

The National Climate Assessment: An Opportunity for Education?

CLEAN Teleconference | September 17, 2013



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US Global Change Research Program

Global Change Research Act (1990):

“To provide for development and coordination of a comprehensive and integrated United States research program which will assist the Nation and the world to **understand, assess, predict, and respond** to human-induced and natural processes of global change.”



13 Federal Departments & Agencies +
Executive Office of the President



United States
Global Change
Research Program

More information at
<http://www.globalchange.gov>

US Global Change Research Program Strategic Plan Goals

Advance Science: *Study Climate and Global Change*

Advance scientific knowledge of the integrated natural and human components of the Earth system

Inform Decisions: *Prepare the Nation for Change*

Provide the scientific basis to inform and enable timely decisions on adaptation and mitigation

Conduct Sustained Assessments: *Assess the US Climate*

Build sustained assessment capacity that improves the Nation's ability to understand, anticipate, and respond to global change impacts and vulnerabilities

Communicate & Educate: *Make Our Science Accessible*

Advance communications and education to broaden public understanding of global change and develop the scientific workforce of the future



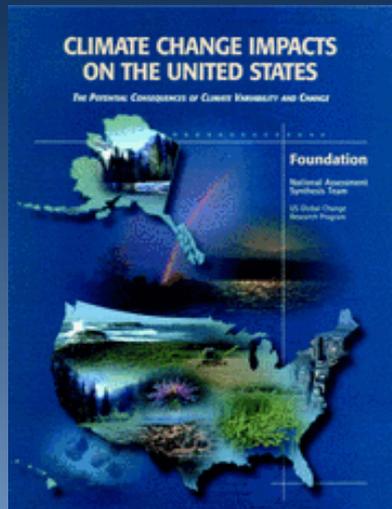
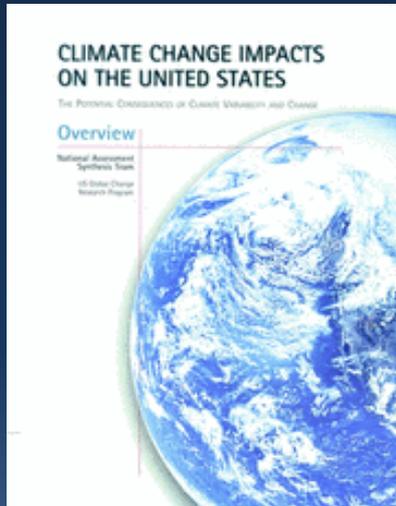
National Climate Assessment: GCRA (1990), Section 106

...not less frequently than every 4 years, the Council... shall prepare... an assessment which –

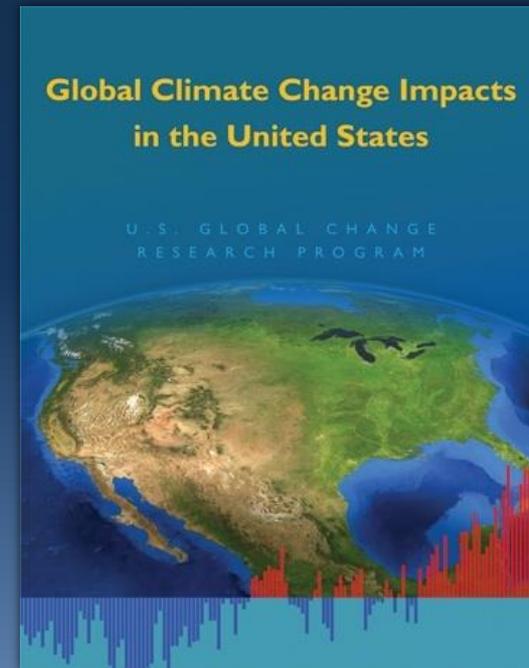
- integrates, evaluates, and interprets the findings of the Program (USGCRP) and discusses the scientific uncertainties associated with such findings;
- analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and
- analyzes current trends in global change, both human- induced and natural, and projects major trends for the subsequent 25 to 100 years.

Previous National Climate Assessments

Climate Change Impacts on the United States (2000)



Climate Change Impacts in the United States (2009)



<http://nca2009.globalchange.gov/>

The “New” National Climate Assessment

Goal

- Enhance the ability of the United States to **anticipate, mitigate, and adapt** to changes in the global environment.

Vision

- Advance an **inclusive, broad-based, and sustained process** for assessing and communicating scientific knowledge of the impacts, risks, and vulnerabilities associated with a changing global climate in support of decision-making across the United States.



Goals for the NCA

- A **sustained process** for informing an integrated research program
- New approaches to development and use of **scenarios at multiple scales**
- **Evaluation** of the implications of alternative **adaptation and mitigation options**
- **Community building** within regions and sectors that can lead to enhanced resilience

