

USGS Global Change: Impacts on Water Resources, and Climate Change Programs Nationally and in the Southwest

The new alphabet soup:

Mission areas

SSPT

Powell Center

CSC

LCC

WaterSmart



From Glacier National Park, Glacier Retreat Project (NPS/USGS)

Evolving from an organization that was created to inventory the Nation's public lands and natural resources, the mission of the 21st century USGS is most simply expressed in its maxim “Science for a Changing World.”

In order for the USGS to respond to evolving national and global priorities, it must periodically reflect on, and optimize, its strategic directions. This 2007 report was the first comprehensive science strategy since the early 1990s to examine critically major USGS science goals and priorities.

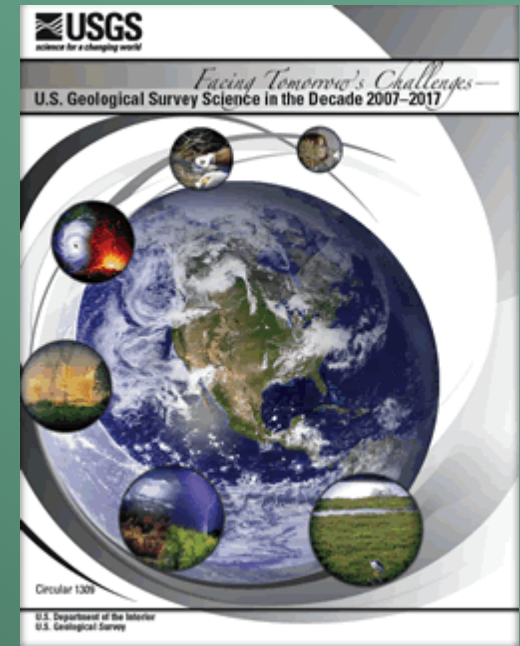
Facing Tomorrow's Challenges —

U.S. Geological Survey Science in the Decade 2007–2017

Circular 1309

U.S. Department of the Interior

U.S. Geological Survey



USGS Global Change Science Strategy

Circular contains 6 programmatic goals for USGS global change science over the short-term (1-5 years) and the longer-term (5-10 years), along with strategic actions, products and key partnerships.

Progress towards the six goals will improve understanding of:

- rates, causes and impacts of past global changes;**
- the global carbon cycle;**
- land use and land cover change rates, causes, and consequences;**
- droughts, floods, and water availability under changing land use and climate;**
- coastal response to sea-level rise, climatic hazards, and human development; and**
- biological responses to global change.**

USGS GLOBAL CHANGE SCIENCE CORE STRENGTHS...



FOCUSED SCIENTIFIC CAPACITY
in fundamental and applied aspects of
geology, geography, hydrology, and biology



LONG-TERM RESEARCH AND MONITORING
to describe trends in land use, water,
energy, minerals, species and ecosystems,
and the consequences of global change



**APPLICATION AND TRANSLATION
THAT INTEGRATES CLIMATE AND
ENVIRONMENTAL CHANGE DATA**
to predict impacts on natural
resources and human populations



NATIONAL-SCALE MAPPING
of geology, topography, land
cover, water use, and ecosystems;
**REGIONAL- TO GLOBAL-SCALE
EARTH OBSERVATIONS**
documenting the expansion of
human activity and changes in
natural systems



**COMPREHENSIVE
CHARACTERIZATIONS**
based on integrated data
collection, mapping, and
research; describing the earth
through time, paleo to present



MULTI-SCALE STUDIES
as a basis for integrated,
international, national,
and regional assessments
of global change impacts
on water resources and
terrestrial, aquatic, and
coastal environments



**CONSISTENT DATA COLLECTION
AND CONTINUOUS SYNTHESIS**
for vulnerability and impact assessments
to meet the needs of decision-makers



