

# EPA's Global Change Research Program: An Overview

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## **DISCLAIMER**

The views expressed in this presentation are those of the author and do not necessarily reflect the views or policies of the U.S. Environmental Protection Agency.

*June 10, 2010*

# *Global Program Overview: Coordination across the Office of Research and Development*

- National Program Director (Darrell Winner)
- Research Coordination Team (RCT)
  - Includes ORD, Regions, Program Offices, Tribes
- Research directions and performance measures are described in Multi-Year Plans (MYPs)
  - Global MYP is currently undergoing major revisions

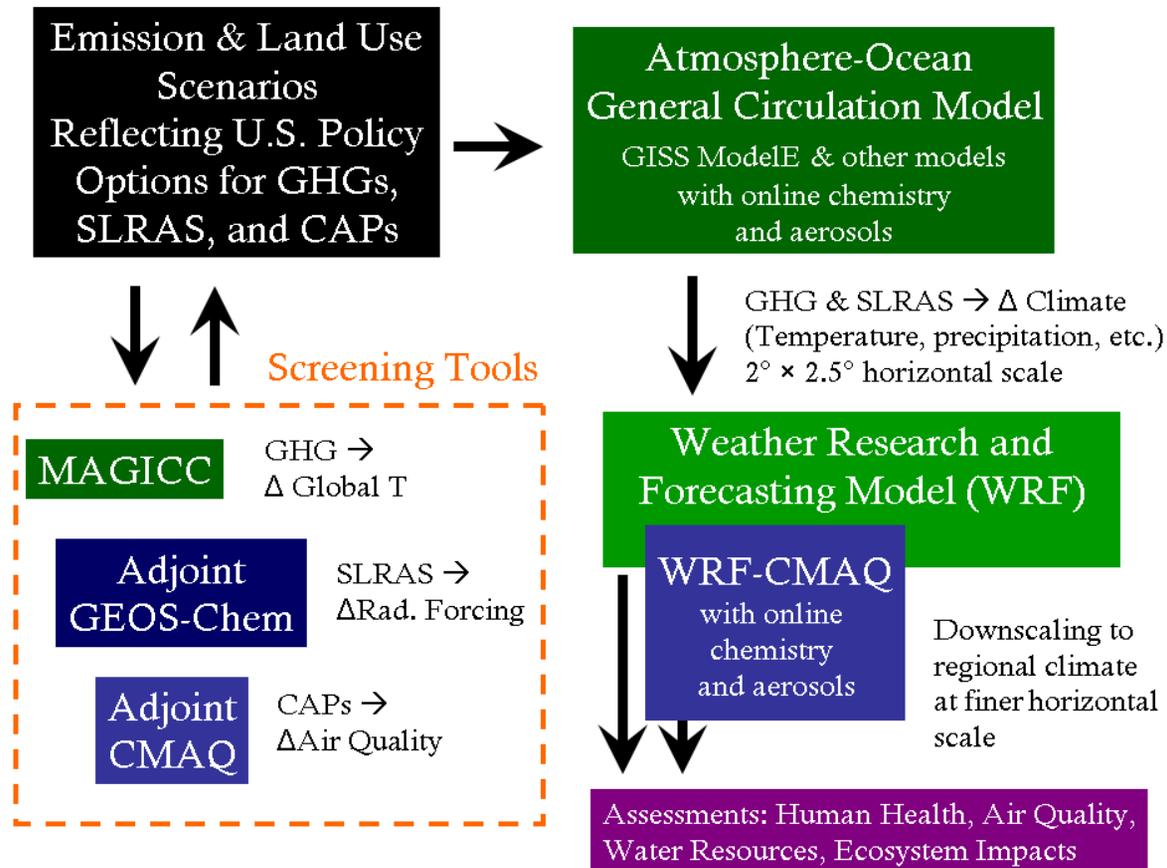


# *ORD's Global Change Research Program*

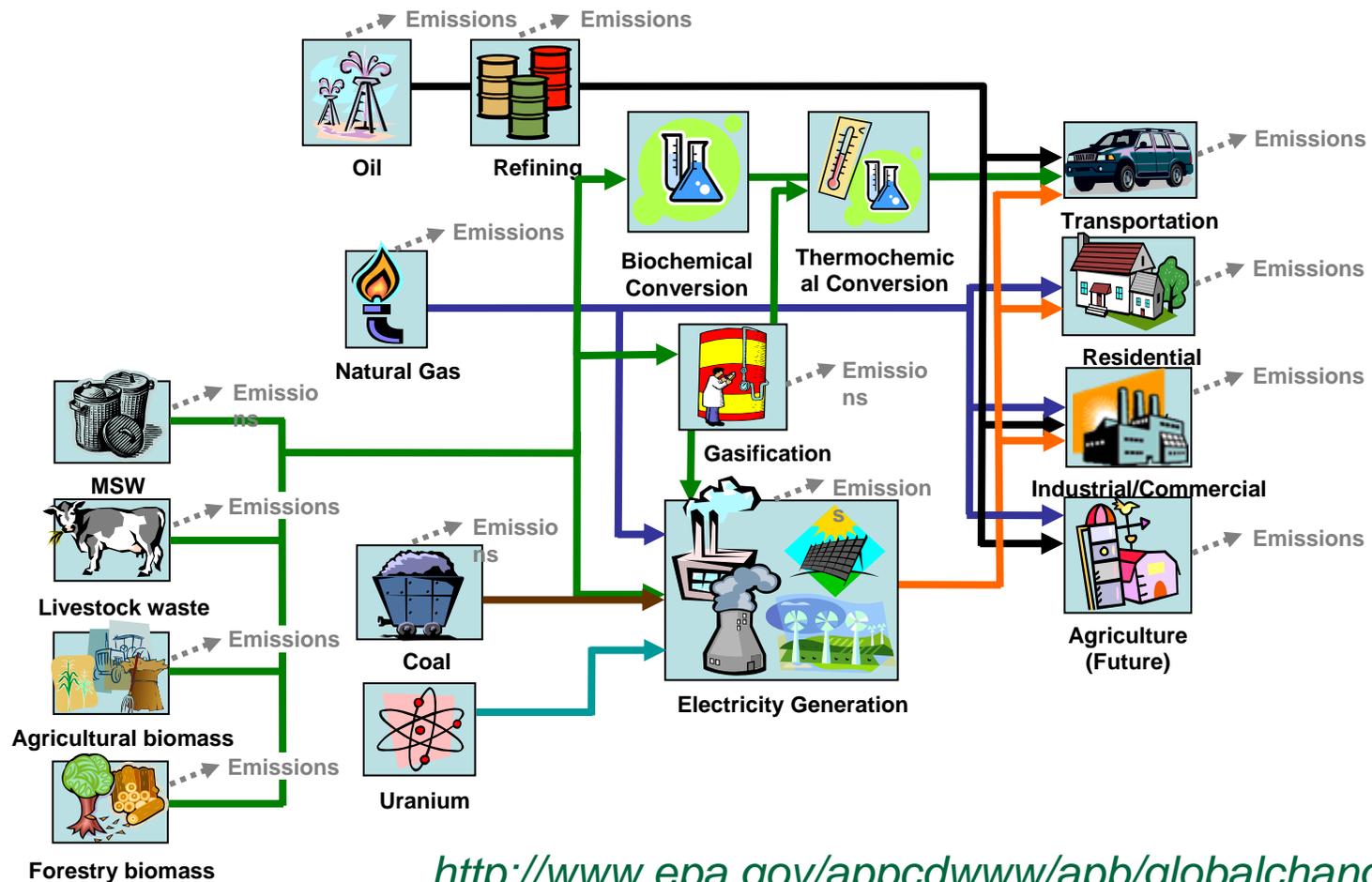
- **Air Quality**: Assess how climate change could impact future air quality and identify potential options to adapt to these impacts.
- **Water Quality**: Protect water resources and aquatic ecosystems by assessing and adapting to global change.
- **GHG Mitigation**: Provide information, data and tools to support development and implementation of GHG regulations/policies and assess environmental implications of proposed mitigation strategies
- **USGCRP**: Provide timely and useful assessments and tools to support resource management decisions in particular places and sectors.



