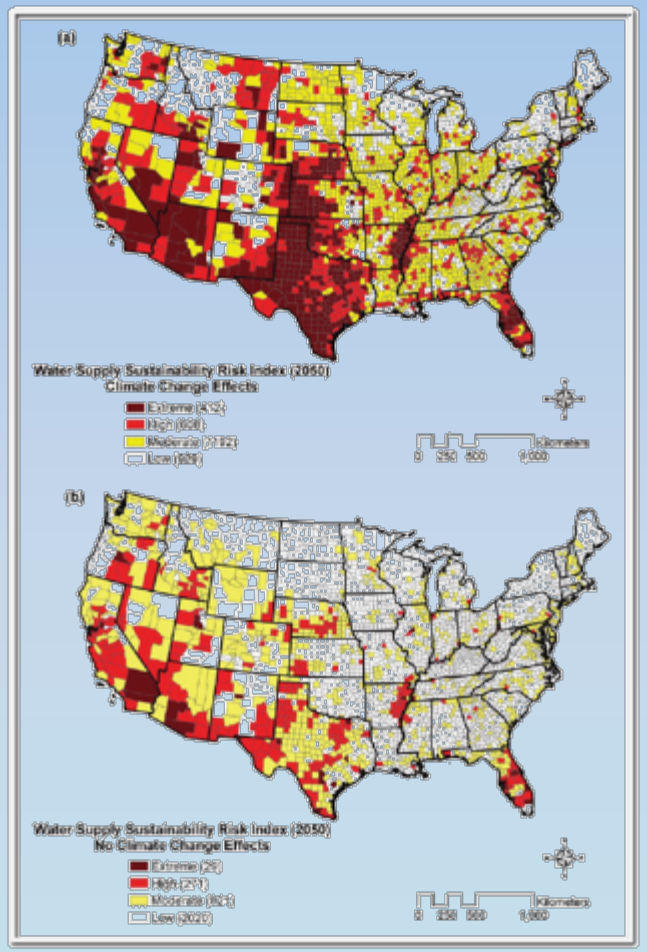
The National Climate Assessment



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Office of Science and Technology Policy

Association of Metropolitan Water Agencies

March 18, 2013

U.S. Global Change Research Program

National Climate Assessment

US Global Change Research Program

Global Change Research Act (1990) Mandate:

"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."

United States Global Change Research Program

13 Federal Departments & Agencies + Executive Office of the President

U.S. Global Change Research Program
National Climate Assessment

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.

U.S. Global Change Research Program
National Climate Assessment

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.

U.S. Global Change Research Program
National Climate Assessment

Goals for the NCA

- A **sustained process** for **informing an integrated research program**

- A scientific foundation for decision support, including **scenarios and other tools 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

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National Climate Assessment

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
- **National indicators** of change and the capacity to respond

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What's New about Process?

- Inclusive, broader expertise
  - Over 240 authors
  - 60 member federal advisory committee
- Public engagement, e.g. "Request for Information"
- Focus on a sustained process
  - Supporting quadrennial reports
  - Intermediate products to bolster assessment capacity
- NCAnet