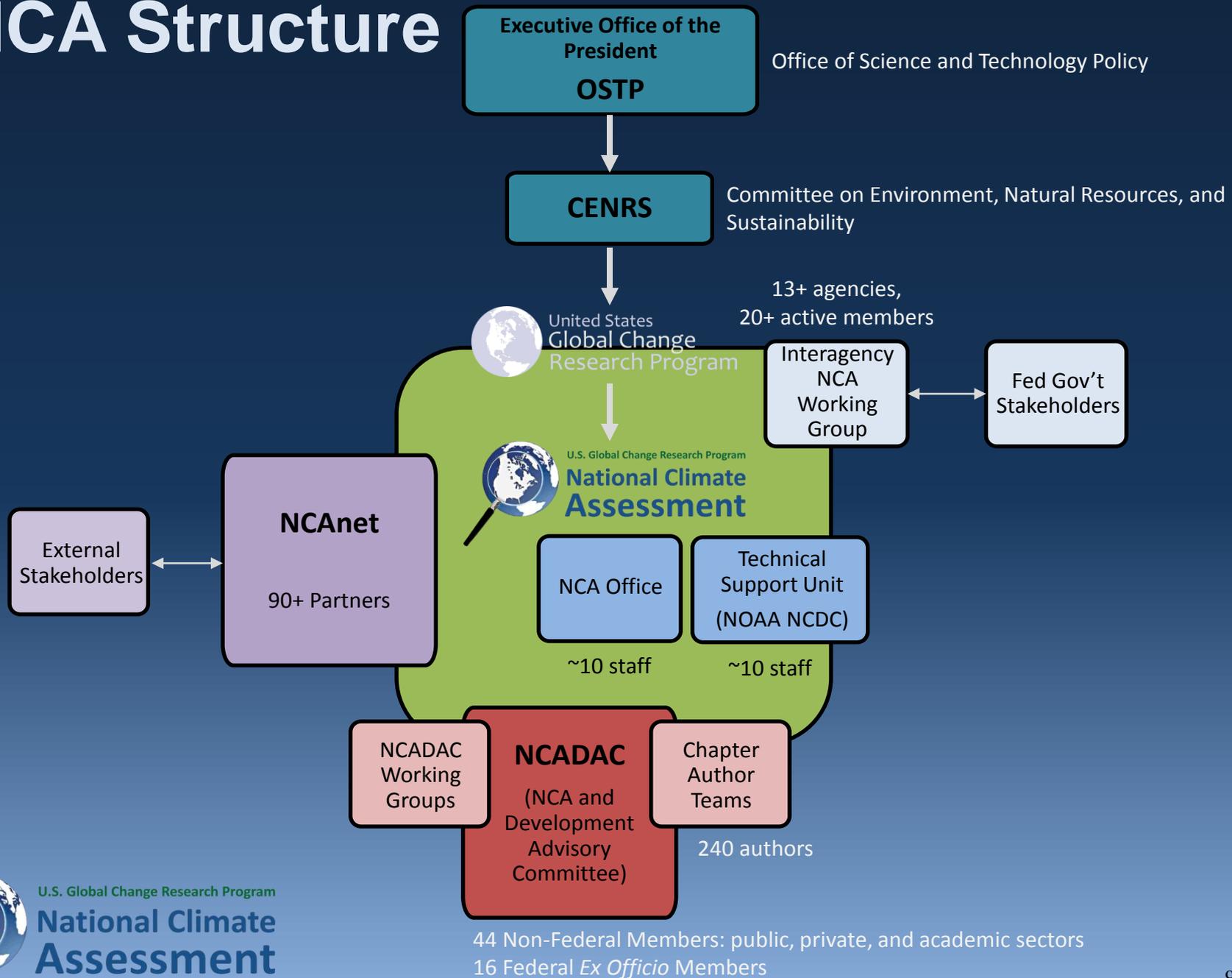


Outcomes of the NCA

- **Ongoing, relevant, highly credible analysis** of scientific understanding of climate change impacts, risk, and vulnerability
- Enhanced timely **access to Assessment-related data** from multiple sources useful for decision making
- **Systematic evaluation** of progress towards reducing risk, vulnerability, and impacts
- **National indicators** of change and the capacity to respond

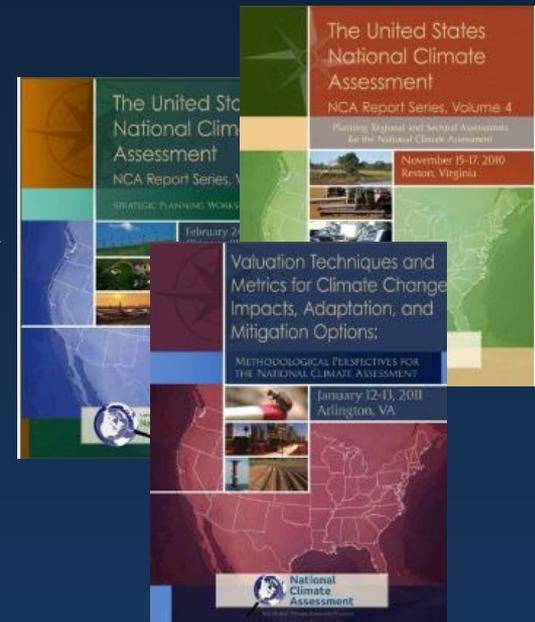


NCA Structure



Process to Date

- **Process-focused workshops** established consistent methodologies, models, scenarios, and approaches
- Regional and sectoral workshops convened by agency-sponsored technical input teams
- Listening sessions and symposia at professional society meetings focusing on ecosystems, water, meteorology, soil science, applied anthropology, resource management, and more

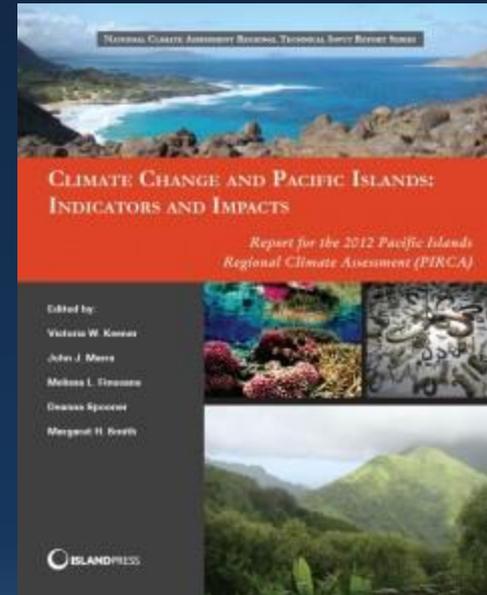


On www.globalchange.gov:

- Strategic Planning
- Knowledge [Data / Information] Management
- Conducting Regional & Sectoral Assessments
- Building a System of Indicators: Ecological, Physical, Societal
- Modeling & Downscaling
- Scenarios
- Valuation Techniques
- Vulnerability Assessments
- Regional & sectoral workshop reports
- Listening session summaries

Process to Date

- First “request for information”: 250+ technical inputs from 100+ individuals and teams, including:
 - New regional climate histories and projections for each region
 - New sea level rise scenarios
 - **In-depth foundational assessments** for each region and most sectors
- Public comment on draft report January 14 – April 12, 2013
- Author teams and NCADAC are revising report in response to comments



Island Press is publishing revised versions of most of the regional technical inputs:

<http://www.cakex.org/NCAreports>

Federal agency-sponsored reports:

www.globalchange.gov

Regional climatologies, projections, and scenarios:

<http://scenarios.globalchange.gov>

Third NCA Report Process

Federal agencies,
universities, NCAnet
members, and others

January 14 –
April 12, 2013



Draft Third National Climate Assessment

<http://ncadac.globalchange.gov>



The screenshot shows the homepage of the National Climate Assessment Development Advisory Committee (NCADAC). At the top left is the logo for globalchange.gov, U.S. Global Change Research Program. To the right is a row of thirteen agency logos, with the tagline "Thirteen Agencies, One Vision: Empower the Nation with Global Change Science". Below the logos is the text "National Climate Assessment Development Advisory Committee". A dark blue navigation bar contains a "Home" button. The main content area features a headline: "Federal Advisory Committee Draft Climate Assessment Report Released for Public Review". Below the headline are three paragraphs of text providing details about the committee's role, its members, and the report's development process.

globalchange.gov
U.S. Global Change Research Program

Thirteen Agencies, One Vision: Empower the Nation with Global Change Science

National Climate Assessment Development Advisory Committee

[Home](#)

Federal Advisory Committee Draft Climate Assessment Report Released for Public Review

A 60-person Federal Advisory Committee (The "National Climate Assessment and Development Advisory Committee" or NCADAC) has overseen the development of this draft climate report.