# National Exposure Research Lab: Integrated Climate-Air Quality Framework



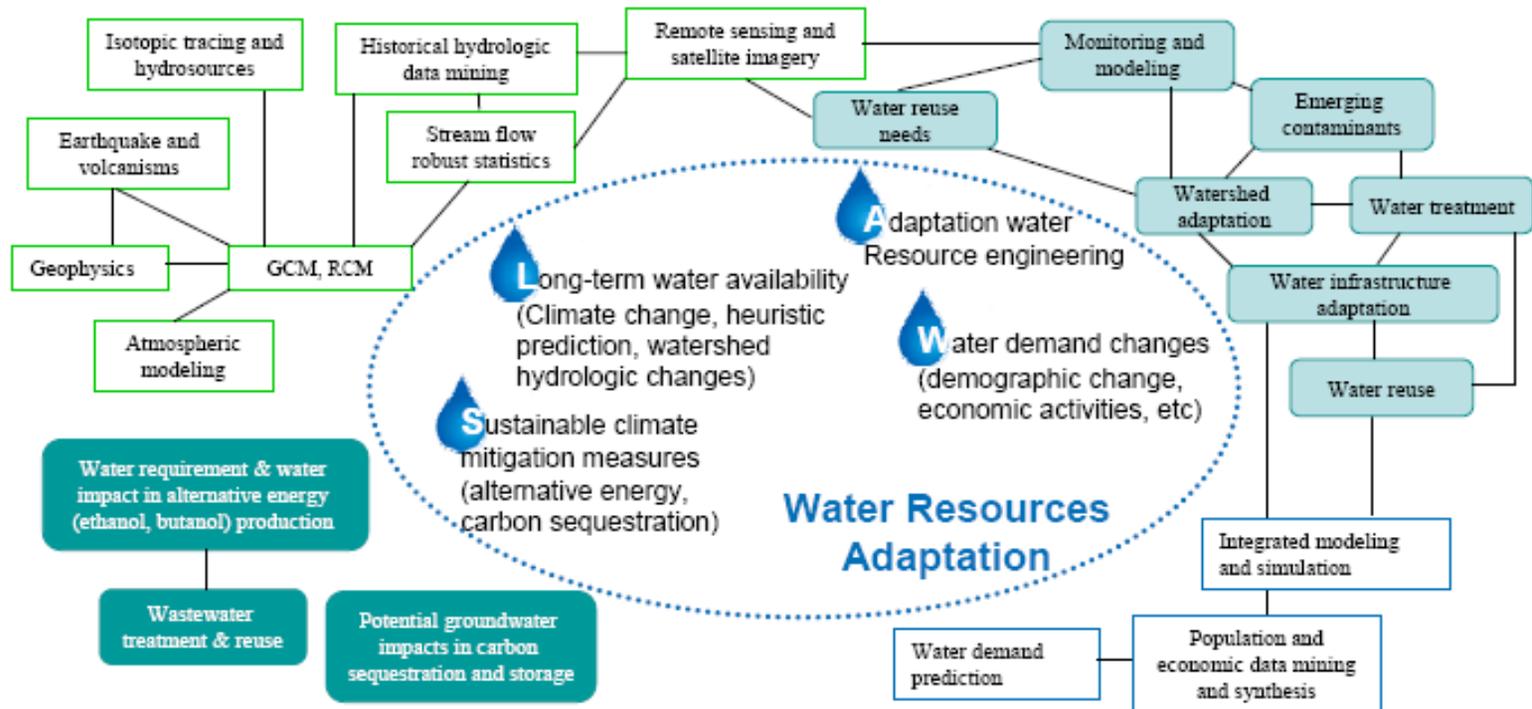
# National Risk Management Research Lab: Modeling Energy System Interactions with MARKAL



# National Risk Management Research Lab: Water Resources Adaptation Program (WRAP)

*Water quality and hydrologic impacts*

*Adaptive engineering and program management*



*Water resources impacts from climate change mitigations*

*Demographic and socioeconomic developments*

## 2007 Tribal STAR RFA

### National Center for Environmental Research



*Issues in Tribal Environmental Research and Health Promotion:  
Novel Approaches for Assessing and Managing Cumulative Risks  
and Impacts of Global Climate Change*

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#### Grants Awarded

- Impacts of Climate Change on Health Benefits of a Tribal Alaskan Resource: Integrating Traditional Ecological Knowledge with Risk Assessment Through Local Monitoring (Investigators: Mary Ann Lila, et al. at University of Illinois at Urbana-Champaign, Office of Alaska Native Health Research and Epidemiology, and Rutgers University)
- Understanding the Cumulative Affects of Environmental and Psycho-Social Stressors that Threaten the *Pohlik-lah* and *Ner-er-ner* Lifeway: The Yurok Tribe's Approach (Investigator: Kathleen Sloan at Yurok Tribe Environmental Program)



