including John Harte, Roger Pielke, Sr., and Don Wuebbles. Cost of the book is \$29 plus \$5 shipping and handling. A complete set of four books (Elements of Change 1994, 1995, 1996 and 1997) is available for \$75 plus shipping and handling. Order by email: [agcimail@agci.org](mailto:agcimail@agci.org), by phone (970 925 7376), or by fax (970 925 7097). The electronic edition of Elements of Change 1997 will be available later this year at AGCI's website: [www.gcrio.org/agci-home.html](http://www.gcrio.org/agci-home.html). Electronic editions of Elements of Change 1994, 1995 and 1996 are currently available at the site.

- Susan Joy Hassol, Aspen Global Change Institute



# Synthesis Team News

The National Assessment Synthesis Team is a federally chartered advisory committee responsible for the intellectual leadership of the National Assessment process. It was created in early 1998 under the auspices of the National Science Foundation. The Synthesis Team has held two meetings: an organizational meeting in February and its first official meeting in April. At these meetings, they:

- Developed strategies for climate and socioeconomic scenarios;
- Selected 5 sectors to receive special treatment in this first assessment (water, health, coasts, agriculture, forests);
- Discussed and approved co-chairs and members for the sector teams;
- Discussed a strategy for templates that covered both general methodology and report table of contents.
- Discussed how the regions might coordinate with the sectors and the Synthesis Team and how regional contributions might best be incorporated into the Synthesis Report.

The following white papers have been completed by the team:

- Climate scenarios "Elements of an Ideal Climate Scenario Formulation" (sent to regions and sectors)
- Socioeconomic scenarios/frameworks (sent to regions and sectors)
- Sectoral templates
- Regional templates

Current Synthesis Team activities include:

- Distributing historical monthly and daily data for the regional and sectoral teams (CD-ROM and web site)
- Collecting scenario results from Hadley, Canadian Climate Model, Max-Planck, etc., and making this accessible to the regional and sectoral teams
- Facilitating 3 NCAR model runs (base line, transient, stabilization)
- Developing a long-term strategy for archiving and providing user support for these data sets.

**Synthesis team members:**

**Co-chairs:**

Tony Janetos, National Aeronautics and Space Administration  
Jerry Melillo, Ecosystems Center Marine Biological Laboratory

**Members:**

Eric Barron, Penn State University  
Linda Joyce, Colorado State University  
Tom Karl, National Climate Data Center  
Barbara Miller, Rankin International, Inc.  
Granger Morgan, Carnegie Mellon University  
Ted Parson, Harvard/Kennedy School of Government  
Richard Richels, Electric Power Research Institute  
Dave Schimel, National Center for Atmospheric Research



## Region and Sector Leaders Gather at Summer Workshop

The Summer Workshop of National Assessment leaders will be held July 27-31, 1998, in Monterey, California. The workshop will bring together region and sector leaders, along with members of the synthesis team.

The overarching goal of the workshop is to integrate the different elements of the National Assessment to assure cohesion. To accomplish this, we have identified several objectives for the workshop:

- To promote communication, sharing of information, coordination, collaboration, and exchange of ideas among all National Assessment participants.

- To amplify and clarify the process for generating the first assessment reports and for building and sustaining stakeholder interactions,
- To facilitate and enable regions and sectors to take the next steps in furthering their assessment activities.

Participants will review the sector plans and the expectations and timelines for regional assessments, and will discuss the challenges the regions are facing in meeting their goals. Other workshop sessions will include discussions of socioeconomic scenarios, outreach to stakeholders, and steps beyond the 1999/2000 report process.

### 1998 Summer Workshop Agenda Summary:

**Monday, July 27:** Discussing the Assessment Framework and Defining Questions and Issues to Address or Resolve Throughout the Course of the Meeting

**Tuesday, July 28:** Reviewing the Regional Strategies and Building Inter-regional Communication and Collaboration

**Wednesday, July 29:** Discussing Scenario Approaches and Providing Assistance on Data Access and Use

**Thursday, July 30:** Fostering Continuous Dialogue among Stakeholders and Building Capacity for Information Exchange

**Friday, July 31:** Bringing the Pieces Together to Define a Coherent National Assessment

## Alaska

Regional scoping workshop held June 3-6, 1997. A web site is available, and the final report is posted. The principal regional investigators are in the process of planning the regional assessment and have produced a brochure explaining global change in Alaska. Sectors in which impacts may have an important impact include: fisheries, coastal zones, sea level rise, permafrost thawing, socio-economic impacts, and construction and infrastructure.