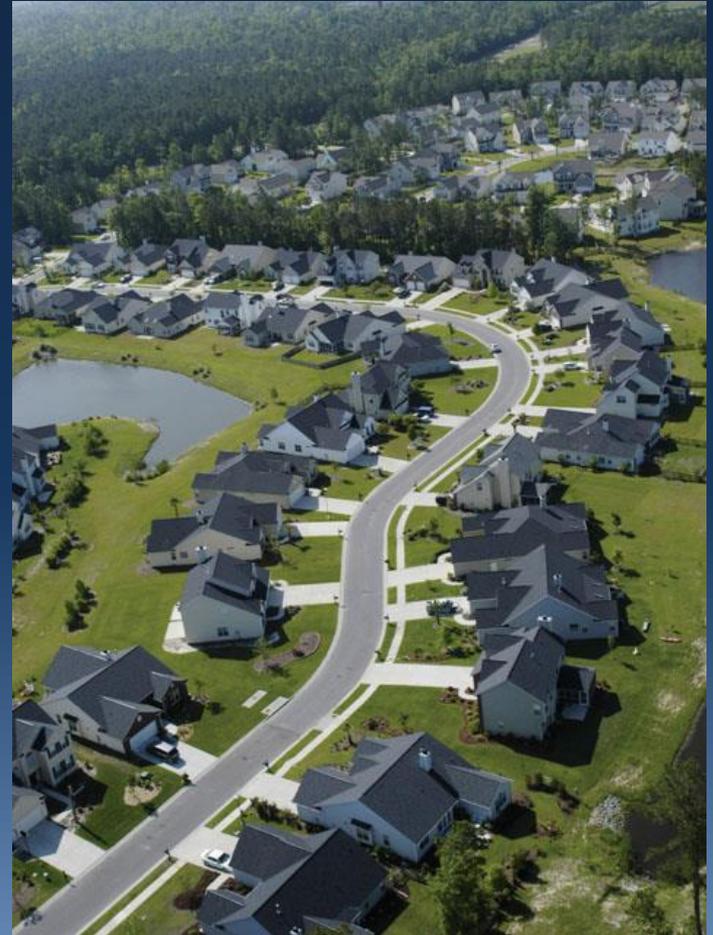
The NCADAC, whose members are available here (and in the report), was established under the Department of Commerce in December 2010 and is supported through the National Oceanic and Atmospheric Administration (NOAA). It is a federal advisory committee established as per the Federal Advisory Committee Act of 1972. The Committee serves to oversee the activities of the National Climate Assessment. Its members are diverse in background, expertise, geography and sector of employment. A formal record of the committee can be found at the NOAA NCADAC website.

The NCADAC has engaged more than 240 authors in the creation of the report. The authors are acknowledged at the beginning of the chapters they co-authored.

Following extensive review by the National Academies of Sciences and by the public, this report will be revised by the NCADAC and, after additional review, will then be submitted to the Federal Government for consideration in the Third National Climate Assessment (NCA) Report. For more information on the NCA process and background, previous assessments and other NCA information, please explore the NCA web-pages. The NCA is being conducted under the auspices of the Global Change Research Act of 1990 and is being organized and administered by the Global Change Research Program.

Outline for Third NCA Report

- Letter to the American People
- Executive Summary: Report Findings
- Introduction
- Our Changing Climate
- Sectors & Sectoral Cross-cuts
- Regions & Biogeographical Cross-cuts
- Responses
 - Decision Support
 - Mitigation
 - Adaptation
- Agenda for Climate Change Science
- The NCA Long-term Process
- Appendices
 - Commonly Asked Questions
 - Expanded Climate Science Info



U.S. Global Change Research Program

**National Climate
Assessment**

Sectors

- Water Resources
- Energy Supply and Use
- Transportation
- Agriculture
- Forestry
- Ecosystems and Biodiversity
- Human Health



Sectoral Cross-Cuts



- Water, Energy, and Land Use
- Urban Systems, Infrastructure, and Vulnerability
- Impacts of Climate Change on Tribal, Indigenous, and Native Lands and Resources
- Land Use and Land Cover Change
- Rural Communities
- Biogeochemical Cycles



Regions & Biogeographical Cross-Cuts

Oceans and
Marine
Resources



Coasts,
Development,
and Ecosystems



U.S. Global Change Research Program
**National Climate
Assessment**

<http://ncadac.globalchange.gov>

- Download the entire draft report or individual chapters
- 11 overarching report findings
- Each chapter begins with \approx 3-5 key messages
 - At the end of each chapter, “traceable accounts” provide additional detail about the author teams’ process, supporting information, and confidence
- Chapters discuss climate change impacts on the region or sector within a risk-based framework
- Chapters on responses (decision support, adaptation, mitigation) discuss examples, frameworks, and progress on planning and implementing responses to climate change

Draft NCA Report Findings

- Global climate is changing, and this is apparent across the U.S. in a wide range of observations. The climate change of the past 50 years is due primarily to human activities, predominantly the burning of fossil fuels.
- Some extreme weather and climate events have increased in recent decades, and there is new and stronger evidence that many of these increases are related to human activities.
- Human-induced climate change is projected to continue and accelerate significantly if emissions of heat-trapping gases continue to increase.



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**National Climate
Assessment**