# *National Center for Environmental Assessment Global Change Program*

- We **assess the impacts of climate change** on air quality, water quality, aquatic ecosystems, and human health and welfare.
  - Air Quality Assessment
  - Aquatic Ecosystems
  - Water Quality Tools
  - Regional Climate Change (NARCCAP)
  - Land Use Change (ICLUS)
  - Hydrological Modeling (20 Watersheds)
- We do **place-based case studies**
- We develop **decision support tools**
- We **focus on vulnerable populations**
  - Impacts on health and well-being of older adults

## ***Contacts for Laboratory and Center Focus Areas***

- **NCEA**..... **Air and water quality assessments, USGCRP assessments**
  - Lead: Anne Grambsch (703-347-8521)
  - Web-site: <http://www.epa.gov/ncea/global/>
- **NCER**..... **STAR grant program (all program focus areas)**
  - Lead: Bryan Bloomer (202-343-9078)
  - Web-site: <http://epa.gov/ncer/science/globalclimate/>
- **NERL**..... **Air quality modeling (CIRAQ)**
  - Leads: David Kryak (919-541-1457)
  - Web-site: <http://www.epa.gov/asmdnerl/Climate/index.html>
- **NHEERL**..... **Aquatic ecosystems, hydrologic landscapes**
  - Leads: Peter Beedlow (541-754-4634)  
Kathryn Saterson (919-541-2535)
  - Web-sites: <http://www.epa.gov/wed/>, <http://www.epa.gov/nheerl/>
- **NRMRL**..... **Mitigation, MARKAL modeling (technology), water resources**
  - Leads: Doug McKinney (919-541-3006),  
James Goodrich (513-569-7605)
  - Web-sites: <http://www.epa.gov/appcdwww/apb/globalchange/>  
<http://www.epa.gov/nrmrl/wswrd/wqm/wrap/index.html>



## *The Climate Context*

- Changes in the intensity and frequency of precipitation
- Temperature-driven changes in heat & hydrology, including more frequent heat waves, snow melt, glacial retreat, decreasing reservoir levels and more persistent & extreme drought, water shortages & wildfires
- Arctic warming with permafrost melt
- Changes in minimum & maximum temperatures
- Potential increases in the intensity & frequency of tropical storms with increased sea surface temperatures
- Sea-level rise and increase in storm surge
- Increases in coastal & riverine flooding



***Source: IPCC, Summary for Policy Makers, 2007***

## *Vulnerable Populations*



SAP 4.6 identified several population groups that were especially vulnerable to climate change. For example:

- Older adults, especially the very old
- Children, especially the very young
- Those living in poverty and those living alone
- Native American Peoples

Initial focus is on older adults, but are exploring possibility of working with other populations