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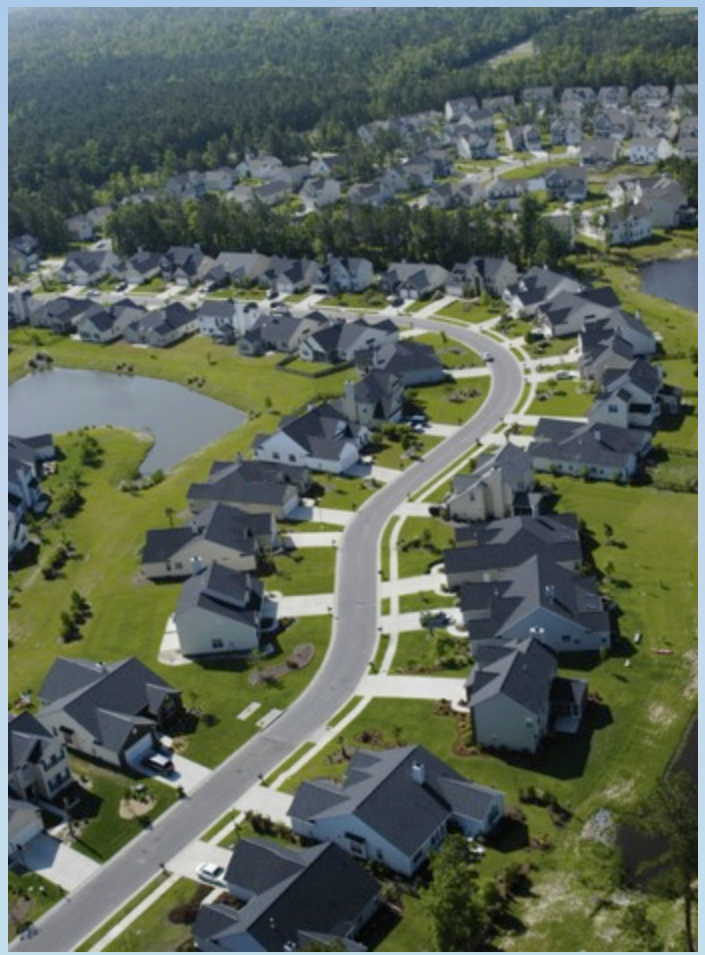
National Climate Assessment

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



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Water Chapter Authors

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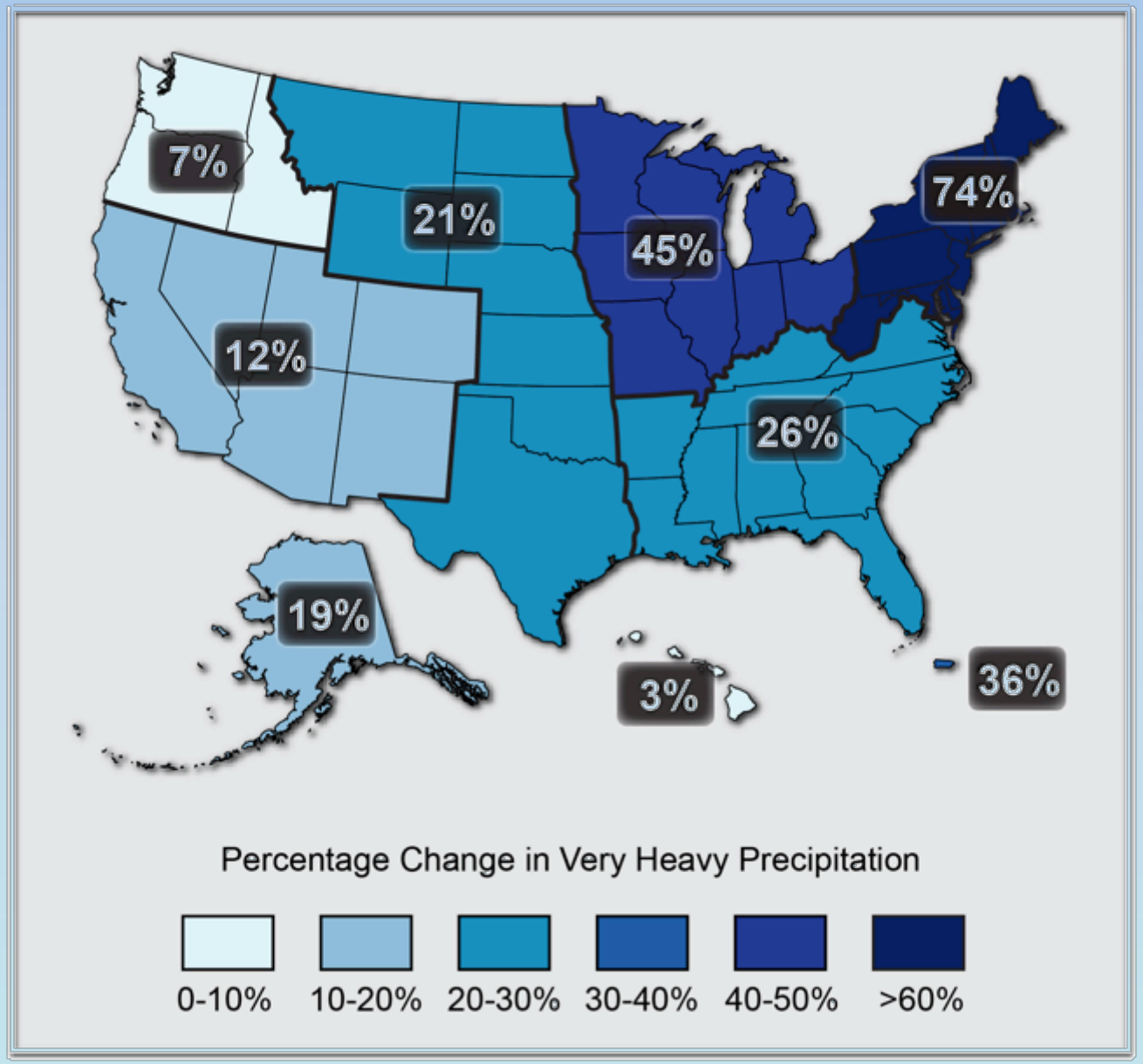
Change in Volume of Rain Falling in Heavy Precipitation Events