Draft NCA Report Findings

Ten Indicators of a Warming World

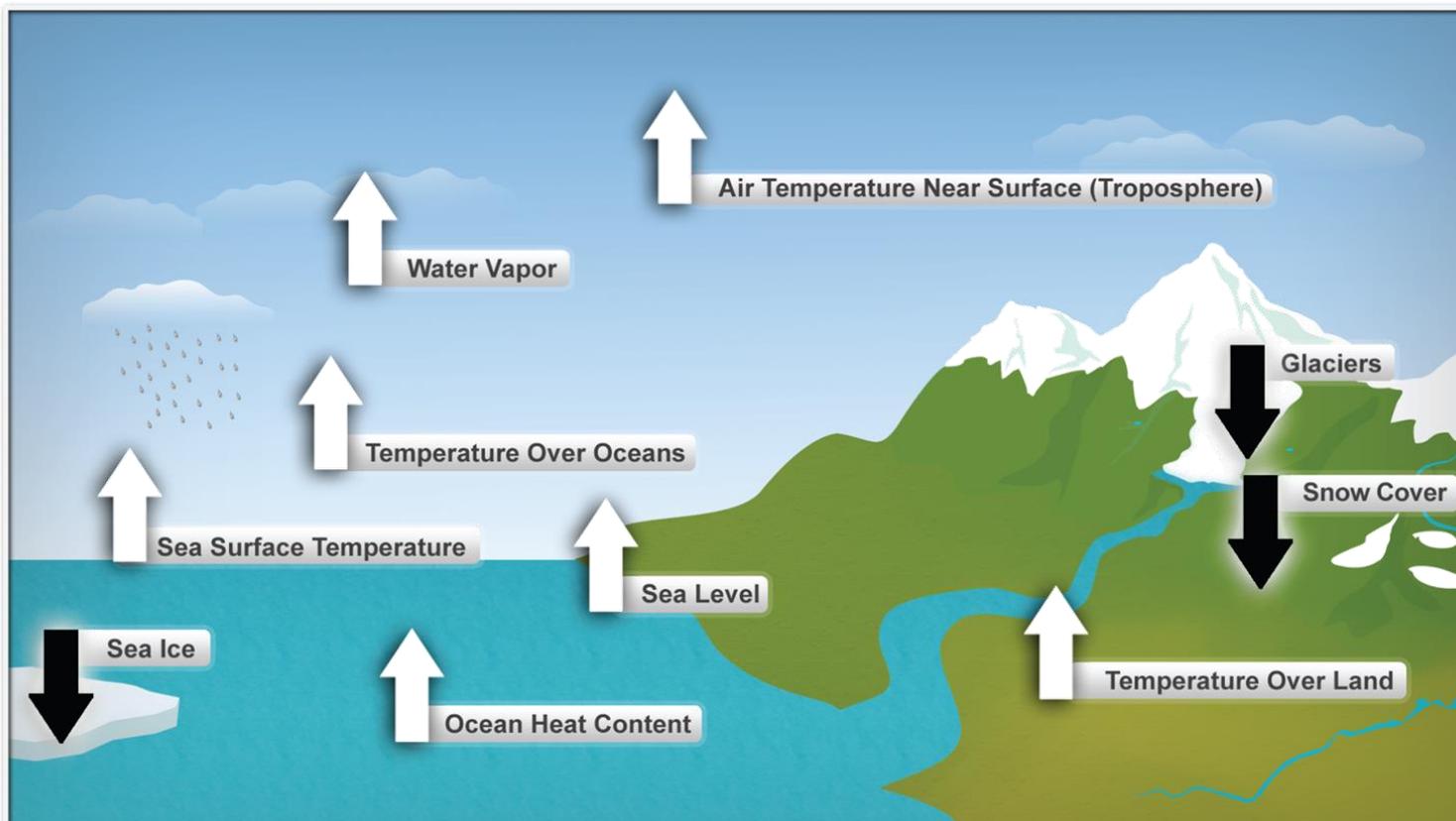


Figure 2.1

Draft NCA Report Findings

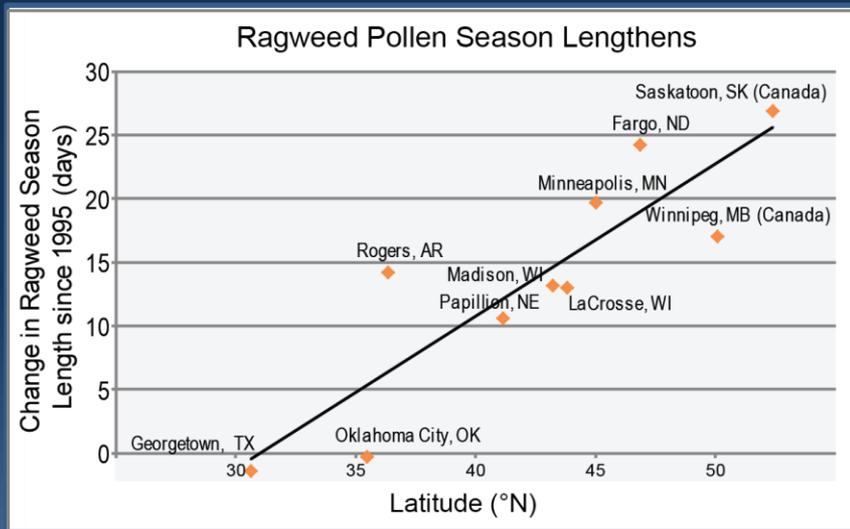


Figure 9.2

- Impacts related to climate change are already evident in many sectors and are expected to become increasingly challenging across the nation throughout this century and beyond.
- Climate change threatens human health and well-being in many ways, including impacts from increased extreme weather events, wildfire, decreased air quality, diseases transmitted by insects, food, and water, and threats to mental health.



Draft NCA Report Findings

- Infrastructure across the U.S. is being adversely affected by phenomena associated with climate change, including sea level rise, storm surge, heavy downpours, and extreme heat.
- Reliability of water supplies is being reduced by climate change in a variety of ways that affect ecosystems and livelihoods in many regions, particularly the Southwest, the Great Plains, the Southeast, and the islands of the Caribbean and the Pacific, including the state of Hawai`i.

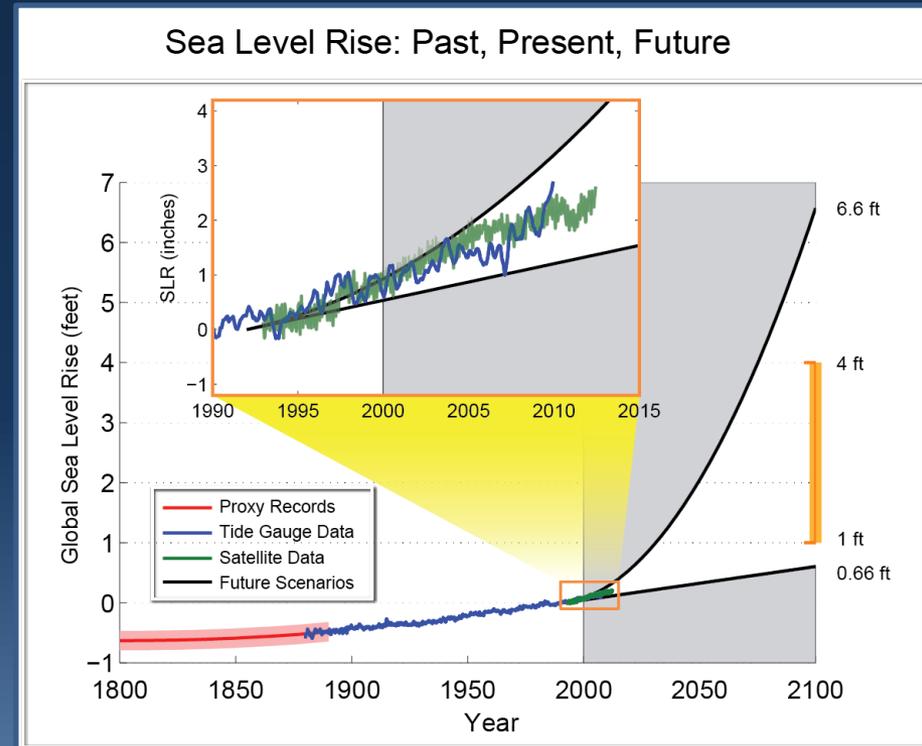


Figure 2.26



Draft NCA Report Findings

- Adverse impacts to crops and livestock over the next 100 years are expected. Over the next 25 years or so, the agriculture sector is projected to be relatively resilient, even though there will be increasing disruptions from extreme heat, drought, and heavy downpours. U.S. food security and farm incomes will also depend on how agricultural systems adapt to climate changes in other regions of the world.
- Natural ecosystems are being directly affected by climate change, including changes in biodiversity and location of species. As a result, the capacity of ecosystems to moderate the consequences of disturbances such as droughts, floods, and severe storms is being diminished.