# Population Projections

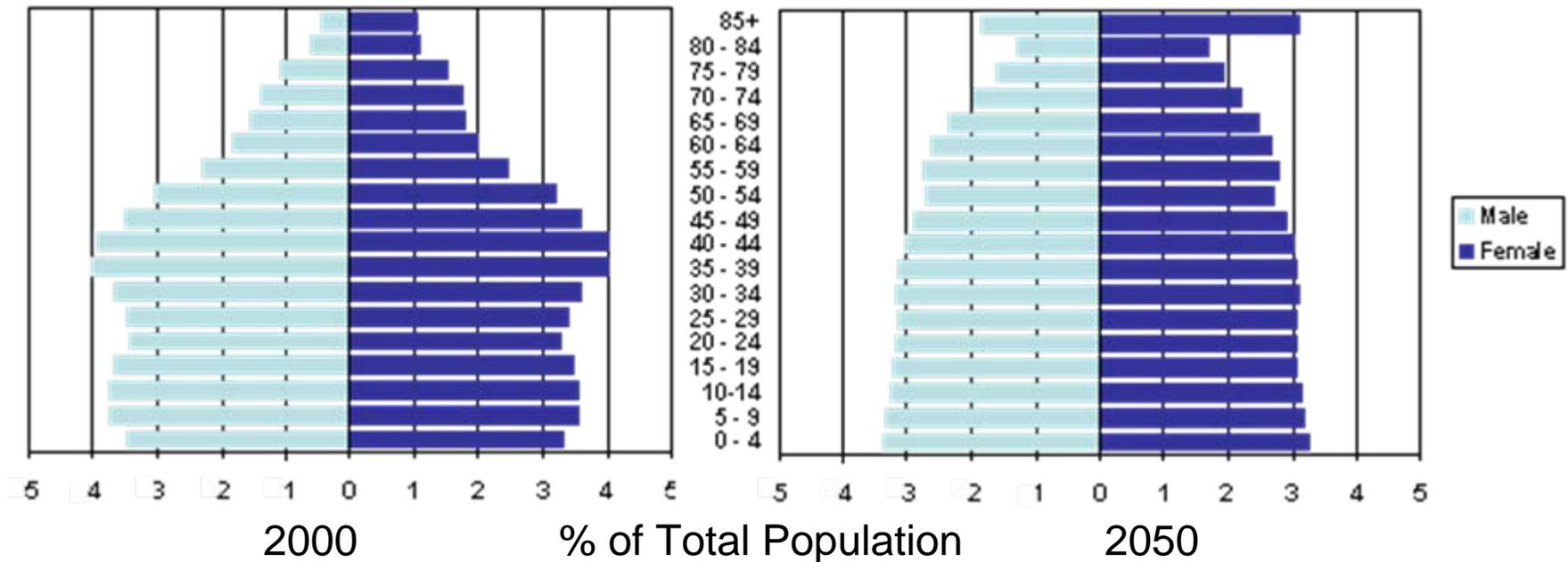
## Older Adults – 2000 & 2050

Population 65 and older in  
2000 is 13.5% of total

Population 65 and older in  
2050 is 20.5% of total

**85+ yrs = 1.5%**

**85+ yrs = 5%**



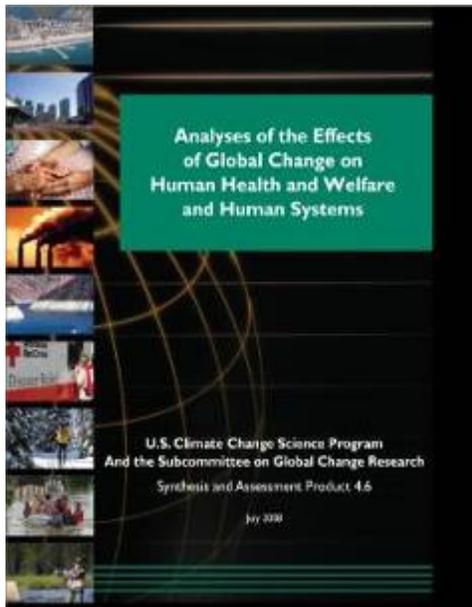
## Impacts on Older Adults

| Climate Change         | Potential Impacts on Older Adults   |
|------------------------|---|
| <b>Heat waves</b>      | <ul style="list-style-type: none"> <li>▪ <i>Deaths from heat stroke, dehydration, exacerbation of cardio-pulmonary diseases / deficits related to medication effects on thermoregulation / limited social contacts and restricted mobility magnify health effects of temperature extremes</i></li> </ul>    |
| <b>Air pollution</b>   | <ul style="list-style-type: none"> <li>▪ <i>Increased ground level ozone and fine particulate matter / exacerbation of cardio-pulmonary diseases, especially asthma &amp; COPD / may lead to premature death</i></li> </ul>   |
| <b>Tropical Storms</b> | <ul style="list-style-type: none"> <li>▪ <i>Storm-related injuries and deaths / exacerbation of chronic illnesses, including mental illness (depression and PTSD) / extensive property damage requiring extended evacuation</i></li> </ul>  |
| <b>Flooding</b>        | <ul style="list-style-type: none"> <li>▪ <i>Diarrheal illness from contaminated drinking water caused by e.coli, giardia, cryptosporidium, and salmonella / indoor mold and respiratory illnesses (Katrina cough) / forced evacuation and relocation / increased incidence of mental illness</i></li> </ul> |