Change based on 1901 – 1960 average, top 1% of all daily events

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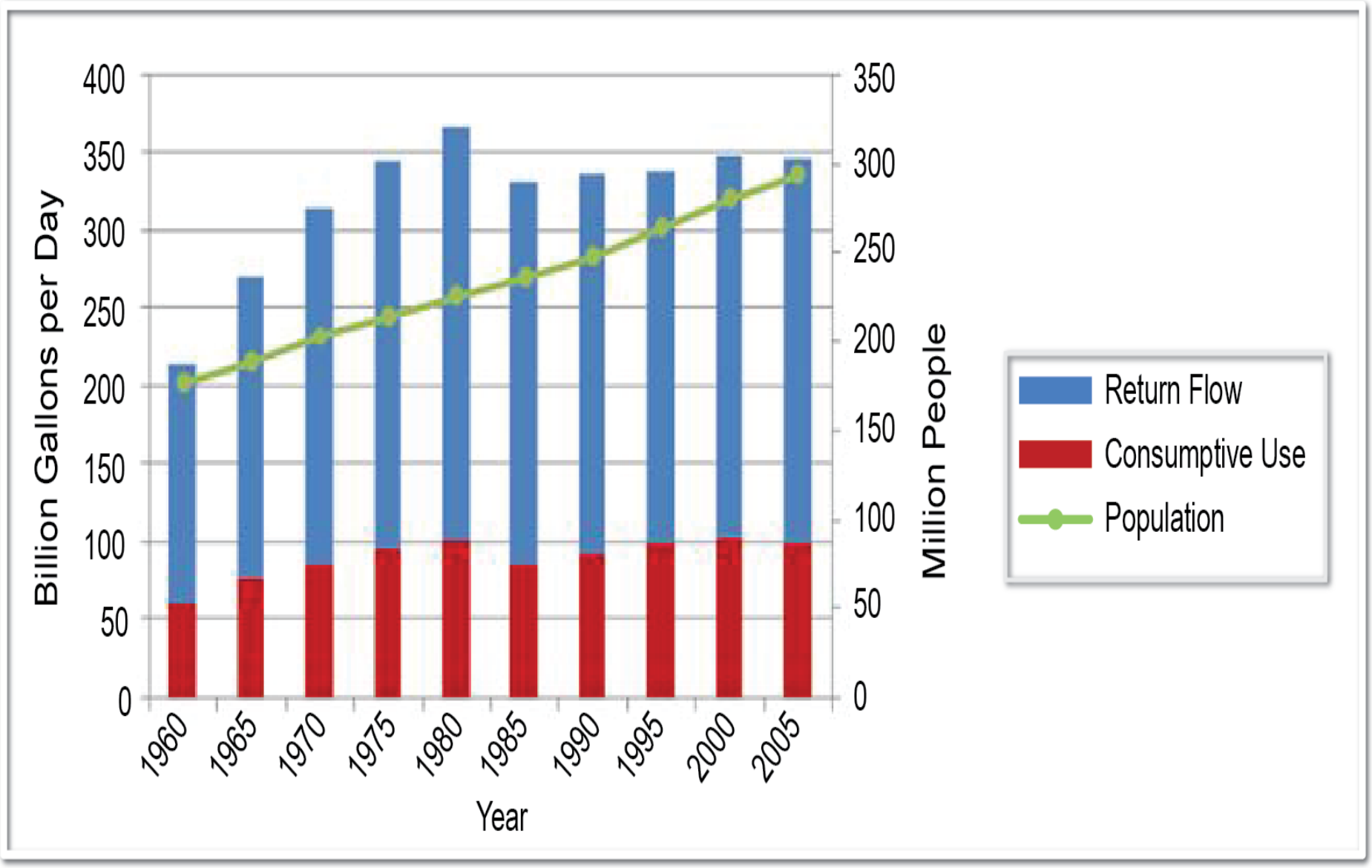
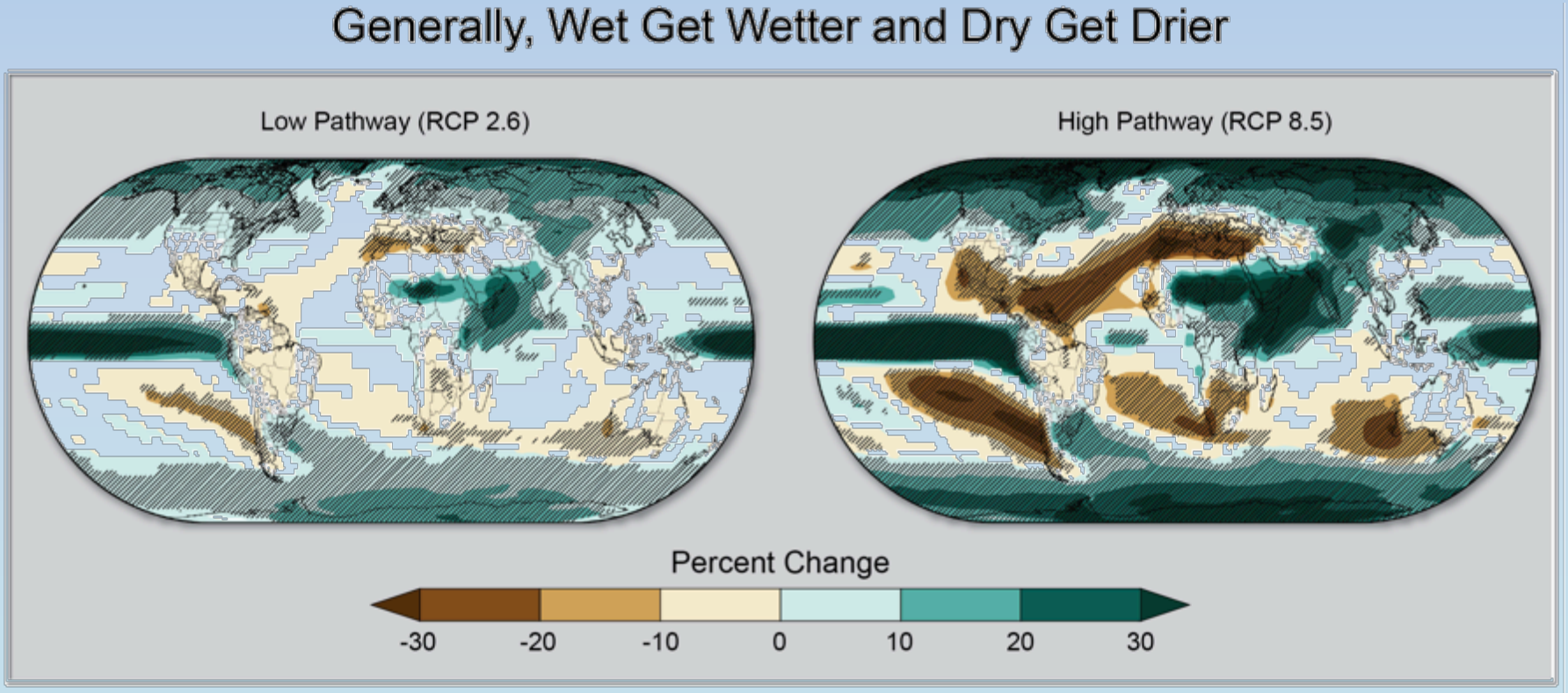
U.S. Freshwater Withdrawals