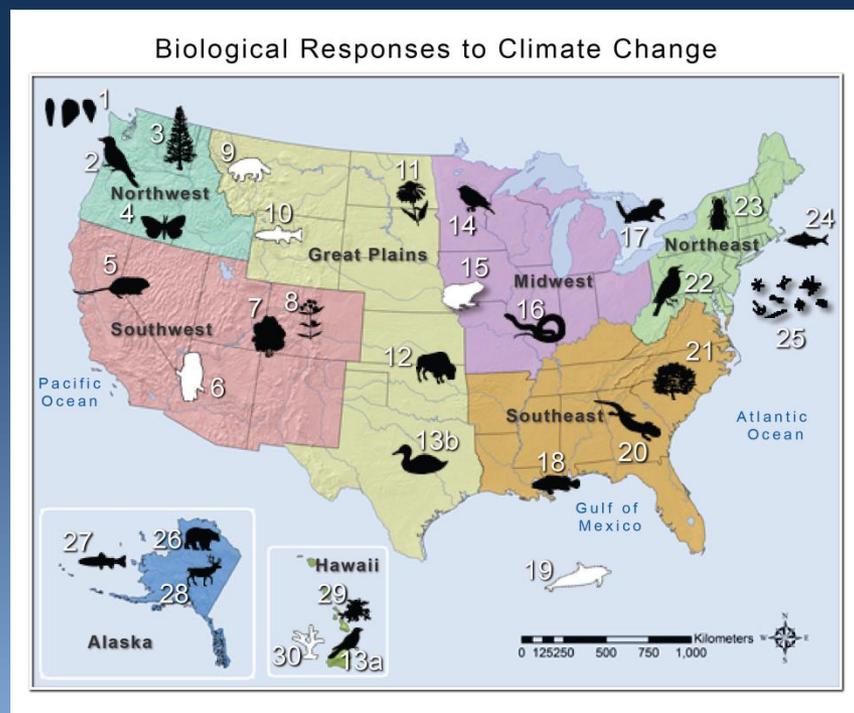


Figure 8.4

Draft NCA Report Findings

- Life in the oceans is changing as ocean waters become warmer and more acidic.
- Planning for adaptation (to address and prepare for impacts) and mitigation (to reduce emissions) activities is increasing, but progress with implementation is limited.

Adaptation Possibilities for Coastal Infrastructure



Figure 25.5

Ecosystem Restoration



Figure 25.6



Example of Sectoral Key Messages: Urban

- Climate change and its impacts threaten the well-being of urban residents in all regions of the US. Essential local and regional infrastructure systems such as water, energy supply, and transportation will increasingly be compromised by interrelated climate change impacts.
- In urban setting, climate-related disruptions of services in one infrastructure system will almost always result in disruptions in one or more other infrastructure systems.
- Climate vulnerability and adaptive capacity of urban residents and communities are influenced by pronounced social inequalities that reflect age, ethnicity, gender, income, health, and (dis)ability differences.
- City government agencies and organizations have started urban adaptation efforts that focus on infrastructure systems and public health. However, these efforts face many barriers to implementing and incorporating wider governmental, general public, and private efforts.

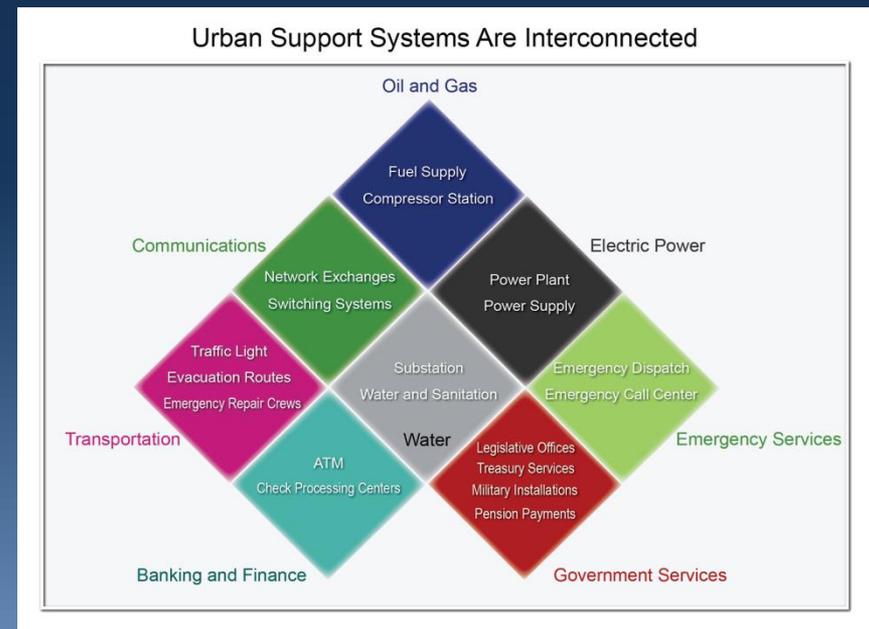


Figure 11.2

Example of Regional Key Messages: Midwest

- In the next few decades, longer growing seasons and rising carbon dioxide levels will increase yields of some crops, though those benefits will be increasingly offset by the occurrence of extreme event such as heat waves, droughts, and floods. In the long term, combined stresses associated with climate change are expected to decrease agricultural productivity, especially without significant advances in genetic and agronomic technology.
- The composition of the region's forests is expected to change as rising temperatures drive habitats for many tree species northward. The region's role as a net absorber of carbon is at risk from disruptions to forest ecosystems, in part due to climate change.

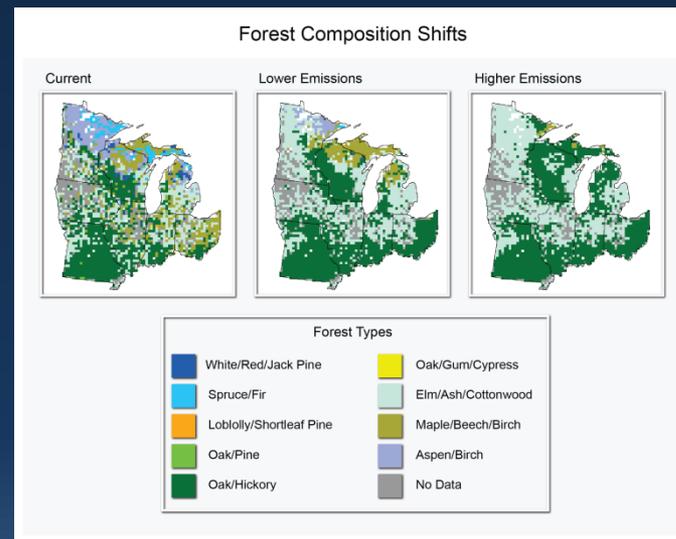


Figure 18.4

Example of Regional Key Messages: Midwest, cont.

