ORD Climate Research Roadmap

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EPA Science Advisory Board
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Overview

- Problem Statement
- Partner-Identified Research Needs
- Science Challenges
- Summary of Current Research
- Coordination and Integration
- Interactions with Partners and Stakeholders
- Relationships to StRAPs

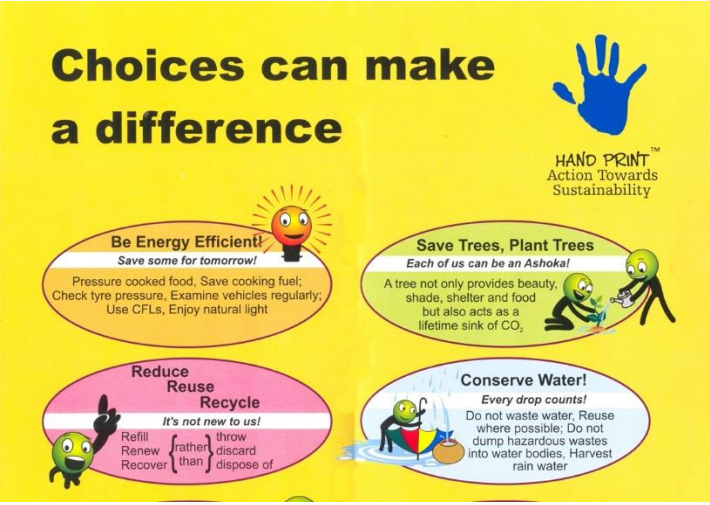
Input from across EPA

- ORD
  - Air, Climate, and Energy
  - Chemical Safety and Sustainability
  - Homeland Security Research
  - Human Health Risk Assessment
  - Safe and Sustainable Water Research
  - Sustainable and Health Communities
  - IOAA
- OAR and Regions
  - OAP
  - OAQPS
  - ORIA
  - OTAQ
- OW and Regions
  - OW Climate Coordinator (IOAA/OW)
- OSWER
- OP
- OCSPP

Problem Statement and Scope

Scientific and technical information needed by EPA to:

- better understand the impacts of climate change
- inform governmental bodies, communities and individuals to prepare for, adapt to, and mitigate those impacts



The scope of ORD's climate research focuses on *providing the information needed by our EPA partners to carry out their programmatic missions as* aligned with EPA Strategic Goals and Administrator's Priorities

Climate Change and EPA's Strategic Goals

- Climate change is a key focus of Goal 1: Addressing Climate Change and Improving Air Quality
- Climate change also impacts other EPA Strategic Goals (Protecting America's Waters, Advancing Sustainable Development)
- Several cross-Agency priorities are also directly relevant to climate change: Sustainable Future; Difference in Communities; and State, Tribal, Local, and International Partnerships

Partner-Identified Research Needs (1)

- Water Quality
  - Climate-driven demands on water treatment systems
  - Climate impacts on watersheds
  - Impacts of climate change on harmful algal blooms
  - Climate-driven changes in ocean and coastal environments

- Air Quality
  - Emissions and impacts of short-lived climate forcers
  - Impacts of climate change on stratospheric ozone
  - Ecosystem vulnerability via deposition
  - Impacts of wildfires

Partner-Identified Research Needs (2)

- Ecosystems and land
  - Impacts of extreme weather, flooding, and sea level rise on potential releases at contaminated sites, debris disposal, and emergency response effectiveness
  - Climate-driven impacts on green infrastructure and brownfields

- Human Health
  - Advanced mechanical ventilation in residential and commercial buildings
  - Quantification of incremental climate impacts on human health

Partner-Identified Research Needs (3)

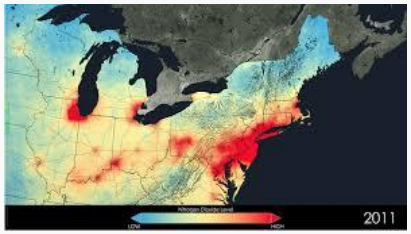
- Mitigation
  - Better data on applications of carbon capture technologies for gas-fired electric generating units
  - Laboratory testing of cookstove performance and emissions
  - Life cycle assessments for materials management