Projected precipitation change under different emissions scenarios



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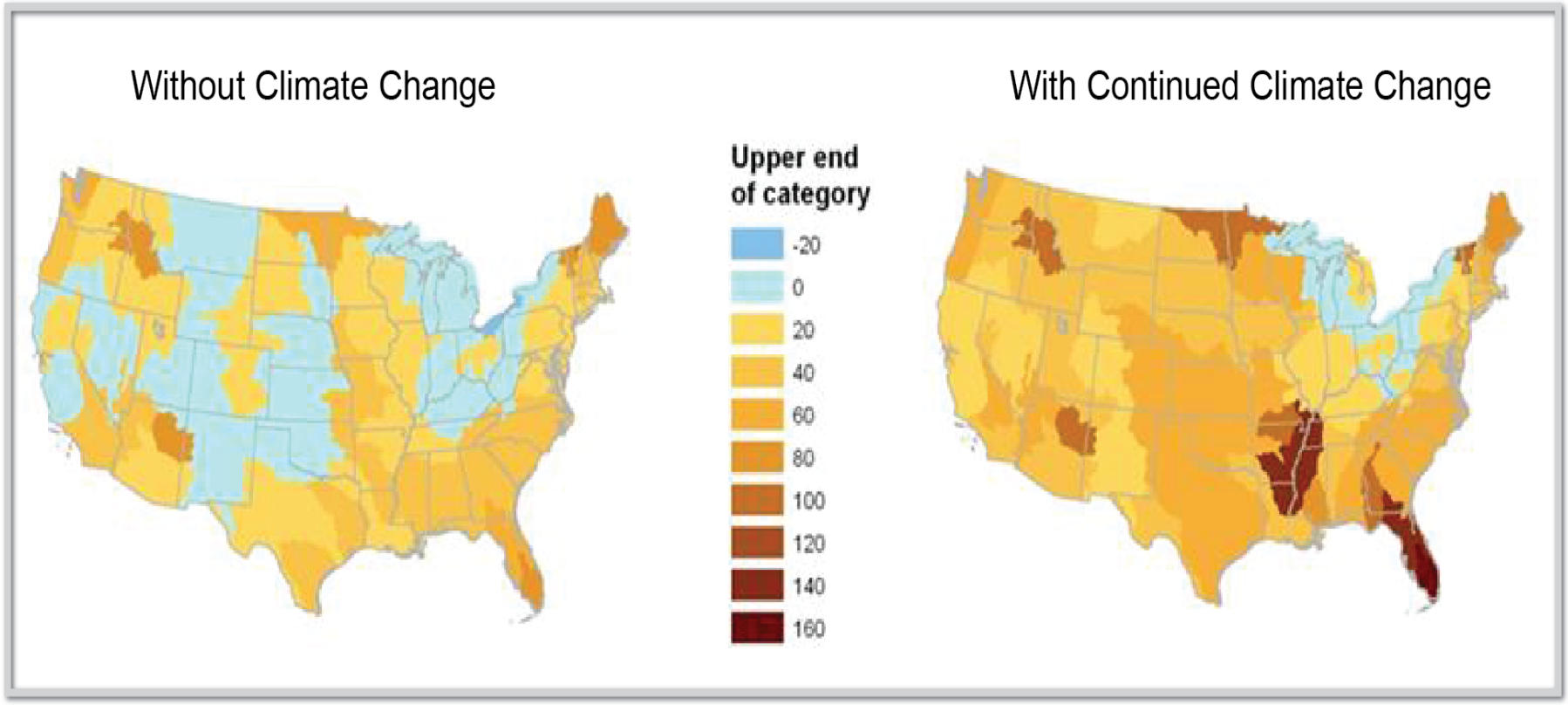
Projected Changes in Water Withdrawal