## Adaptation Options for Older Adults

| Climate Change         | Adaptation Strategies for Older Adults  |
|------------------------|---|
| <b>Heat waves</b>      | <ul style="list-style-type: none"> <li>■ <i>Provide air conditioning and/or access to cooling centers / have direct contact with older adults who are bed ridden or home-bound / over time, we expect vulnerable populations to acclimatize to extreme heat</i></li> </ul>  |
| <b>Air pollution</b>   | <ul style="list-style-type: none"> <li>■ <i>Reduction of fossil fuel use may decrease emissions of criteria pollutants</i></li> </ul>   |
| <b>Tropical Storms</b> | <ul style="list-style-type: none"> <li>■ <i>Improve early warning systems and government policies to discourage resettling vulnerable coastal zones / where feasible, raise land through use of fill for all new structures in flood-prone areas / restore wetlands to minimize storm surge damage</i></li> </ul> |
| <b>Flooding</b>        | <ul style="list-style-type: none"> <li>■ <i>Improve early warning systems and government policies to discourage resettling vulnerable flood zones / where feasible, raise land through use of fill for all new structures in flood-prone areas</i></li> </ul>   |

# ***Synthesis and Assessment Product 4.6: Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems (2008)***

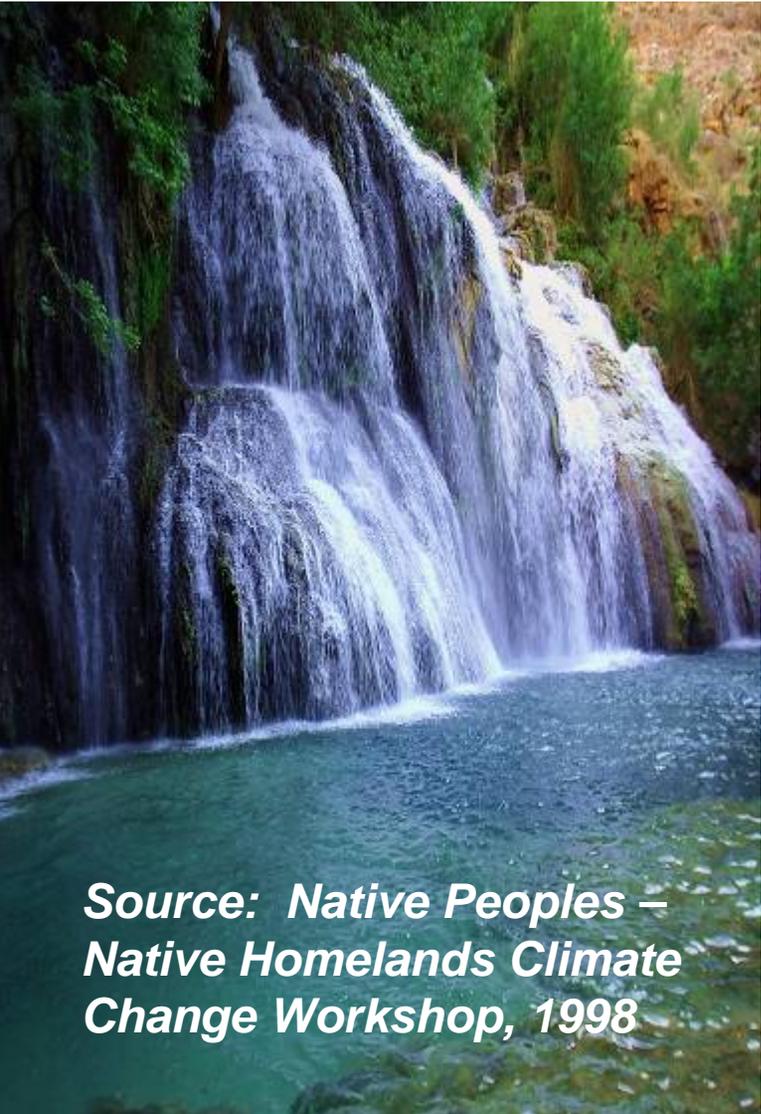


- The SAP 4.6 proposes to identify vulnerable settlements and vulnerable populations – such as native populations on tribal lands – that have limited capacities for response to climate change within their settlements.
- Better understanding of climate change at the community scale would provide a basis for adaptation research that addresses environmental equity and social justice concerns.