- Increased heat wave intensity and frequency, degraded air quality, and reduced water quality will increase public health risks.
- The Midwest has a highly energy-intensive economy with per capita emissions of greenhouse gases more than 20% higher than the national average. The region also has a large, and increasingly utilized, potential to reduce emissions that cause climate change.
- Extreme rainfall events and flooding have increased during the last century, and these trends are expected to continue, causing erosion, declining water quality, and negative impacts on transportation, agriculture, human health, and infrastructure.
- Climate change will exacerbate a range of risks to the Great Lakes region, including changes in the range and distribution of important commercial and recreational fish species, increased invasive species, declining beach health, and harmful algal blooms of algae. Declines in ice cover will continue to lengthen the commercial navigation season.



U.S. Global Change Research Program

**National Climate
Assessment**

Example of Responses Key Messages: Adaptation

- Substantial adaptation planning is occurring in the public and private sectors and at all levels of government, however, few measures have been implemented and those that have appear to be incremental changes.
- Barriers to implementation of adaptation action include lack of funding, policy and legal impediments, and difficulty in anticipating climate-related changes at local scales.
- There is no “one-size fits all” adaptation, but there are similarities in approaches across regions and sectors. Sharing best practices, learning by doing, and iterative and collaborative processes including stakeholder involvement, can help support progress.
- Climate change adaptation actions often fulfill other societal goals, such as sustainable development, disaster risk reduction, or improvements in quality of life, and can therefore be incorporated into existing decision-making processes.
- Vulnerability to climate change is exacerbated by other stresses such as pollution and habitat fragmentation. Adaptation to multiple stresses requires assessment of the composite threats as well as tradeoffs amongst costs, benefits, and risks of available options.
- The effectiveness of climate change adaptation has seldom been evaluated, because actions have only recently been initiated, and comprehensive evaluation metrics do not yet exist.

Table 28.4: Examples of Non-governmental Adaptation Efforts and Services

Types of Adaptation Efforts and Services	Examples of Organizations Providing Services*
Adaptation planning assistance, including creation of guides, tools, and templates	Center for Climate Strategies, ICLEI-Local Governments for Sustainability, International Institute for Sustainable Development, The Nature Conservancy, World Resources Institute, World Wildlife Fund, Natural Resources Defense Council
Networking and best practice exchange	C40 Cities Climate Leadership Group, Adaptation Network, Center for Clean Air Policy, ICLEI-Local Governments for Sustainability, Institute for Sustainable Communities, Urban Sustainability Directors Network, World Business Council for Sustainable Development
Climate information providers	Union of Concerned Scientists, Urban Climate Change Research Network, Stockholm Environment Institute, U.S. Center
Policy, legal, and institutional support	Center for Climate and Energy Solutions (formerly Pew Center on Global Climate Change), Georgetown Climate Center
Aggregation of adaptation-pertinent information	Carbon Disclosure Project, Climate Adaptation Knowledge Exchange, Georgetown Climate Center

*This list contains examples of non-governmental organizations providing the identified services and should not be considered all-inclusive or a validation of actions claimed by the organizations.



U.S. Global Change Research Program

**National Climate
Assessment**

The Third NCA Report will come out in ~ March 2014...

theguardian

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Environment | Climate change

GET INVOLVED

A Student's Guide to the National Climate Assessment
from Wildlife Promise

2/13/2013 // Sara Gassman // [campus ecology](#) | [climate change](#) | [climate science](#) | [National Assessment](#)

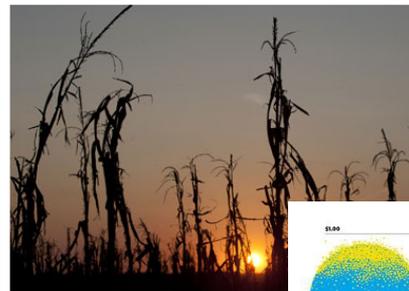
We are currently in the midst of a 90-day comment period for a defining government document, the draft **National Climate Assessment**. The 1,000-page report is available for review and, importantly, to submit comments. Two-hundred-forty authors and sixty advisors from all corners of the scientific community compiled the report, divided into more easily accessible and topic, so you can focus on "Water, Energy and Land Use" or climate impacts in the Great Plains. The Executive Summary lists eleven general themes of the NCA, including the following:

- Human-induced climate change is projected to **continue and accelerate emissions of heat-trapping gases continue to increase.**
- Natural ecosystems are being directly affected by climate change, including **biodiversity and location of species.** As a result, the capacity of ecosystems to absorb disturbances such as droughts, floods and severe storms is being reduced.
- Planning for adaptation (to address and prepare for impacts) and mitigation is increasing, but **progress with implementation is limited.**

Climate change set to make America hotter, drier and more disaster-prone

Draft report from NCA makes clear link between climate and extreme weather as groups urge Obama to take action

Suzanne Goldenberg, US environment correspondent
guardian.co.uk, Friday 11 January 2013 16.26 EST
Jump to comments (581)



The report says steps taken by Obama to reduce global warming are insufficient to prevent the most severe consequences of climate change, says Suzanne Goldenberg for AFP

Future generations of Americans can expect sweltering in temperatures above 100F (38C) into a hotter, drier, and more disaster-prone country.

Washington, D.C., Joins National Call for Climate Change Action

Details Category: Environmental Published on Tuesday, 12 March 2013 13:29 Written by Press Release

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Nation's Capital Urges President to Use Clean Air Act to Cut Carbon Pollution

WASHINGTON—(ENWSPP)—March 12 - In the wake of a federal scientific report showing that climate change is driving up the risk of heat waves and extreme weather, the D.C. Council has passed a resolution calling on President Barack Obama and the Environmental Protection Agency to "move as swiftly as possible to implement and enforce the Clean Air Act to reduce carbon in the atmosphere."



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Welcome to Kaiser Permanente's "Green Resource Center"

FEATURE STORY

Kaiser Permanente Leads Insurers in Addressing Climate Change: Report

March 18, 2013

Kaiser Permanente has taken the lead among health insurers in addressing climate change, according to a new report from the Ceres, a Boston-based non-profit that promotes eco-minded business practices.

In its report, Ceres ranked 184 insurance companies for their climate risk disclosure and climate risk management. Out of those insurance companies surveyed, Kaiser Permanente was the only health insurance company to earn a spot in the report's top 10. "Only one health insurer, Kaiser Permanente, has a strong climate position," the report states.

nt to improve the health of the communities it serves, Kaiser Permanente implemented an aggressive strategy last year to reduce its overall carbon footprint by 20%, compared to its 2008 levels. The strategy includes the organization's current on-site solar and fuel cell energy conservation measures.

ntinue to increase, climate change will cause health effects that will reduce Kaiser Permanente's ability to fulfill its promise of quality, affordable care. Kaiser Permanente's vice president for Employee Safety, Health and Stewardship Officer, "It's clear we need to be prepared and we will increase the demand for health care."