- Social science and uncertainty
  - Understand interactions between social, environmental, and biological factors for EJ/Tribal communities
  - Behavior related to energy efficiency
  - Community capacity to address climate-driven environmental impacts

Science Challenges

- **Water quality and aquatic ecosystems**: understand how climate change (with other stressors) is altering flows and other parameters critical to maintaining and enhancing water quality

- **Air quality**: understand how climate change and air quality interact and affect one another



- **Human health**: understand the incremental impacts on human health due to climate-driven exacerbation of existing, and effects of new, environmental stressors

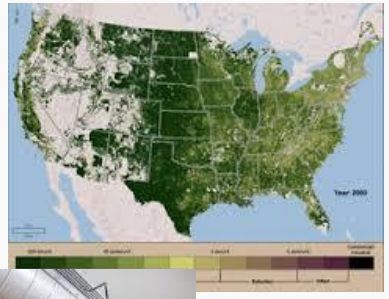
Science Challenges

- **Ecosystems and land**: understand how climate change impacts can affect contaminated sites and terrestrial ecosystems

- **Mitigation**: inform effective mitigation strategies that avoid adverse environmental impacts

- **Social sciences**: advance the understanding of how social systems affect and respond to a changing climate

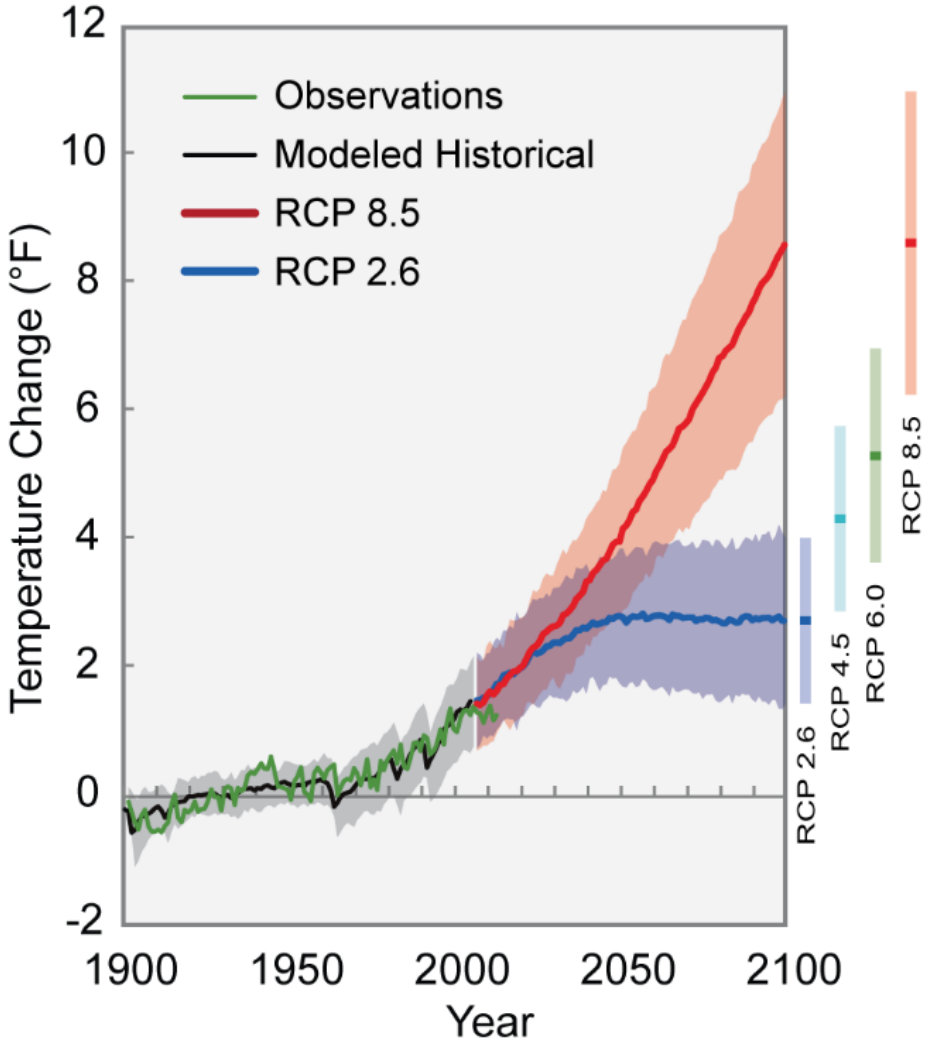
- **Uncertainty**: develop methods and approaches to inform decisions in the context of the deep uncertainties inherent to climate change