## *Native Peoples: Key Issues and Climate Change*

- Water supplies
- Human health and extreme events
- Tourism and community development
- Cultural sites, wildlife and natural resources

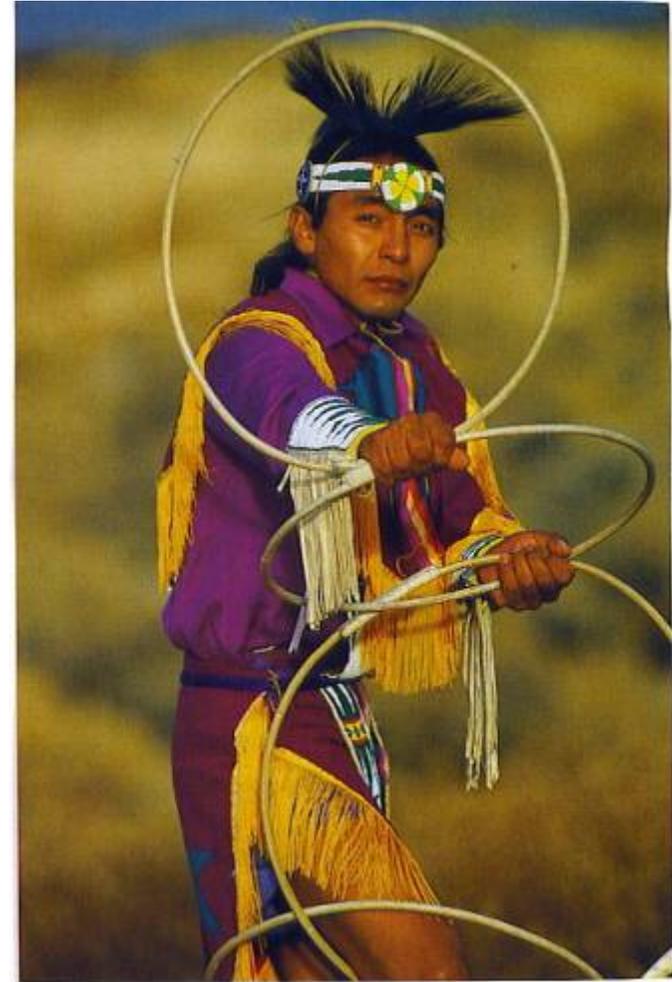
Native peoples feel increasingly vulnerable to global environmental change, as they are **not able to cope easily with climate change by relocating**. Few tribes can afford the purchase of new land and federal laws hinder the transfer or expansion of Tribal jurisdiction.



*Source: Native Peoples –  
Native Homelands Climate  
Change Workshop, 1998*

## ***Native Communities and Climate Change: Protecting Water Resources***

- Native cultures in the Southwest are particularly vulnerable to impacts of climate change on water quality and availability.
- The amount of water actually available is determined through negotiation and litigation. Today, negotiations are either underway or pending even as water demand continues to increase across the Southwest.
- Years of drought and climate change have the potential to spark significant conflict over an already over-allocated and dwindling resource.



## *Four Regional Case Studies: Impacts of Climate Change on Native Peoples*



- There is a great diversity of culture among Native American tribes due to unique histories and the close connection between tribes and their geographic location.
- The effects of climate change vary greatly from region to region due to various geographic, hydrologic, and other factors. Each tribe will be affected by climate change differently.
- What follows are four case studies that concentrate on tribes in particular geographic regions:
  - (1) the Pacific Northwest
  - (2) Alaska
  - (3) the Southwest and
  - (4) the Southeast, in particular Florida.

# 4 Regional Case Studies

|                     | Examples of Observed Trends   | Examples of Observed Trends  | Key Impacts  | Legal rights affected by climate change   |
|---------------------|---|--|--|---|
| Pacific Northwest   | Warming trend of approx. 1.5 F over past 100 years                  | Warmer temps lead to more winter precip falling as rain rather than snow & reduced snow pack | Effects of climate change on salmon  | Stevens Treaties establish the tribal right to fish                             |
| Alaska              | Region to become generally warmer and wetter with permafrost melt   | Warming trend impacts the amount of sea ice as well as sea levels                            | Subsistence ways of life/hunting, herding, fishing and gathering renewable resources   | Rights to Federal and state assistance for flooding and erosion damage          |
| Southwest           | Water scarcity: surface and groundwater supplies at risk            | Shift in flow regimes  | Agricultural operations / tourism based industry / natural resource extraction         | Western water allocation: Prior Appropriation Doctrine / Winters case           |
| Southeast / Florida | Rising sea levels / rising temps / scarcity of freshwater resources | Greater risk of wildfires and alteration of water-dependent ecosystems                       | Lands are at risk from coastal inundation and erosion, traditional activities affected | Everglades have traditionally supplied subsistence activities and growing crops |



**Thank you for your attention.**

**Questions?**

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