USA TODAY WEEKEND

MAY 31 - JUNE 2, 2013

SUMMER MUSIC PREVIEW

A look at the season's big shows, 1-2D

PLAYERS ready to make a run at baseball history

Major League Baseball's New York Yankees are looking for six players who have a good chance to receive a spot in the record books.

Arvind, 13, is spelling champ

New York's best young student has won the Scripps National Spelling Bee with the correct spelling of "Krochmal".

JOHN GRAB COULMAN: When passion beats facts

Local media feeds us from "being informed" - watch now the information.

WEATHERING THE CHANGE

As the weather gets warmer, pollen is kicked up into the air and can cause respiratory ailments.

Pollen plague

HOW CLIMATE CHANGE IS AFFECTING EVERY BREATH YOU TAKE

BEEF PRICES GETTING MEATIER

Hit record in lead up to Memorial Day

Elizabeta Witek
The Week

MELNOR PARK, ILL. From the roof of the Gottlieb Memorial Hospital in the Chicago suburbs, an 85-year-old retired doctor finds troubling evidence of why so many people are sneezing and itching their eyes.

Joseph Lejko counts the pollen and mold spores that collect on slides inside an air-sucking machine atop the six-story building.

Lejko says he's not the only one who's noticed the change. "I've seen it for years," he says. "I've seen it for years."

Climate change could be partly responsible, says Lejko. "Climate change could be partly responsible," he says. "Climate change could be partly responsible," he says.

...but the media and many organizations are already taking note of the draft report

Products and Outcomes

- Third NCA Report as an interactive PDF (300+ pages) and accompanying printed summary document (80 pages) [≈ March 2014]
 - with links to --
 - First stage of the Global Change Information System (GCIS), which will provide access to the underlying information and analyses used in the NCA Report

Foundation for strong communications products and processes useful to a variety of audiences, including national, regional, state, and local decision makers

- 2 page handouts for regions, sectors, and responses
- Videos, social media, and other shareable materials

Opportunities for Education?

- Translating report findings, key messages, and report content
- Connecting report findings to existing educational standards (e.g., NGSS)
- Creating new opportunities to use report in formal and information educational settings (e.g., reading material for a class, using graphics for lessons or in displays, etc.)
- Early ideas developed for discussion in NCAnet: [NCA affiliate group meeting](#) & [additional presentation](#)
- Professional development



Creating a Sustained Assessment Process



U.S. Global Change Research Program
**National Climate
Assessment**

Sustained Assessment

Why Consider Special Reports and Activities?

- **Deepen understanding** of climate change effects on a particular sector or region
- Investigate **new scientific issues** of concern
- **Build capacity** to conduct more sophisticated, useful, and credible assessments over time
- Better **support decisions** that reduce risk and increase opportunities
- Enable a **full review** for issues of national importance in an efficient and credible way



U.S. Global Change Research Program

**National Climate
Assessment**

Sustained Assessment Special Report

- Approved by NCADAC last week – [available here](#)

- ★ • Critical element 1: Establish mechanisms to support **enduring collaborative partnerships** that sustained assessment activities
- Critical element 2: Enhance and organize the **scientific foundations** for managing the risks and opportunities of climate change
- Critical element 3: Provide **infrastructure** to support a sustained assessment process
- ★ • Critical element 4: Diversify the **resource base** and set priorities

The Sustained National Climate Assessment

Foundational reports, e.g.,
Scenario development • Indicators • Valuation

Improved use-based science, e.g.,
CMIP 5+ • Decision support tools

Other assessment efforts, e.g.,



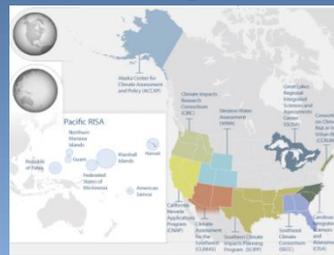
Improved Capacity, e.g.,
Assessment • Adaptation • Services

Special topics reports, e.g.,
Food security • International • Drought

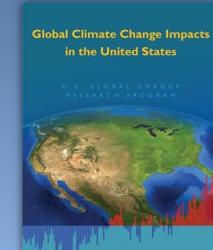
Technical inputs, e.g.,
Regional analyses • Literature reviews • Data & model results

Connecting to and building networks, e.g.,

**Quadrennial National Climate
Assessment Reports**



**NCAnet:
Partners in
Assessment**



DOI Climate Science Centers

Regional Integrated Sciences & Assessments (RISA)

Building Engagement and Communications Capacity

Human Capital

- NCADAC Engagement and Communication Working Group
- NCA Staff
- NCAnet Partners

NCA Vision

Advance an **inclusive, broad-based**, and sustained process for assessing and **communicating scientific knowledge** of the impacts, risks, and vulnerabilities associated with a changing global climate in support of decision-making across the United States.

Engagement Activities

- NCA Website & E-newsletters
- Federal Register Notices
 - Comments on NCA approach and topics
 - Request for Information from the public – 250+ “technical inputs”
- Process, methodology, & topical workshops
- Listening sessions & presentations at meetings & conferences
- Regional “town hall” meetings discuss draft report & building future assessment capacity
- Roll-out & engagement around release of final report



NCAnet: Partners in Assessment

- A network of organizations that extend the NCA process and products to their members and stakeholders
- Build long-term capacity to conduct and use assessments
- Cultivate partnerships with organizations that will be a part of the sustained assessment process
- Organized access to the NCA process and products
- Create and sustain relationships with other organizations interested in climate change
- Share ideas, wisdom, and best practices within and across disciplines
- Collaborate on products and activities that “translate” NCA for a variety of audiences



NCAnet: Partners in Assessment

90+ partner organizations

- Professional societies
- Academic institutions and consortia
- Non-governmental organizations
- Local and state government departments
- Private sector

Online at

<http://ncanet.usgcrp.gov>

- List of partners' NCA-related activities
- Monthly conversations among existing partners
- “Affinity groups” model for collaboration on activities
- Toolkit of materials related to USGCRP and the NCA



NCAnet: Education Affinity Group

- Led by Mark McCaffrey & Minda Berbeco at NCSE
- ~ 20 members representing NGOs, universities, and government
- Meet ~ monthly (next meeting: September 28 @ 2 pm ET)
- <http://ncanet.usgcrp.gov/partners/affinity-groups/education>
- Discuss education ideas, tactics, and materials that support the use of the National Climate Assessment and its related science findings in broadly defined education settings
- Help address gaps and deficiencies in the NCA relative to education and work closely with other affinity groups
- Report back to the broader NCAnet group progress on education-related activities and coordinate with other non-NCAnet education-related efforts

Opportunities for Education?