Uncertainty

- We deal with *experimental* uncertainty on a routine basis

- Uncertainty in the context of climate change refers to the fact that we do not know how policies, technological and economic development, and complex natural processes will affect future conditions



Projected surface temperature anomalies (National Climate Assessment, 2014)

Summary of Issues

- The demand for climate-related research by ORD's partners to support adaptation is diverse and growing
- Climate change is affecting everything
- National-level climate policies are now beginning to emerge, strongly focused on adaptation
- Mitigation will bring substantial changes to the means of energy production and use, leading to new issues and impacts
- ORD is responding to needs and challenges across its research portfolio

ORD Programs Contributing to Climate Science Challenges

	ACE	CSS	HHRA	HS	SHC	SSWR
Water quality and aquatic ecosystems	X		X	X		X
Air Quality	X		X			
Human Health	X	X	X			X
Ecosystems and Land	X	X	X		X	
Mitigation	X	X			X	X
Social Sciences	X			X	X	
Uncertainty	X				X	X

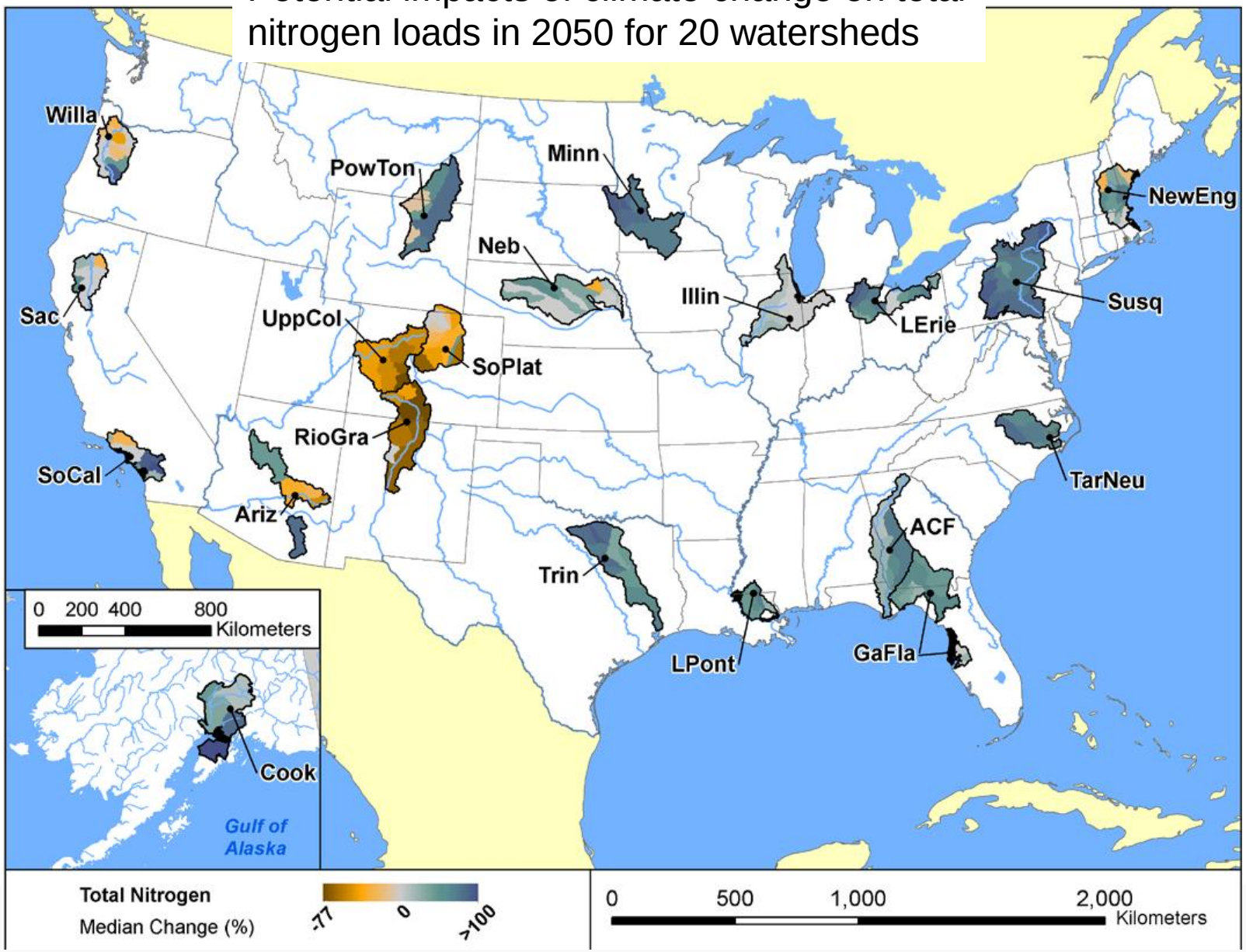
- Research activities in ACE are within ORD's Global Change Research budget and are part of the federal climate research cross-cut coordinated by USGCRP
- Research activities in other ORD programs are climate-related, but are not part of the cross-cut. Research in SHC to improve community-level resilience to climate change is expected to be included in the cross-cut in FY15

Summary of Current Research (1)

- Impacts, Preparation and Adaptation:
  - Evaluating impacts on water quality (including nutrients) and aquatic ecosystems (ACE, SSWR, HSR)
  - Developing and evaluating sustainable water treatment technologies and systems (SSWR, HSR)

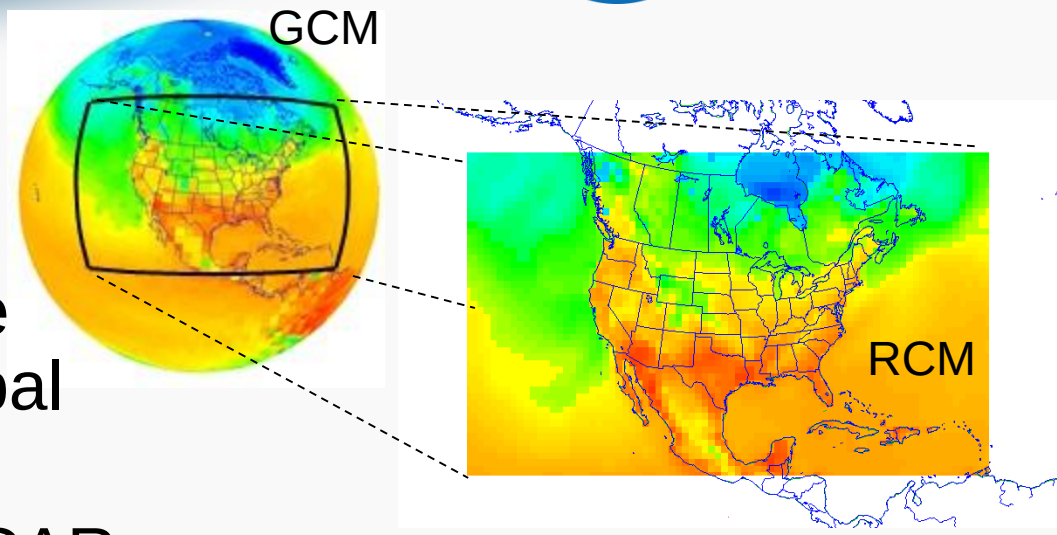
  - Investigating interactions between climate and air quality (ACE)
  - Examining effects of climate change on health (ACE, HHRA)
  - Developing and testing tools for researchers and end users – scenarios, models, indicators, databases (ACE, SSWR, SHC)