## Appalachians

Regional scoping workshop held May 26-29, 1998 in Morgantown, West Virginia. The web site has been established, and workshop organizers are currently working on the workshop report. Some of the main issues in this region include: impacts of global change on forests, air quality, energy, agriculture, water resources, commerce, and human health and communities.

## California

Regional scoping workshop held March 9-11, 1998 in Santa Barbara, California. Sectors of principal importance in the region include water resources, coastal impacts, urban centers, and agriculture. The principal investigators would like to hold a meeting on each of these sectors to further explore impacts. They are also interested in researching the following topics in the assessment: integrated regional impacts modeling, ecological systems impacts assessment, communities and infrastructure impacts assessment, and business and economic impacts. Southern

## Atlantic Coast/Caribbean

Regional scoping workshop held from July 21-23, 1998 in Miami, Florida. A web site is available. The principal investigators are expecting a minimum of 75 participants from Southern Florida, coastal Georgia, Puerto Rico, the U.S. Virgin Islands, and coastal South and North Carolina. They are working to attract a diversity of stakeholders from many industries and communities. Key issues include sea level rise and coastal impacts, water resources, climate variability and extreme weather events, impacts on marine ecosystems, human health impacts and climate change and islands.

## Eastern Midwest

Regional scoping workshop was held June 29-30, 1998 in Indianapolis, Indiana. A web site is available. Agriculture, forestry, energy and manufacturing and construction are some of the most important industries in the region and were the focus of the workshop breakout groups.

## Great Lakes

Regional scoping workshop held May 5-7, 1998 in Ann Arbor, Michigan. Issues addressed in workshop breakout groups included: agriculture, water resources, land and water ecology, human health, governance and education, economy, commerce, and infrastructure. Details of the workshop may be viewed via the workshop web site.

## Great Plains-Central

Building upon the regional scoping workshop held May 27-29, 1997, the Central Great Plains principal regional investigators have submitted an assessment work plan which details a quantitative assessment covering all of the Great Plains and Great Basin regions. They have also established an Advisory Executive Committee and plan to establish a regional assessment synthesis team. The principal regional investigators are also supporting the NIGEC assessment efforts that will build information bases for the Great Plains, Midwest, Southeast, and south central regions. Main issues in the region which the assessment will focus on include water resources, agricultural land use and adaptation, ranching and rangeland production systems, and conservation.

## Great Plains-Northern

Regional scoping workshop was held November 5-7, 1997 in Grand Forks, North Dakota. The final report is now available on the web site. Main issues in the region include agriculture, water resources, extreme weather events such as the flooding of the Red River in 1997, and the impact of climate change on protected lands.

## Great Plains-Southern

Regional scoping workshop will be held September 14-16, 1998 in Austin, Texas (date is tentative). A proposed agenda has been submitted and distributed to the USDA Global Change Task Force mem-

bers for consideration and a steering team has been established. The workshop will focus strongly on agriculture.

## Gulf Coast

Regional scoping workshop held February 25-27, 1998 in Baton Rouge, Louisiana. A web site is available. The principal regional investigators are in the early stages of planning the assessment which will be based at Southern University. Main issues in the region include sea level rise and wetlands, fisheries, ecosystems, human health, socio-economic impacts, and agriculture.

## Hawaii and Pacific Islands

Regional scoping workshop held March 3-6, 1998 in Honolulu, Hawaii. A web site is available. Representatives from Guam, the Samoan Islands, the Fiji Islands, and the Micronesia Islands attended as well as those in the Hawaiian Islands. Breakout groups focused on fisheries, tourism and recreation, biodiversity, water resources, infrastructure, agriculture, and public health and safety.

## Metropolitan East Coast

Regional scoping meeting held March 23-24, 1998 in New York City. This workshop was unique in focusing on an urban perspective. Breakout groups included resource demands, infrastructure, ecosystem services effects, and institutions, policies and regulations.

## Middle-Atlantic

Regional scoping workshop held September 9-11, 1998 in State College, Pennsylvania. The workshop report is available on the web site. An Assessment Steering Committee meeting was held June 8-9, 1998, and the assessment team has begun a quantitative assessment which will include some original research. Important issues in the region include: impacts on water resources, impacts on ecosystems, and socio-economic implications and responses.