Climate Change Impacts on the Water Sector

Key Messages

1. Annual precipitation and runoff increases are observed now in the Midwest and Northeast regions and are projected to continue or develop in northern states; decreases are observed and projected in southern states.
2. Summer droughts are expected to intensify in most regions of the U.S., with longer term reductions in water availability in the Southwest, Southeast, and Hawai‘i inresponse to both rising temperatures and changes in precipitation.
3. Floods are projected to intensify in most regions of the U.S., even in areas where average annual precipitation is projected to decline, but especially in areas that are expected to become wetter, such as the Midwest and the Northeast.

Climate Change Impacts on the Water Sector

Key Messages

4. Expected changes in precipitation and land use in aquifer recharge areas, combined with changes in demand for groundwater over time, will affect groundwater availability in ways that are not well monitored or understood.
5. Sea level rise, storms and storm surges, and changes in surface and groundwater use patterns are expected to challenge the sustainability of coastal freshwater aquifers and wetlands.
6. Air and water temperatures, precipitation intensity, and droughts affect water quality in rivers and lakes. More intense runoff and precipitation generally increase river sediment, nitrogen, and pollutant loads. Increasing water temperatures and intensifying droughts can decrease lake mixing, reduce oxygen in bottom waters,and increase the length of time pollutants remain in water bodies.

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Climate Change Impacts - Water

7. In the Southwest, parts of the Southeast, the Great Plains, and the islands of the Caribbean and the Pacific, including the state of Hawai‘i, surface and groundwater supplies are already affected and are expected to be reduced further by declining runoff and groundwater recharge trends, increasing the likelihood of water shortages for many off-stream and in-stream water uses.

8. Increasing flooding risk affects human safety and health, property, infrastructure, economy, and ecology in many basins across the U.S.

9. In most U.S. regions, water resources managers and planners will encounter new risks, vulnerabilities, and opportunities that may not be properly managed with existing practices.

Climate Change Impacts - Water

10. Increasing resilience and enhancing adaptive capacity are useful strategies for water resources management and planning in the face of climate change. Challenges include: competing demands for water; a variety of institutional constraints; lack of scientific information or access to it; considerable scientific and economic uncertainties; inadequate information useful for practical applications; and difficulties in engaging stakeholders.