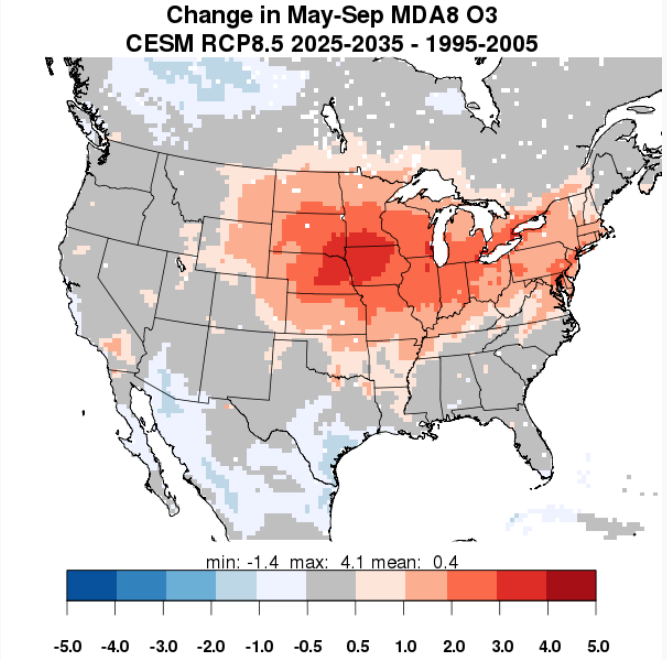
Potential impacts of climate change on total nitrogen loads in 2050 for 20 watersheds



Influences of Regional Climate Change on Air Quality across the U.S.

- Using dynamical downscaling to project regional climate change from multiple IPCC global models and scenarios
- Working with NASA, NCAR, NOAA models; actively collaborating with NASA/GISS
- Applying projected regional climate and emissions to simulate changes in ozone, PM, and deposition





Summary of Current Research (2)

- Impacts, Preparation and Adaptation
  - Developing methods to evaluate adaptation needs and options (ACE, SSWR)
  - Developing sustainable community responses to climate change (SHC, ACE)

- Mitigation and Energy
  - Developing the knowledge and tools to understand and respond to possible future energy system configurations and associated life cycle environmental impacts (ACE)
  - Examining potential environmental impacts of mitigation and energy technologies, including cookstoves and natural gas (ACE)

Summary of Current Research (3)

- Mitigation and Energy
  - Developing information and tools to understand potential life cycle changes in air quality and health impacts related to increased use of ethanol (ACE)
  - Investigating connections between adaptation and mitigation (ACE)
  - Developing methods to measure emissions of black carbon and methane (ACE)

- Social Science-Related
  - Examining community adaptation capacity (ACE, SHC)
  - Evaluating methods to support decision making under deeply uncertain futures (ACE)

Extramural Research Home

Basic Information

Grants & Funding

Guidance & Frequent Questions

STAR Grant Recipients

Fellowships

Small Business

Research Centers

Peer Review

Other Programs

Biodiversity
CNS
EPSCoR
Nanotechnology
P3
STAA

Research Results

Science Topics

Childrens Centers
Cumulative Risk

Funding Opportunities

U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Research

Site Navigation

Research Grant Announcements
RFA e-mail list
Archives

Research Project Search

Extramural Research Search

National Priorities: Systems-Based Strategies to Improve The Nation's Ability to Plan And Respond to Water Scarcity and Drought Due to Climate Change

This is the initial announcement of this funding opportunity.