## New England

Regional scoping workshop held September 3-5, 1997. The final report is available on the web site, and the principal investigators are developing a newsletter. The regional participants are also planning a series of follow-on seminars on forestry, the ski industry, and insurance. Main issues of focus in the

# Regional Notes

region include: forests and biodiversity, tourism and recreation, water quality and fisheries, and health and air quality.

## Pacific Northwest

Regional scoping workshop held July 14-16, 1997, and the final report is available on the web site. The principal regional investigators are now formulating an assessment plan and will be using a range of climate scenarios. Key issues in the region include water quality and supply, coasts, forests, and marine ecosystems.

## Rocky Mountains and Great Basin

Regional scoping workshop held February 16-18, 1998. They plan to complete the proceedings from the workshop within the next two months. Principal regional investigators are currently forming the Regional Assessment Team. Important issues in the region include water, agriculture, energy, and recreation and tourism.

## Southeast

Regional scoping workshop held June 25-

27, 1997, and the workshop report is available on the web site. Three sectors have been chosen for in-depth assessment in this region: agriculture, forests and forest products, and the economic consequences of coastal hazards such as storm surges, excessive flooding, and landfall hurricanes. Along with the these three sectors, principal regional investigators will also focus on two cross-cutting sectors: the relationships between changing climate factors and environmental quality.

## Southwest-Colorado River Basin

Regional scoping workshop held September 3-5, 1997. The final report for this workshop can be accessed on the web page. The principal regional investigators are in the process of contacting candidate assessment team members and steering committee members. Key sectors in this region include the impacts on water resources, natural ecosystems, ranching, agriculture, environmental health, disaster management, transboundary issues, and Native American lands as well as education.

## Southwest-Rio Grande River Basin

Regional scoping workshop held March 2-4, 1998. A web site is available. The principal investigators in this region are in the process of submitting a proposal to NASA to complete its assessment activities, and plan to coordinate with the other regions in its area. Main impacts issues include: agriculture, water resources, drought preparedness and management, environmental education, regional and urban air quality, and human health.

## Native Peoples/Native Homelands

The Workshop has been tentatively scheduled for October 29-November 1, 1998 in Albuquerque, New Mexico. Workshop coordinators are working to include a diversity of Native American stakeholders from throughout the U.S.

# Sector Notes

## Agriculture

The scope of this sector includes how the rate and volume of food production will be affected through increased or decreased rainfall, through changes in pest extent, as well as the socioeconomic effects of agriculture impacts. The U.S. Department of Agriculture will sponsor this sector, which will focus on the sustainability of U.S. agriculture, while also recognizing impacts on local producers.

## Coastal Areas/Marine Resources

The coastal sector will assess a wide range of impacts of climate variability on the shorelines of the United States including the impacts of sea level rise, salt water intrusion, and coastal erosion. These impacts will be considered in relation to the heavy and rapid development and

population influxes into coastal areas. NOAA is sponsoring this sectoral study.

## Forests

The forest sector covers public and private forested lands and will focus on forest ecosystems as well as ecosystem goods and services. The U. S. Forest Service is sponsoring this sectoral study.

## Health

Human health may be affected both directly and indirectly by climate variability. EPA and NIH will be sponsoring this sectoral study. The assessment will be quantitative with some original research and is expected to begin in early July. Formal letters of invitation have been sent to perspective sectoral assessment team members. The team is tentatively planning a meeting for November to solicit stakeholder input.

## Water

Water is a cross-cutting sector which affects both ecosystem and human health. DOI is serving as the agency sponsor. Sectoral assessment members have been identified and formal letters of invitation have been sent to members. An implementation plan has been drafted. The first meeting of the team was held July 2 in Reston, Virginia. The team will hold a workshop September 14-16 in West Palm Beach, Florida. Representatives from the regions will be asked to participate as well as team members from other sectors.

**For contact information and regional and sector web sites, see**  
<http://www.nacc.usgcrp.gov>

U. S. Global Change Research Program  
National Assessment Coordination Office  
400 Virginia Avenue, SW, Suite 750  
Washington, DC 20024

## **Newsletter of the U.S. National Assessment of the Potential Consequences of Climate Variability and Change**

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Melissa Taylor  
U.S. Global Change Research Program  
400 Virginia Avenue, SW, Suite 750  
Washington, DC 20024  
Telephone (202) 314-2239  
FAX (202) 488-8681  
Email [mtaylor@usgcrp.gov](mailto:mtaylor@usgcrp.gov)