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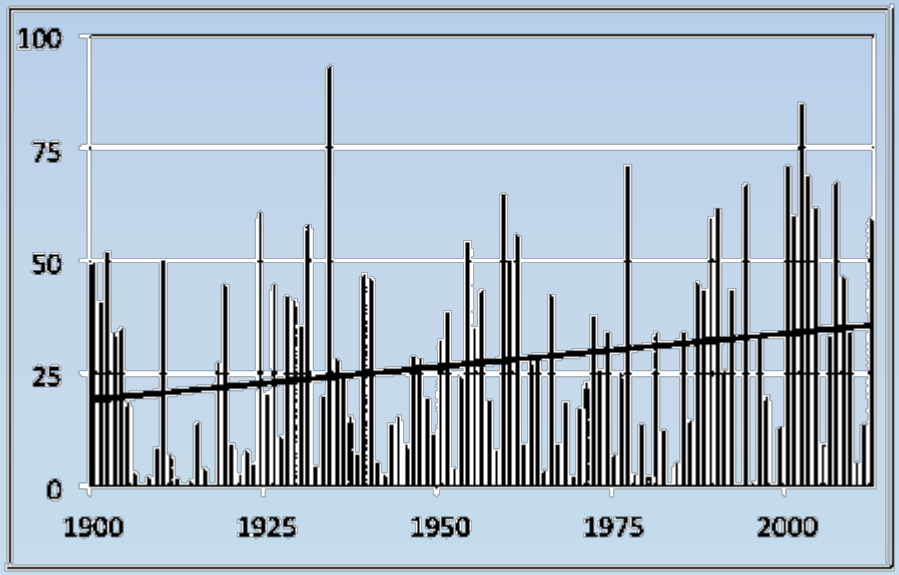
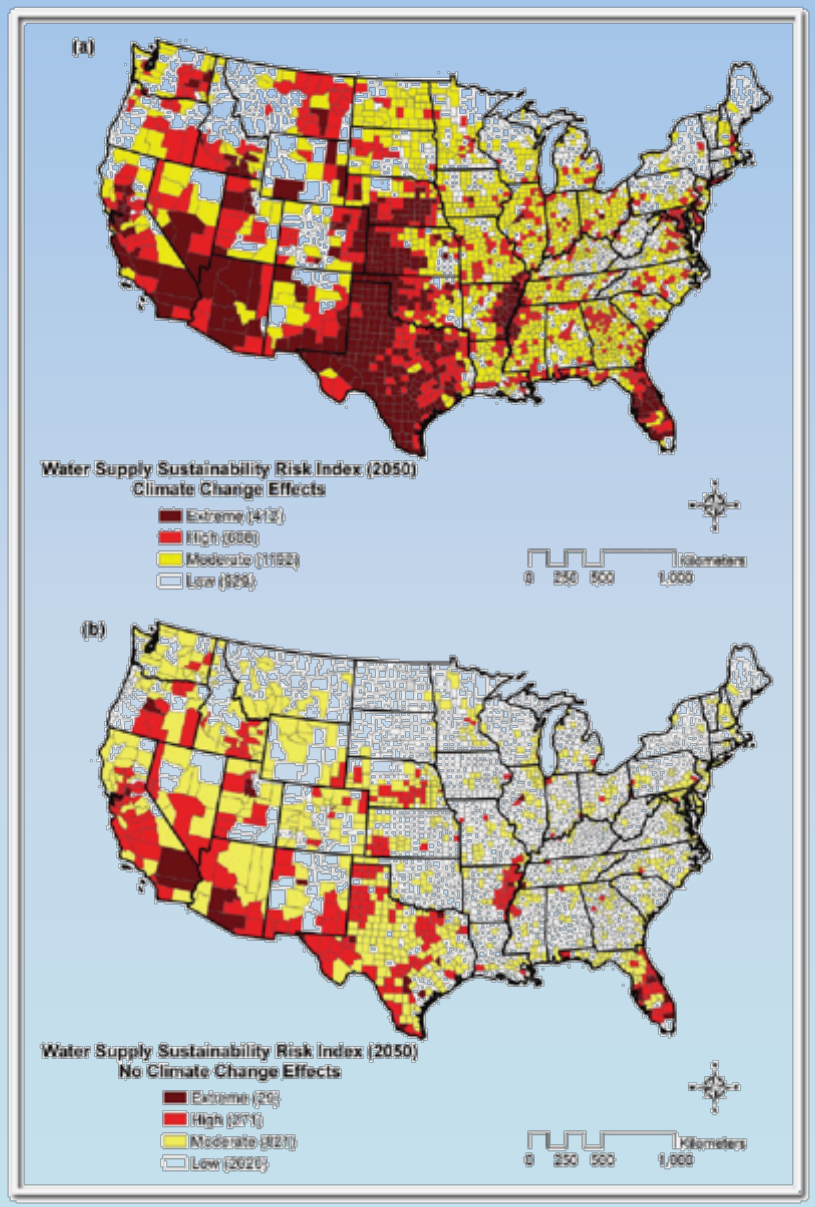
Water Supply



Percent of West in Summer Drought



Counties at risk of water shortage in 2050 with and without climate change

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NCA Climate Highlights

- Rapid change at high latitudes (sea ice decrease, permafrost warming, glacier melt)
- Accelerating sea level rise better documented
- Altered water cycle – groundwater depletion, floods and droughts, seasonal shifts in flood peak
- Heat in the oceans will affect the climate system for years to come
- Oceans absorbing 25% of emitted CO_2, increasing acidity
- Human contributions to global change; attribution of some extreme events (heavy precipitation, heat waves) to human contributions

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Increased Documentation of Impacts