Funding Opportunity Number: EPA-G2014-ORD-L1

Catalog of Federal Domestic Assistance (CFDA) Number: 66.511

Solicitation Opening Date: June 20, 2014
Solicitation Closing Date: August 5, 2014, 11:59:59 pm Eastern Time

Technical Contact: Angela Page (page.angelad@epa.gov); phone: 703-347-8046
Eligibility Contact: Ron Josephson (josephson.ron@epa.gov); phone: 703-308-0442
Electronic Submissions: Todd Peterson (peterson.todd@epa.gov); phone: 703-308-7224

Research Gaps (1)

- Some gaps are more appropriately addressed by other agencies (e.g., water supply)
- Other gaps are included in new StRAPs (e.g. community resilience)
- Additional gaps need to be evaluated in context of cross-Agency adaptation science priorities
  - Discussions under way with Agency Adaptation Task Force

Research Gaps (2)

Partner	Need	Response
OW	Improve 7Q10 streamflow estimates for modeled future climate conditions for NPDES or TMDL actions	Connect with USGS
OW	Identify watersheds that may be at risk of long-term shortfalls in supply	Connect with USGS
OAR	Evaluate residential and commercial buildings advanced mechanical ventilation	Connect with DOE
OAR	Improve community's capacity to understand and take effective action to address harmful environmental impacts in their community	SHC efforts being developed
OAR	Understand interactions between social, behavioral, environmental, and biological factors for EJ and Tribal communities who are disproportionately impacted	Cross-Agency prioritization

Research Gaps (3)

Partner	Need	Response
OSWER	How can wildfires at contaminated sites promote the spread of contamination or impact remedies?	Cross-Agency prioritization
OSWER	What are the assessment, cleanup, and area-wide planning impacts associated with green infrastructure and brownfields?	Connect with SHC
OSWER	Need to evaluate the cumulative health effects of climate change (e.g. the non-chemical stressors that people deal with after a storm and how it impacts their susceptibility to chemical stressors)	Cross-Agency prioritization

Interactions with Partners and Programs - Internal

- Extensive formal and informal cross-ORD communications and interactions at program level
- Internal EPA coordination via group calls, partner-specific meetings and calls; annual ORD program reviews
- Organic collaborations at PI and staff level
  - Assessment of climate impacts on water quality (ACE, SSWR, OW)
  - Incorporation of energy scenarios into regulatory evaluations (ACE, OAR)
  - Investigating methane emissions from lakes (ACE, SSWR)

Interactions with Partners – External

- Program-level coordination through interagency bodies, primarily the U.S. Global Change Research Program (USGCRP), under the Committee on Environment, Natural Resources, and Sustainability (CENRS)
- Project-level coordination and collaboration through interagency working groups
  - EPA, NIEHS, CDC, NOAA, USDA collaboration on assessment of climate change impacts to health through USGCRP
  - Collaboration with NASA on downscaling global-scale modeling results to regional level for air quality modeling

Relationship to Program StRAPs

- Climate research needs from partner inputs prepared for program StRAP development
- Consolidated needs illustrate opportunities for on-going cross-program integration
- Issues unique to climate change identified in roadmap, incorporated into program strategies
  - E.g., development and use of scenarios
- Foundations of sustainability and supporting local decision making across StRAPs provide strong basis for incorporating social sciences
- Climate change “mainstreaming” across EPA enables expanded partner support for climate-related work across all StRAPs

Next Steps and Challenges

- Next steps
  - Provide input and guidance for StRAP development
  - Continue and enhance cross-Program interactions and coordination
  - Continue development of cross-Agency science priorities
  - Enhance coordination with partners on climate-related research needs and activities
  - Expand cross-ORD discussions on unstated climate research needs

- Challenges
  - Rapidly evolving policy environment
  - “Mainstreaming” of climate substantially expands potential scope