- Sustained Assessment Special Report suggests a special report on “An assessment of American attitudes, effective communication and education regarding climate change”
- How to include education in future synthesis reports?
- What role should education play in designing future products of the NCA?

Thank you!

For more information:

<http://assessment.globalchange.gov>

- or -

Emily Therese Cloyd, NCA Public Participation and Engagement Coordinator

ecloyd@usgcrp.gov



Example of Responses Key Messages: Decision Support

- Creating well-structured, transparent, and collaborative decision processes involving researchers and stakeholders is as important to effective decision-making as having good scientific information and tools. An effective process will better enable decision-makers to apply complex information to decisions, consider uncertainties associated with climate variability and change, assess the wide range of possible human responses, and engage institutions and individuals who are potentially affected.
- Many decision frameworks and tools are available to support and improve decision-making on climate change adaptation and ways to reduce future climate change.
- Steps to improve collaborative decision processes could include training more “science translators” to help bridge science and decision-making; integrating development of decision support tools into fundamental scientific research; improving reward structures and institutional recognition for those who work at the boundary of science and decision-making; increasing support through the USGCRP for research to develop decision support tools; and incorporating assessment of decision support resources for sectors and regions into the ongoing National Climate Assessment (NCA) process.

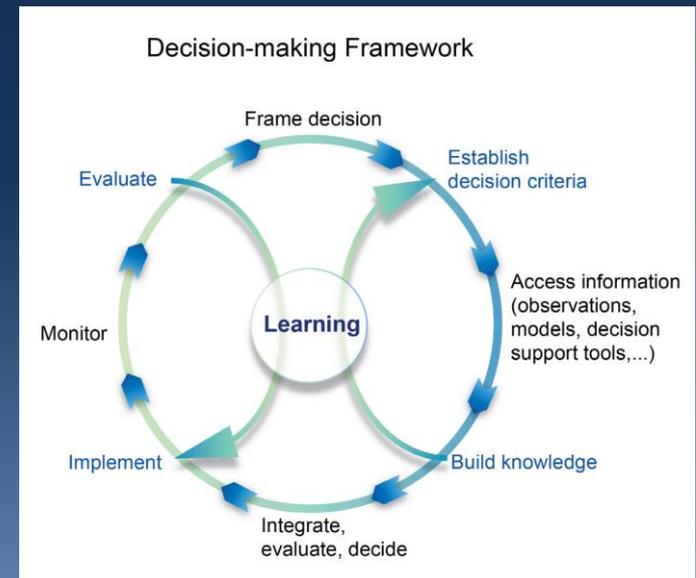


Figure 26.1



Example of Responses Key Messages: Mitigation

- There are long time lags between actions taken to reduce carbon dioxide emissions and their effects on its atmospheric concentration. Mitigation efforts that only *stabilize* global emissions will therefore not reduce atmospheric concentrations of carbon dioxide, but will only limit their rate of increase.
- To meet the rapid emissions reduction (B1) scenario used in this assessment, global mitigation actions would, within the next 25 years, need to limit global greenhouse gas emissions to a peak of around 44 billion tons of carbon dioxide per year. In 2011, global emissions were around 37 billion tons, and have been rising about 0.9 billion tons per year for the past decade. The world is therefore on track to exceed this level within a few years.
- Over recent decades, the U.S. economy has emitted less carbon dioxide per dollar of gross domestic product (GDP) for many reasons. However, U.S. population and economic growth have outweighed these trends, and in the absence of additional public policies greenhouse gas emissions are expected to continue to rise.
- Carbon storage in land ecosystems, especially forests, has offset around 13% of U.S. fossil fuel emissions of greenhouse gases over the past several decades, but this carbon “sink” is projected to become smaller as forests age.
- Even absent a comprehensive national greenhouse gas policy, both voluntary activities and a variety of policies and means at federal, state, and local levels are currently in place that lower emissions. While these efforts represent significant steps towards reducing greenhouse gases, and often result in additional co-benefits, they are not close to sufficient to reduce total U.S. emissions to a level consistent with the B1 scenario analyzed in this assessment.

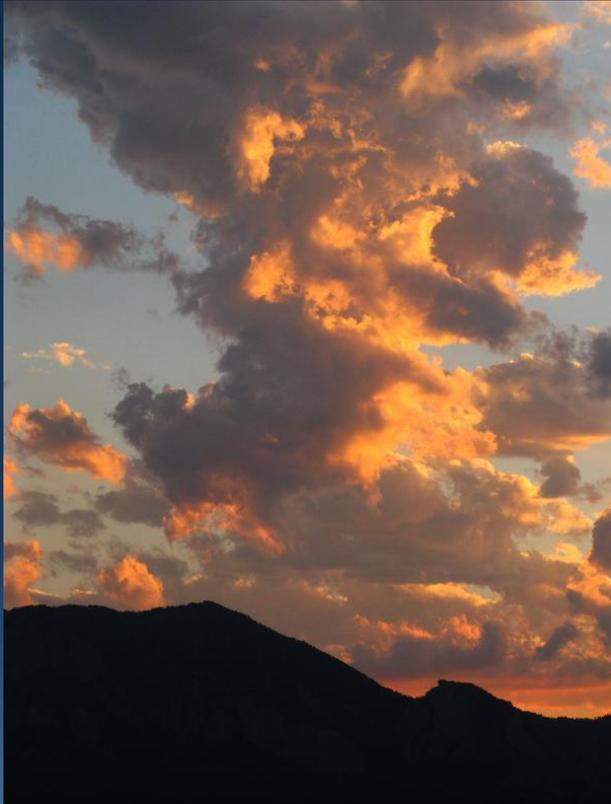
Technical Inputs



Examples: [Climate Adaptation Knowledge Exchange](#), [The Future of Research on Climate Change Impacts on Water](#)

- Literature reviews, discussion papers, and other review papers
 - Synthesize recent work in relevant field(s)
 - Consider assessment methods
 - Highlight important questions for future study
- Case studies of a particular community
 - Climate change vulnerabilities or impacts
 - Planning for and responses to climate change
- Data, modeling results, interpretation, and topical reports
 - Analysis, synthesis, and interpretation
 - Metadata and quality assurance information

Assessment Capacities



- Meetings, workshops, and other dialogues
- Supporting indicator systems
 - Identifying / maintaining key observation & monitoring systems
 - Integrating across data sets to create indicators
- Stakeholder analyses
 - Knowledge and attitudes
 - Communication pathways
 - Network analyses
- Communicating with stakeholders
 - Outreach and educational materials
 - Evaluating effectiveness and use

Examples: Climate Conversations ([Charleston](#), [Omaha](#), [Milwaukee](#), and [Las Vegas](#)), [Listening Session on Communication Strategies](#), Health Sector Workshops ([Southeast](#) and [Northwest](#)), Publication of Technical Input Reports



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