- Implications for groundwater – potential shifts in recharge locations and rates, shifts from dependence on surface water to groundwater in prolonged drought
- Connections between large-scale wildfire, climate change, and drought
- Impacts of extreme precipitation, particularly in the NE, where there has been a 70% increase – huge infrastructure implications

New Scenarios

www.scenarios.globalchange.gov

- Regional climatologies and projections
- Global Sea level rise scenarios

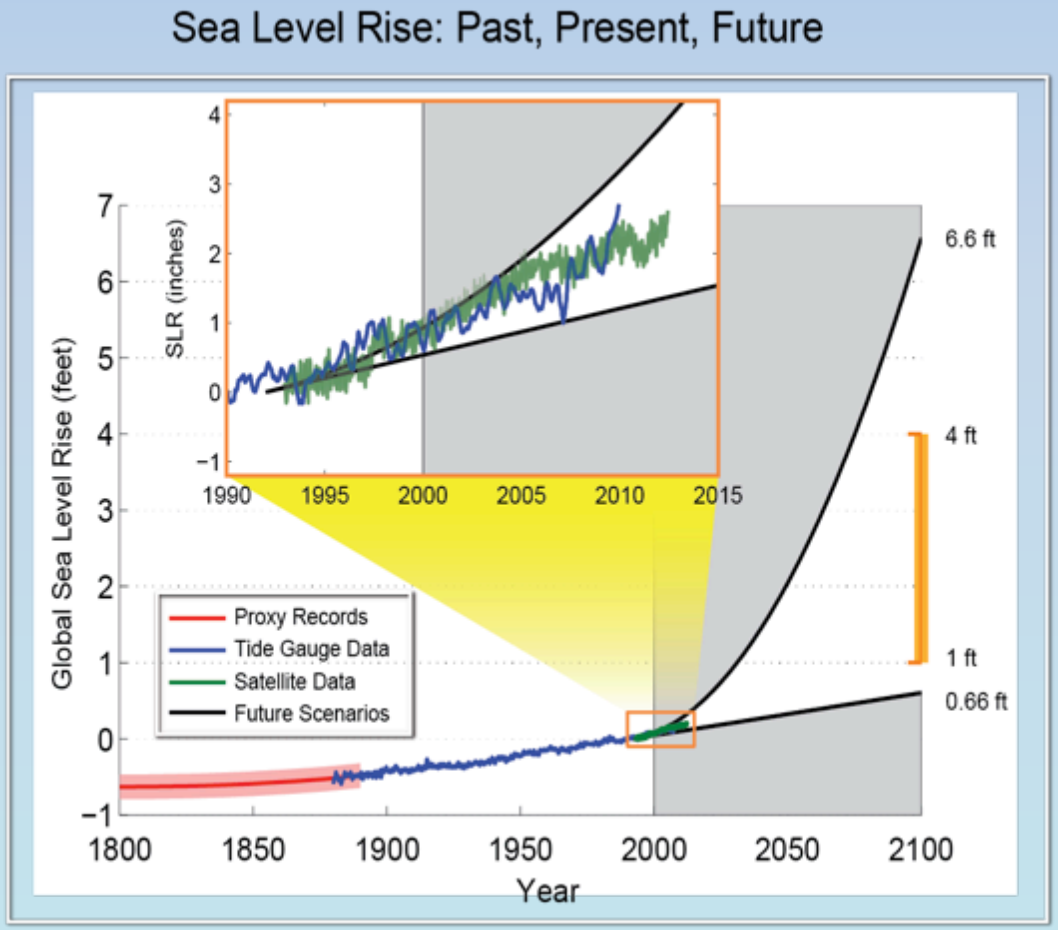

Figure source: Josh Willis, NASA Jet Propulsion Laboratory

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Challenges of Climate Change for Adaptation

- Non-stationarity is a new paradigm
- Trends vs abrupt change/extreme events
- Knowing “what to adapt to” especially if outside the envelope of prior experience
- Cascading effects and cross-system issues
- International context
- Institutional and regulatory issues
- Incorporating “ecosystem-based approaches” into engineered systems

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