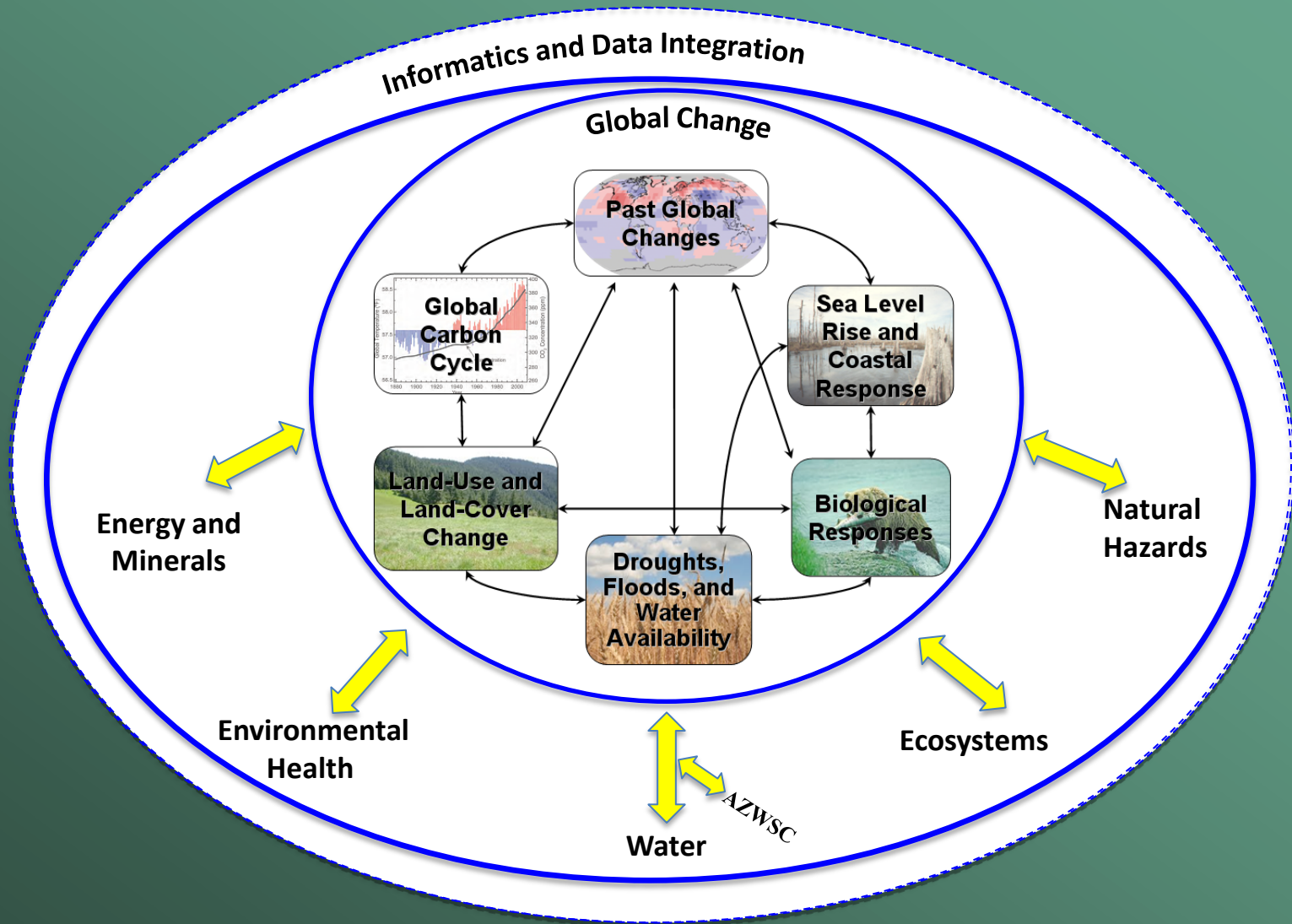
WIDELY DISTRIBUTED PRESENCE
with science centers and
data-collection operations in every
state, offering a unique coverage
across the National landscape



**SYNTHESIS, ASSESSMENT,
AND MODELING**
draw on USGS capacity to
identify trends and predict
effects of global change
on natural resources and
provide a scientific basis
for evaluating resource
management options



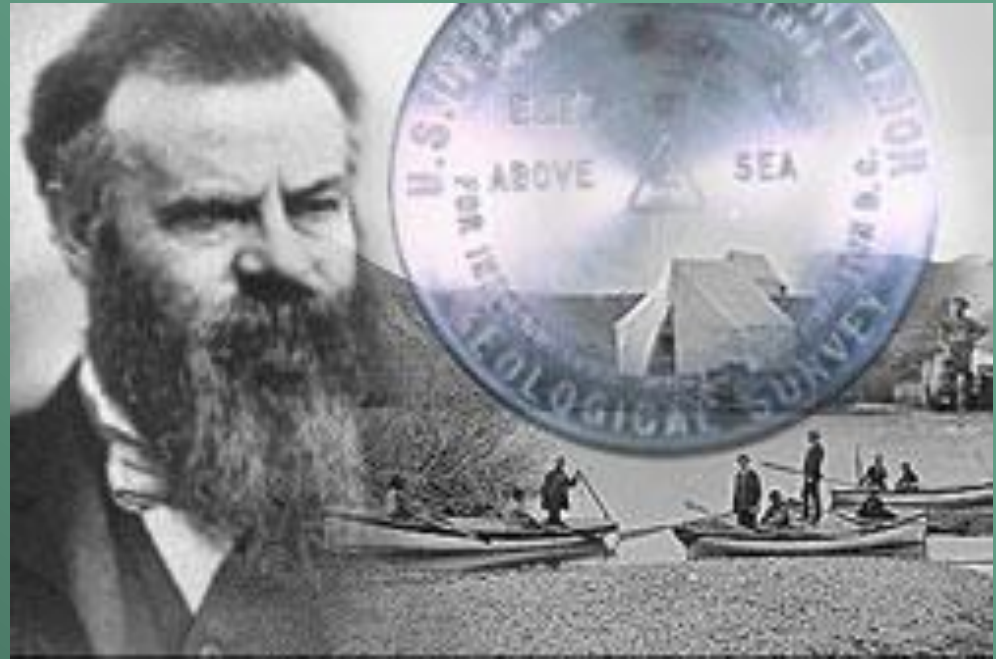
FUNDAMENTAL PROCESS STUDIES
to interpret and understand how
coupled natural and human-modified
environments affect past, present,
and future environments



Relations among Global Change and the six other USGS mission areas.

**The Powell Center for
Analysis and Synthesis, Ft
Collins, Colorado**

**Contact: Jill Baron
(jill_baron @usgs.gov)**



- **Focus on complex earth system and natural resource questions**
- **Advance the state of knowledge through collaborative and interdisciplinary investigation**

Example of Working Groups in progress

Integrating ecological forecasting methods to improve prioritization of natural resource management: An invasive species example



Characterizing a link in the terrestrial carbon cycle: a global overview of individual tree mass growth



Circumpolar assessment of ecological mismatch between avian herbivores and plant phenology



The USGS will, through its existing scientific assets and the new DOI Landscape Conservation Cooperatives (LCCs) and Climate Science Centers (CSCs):

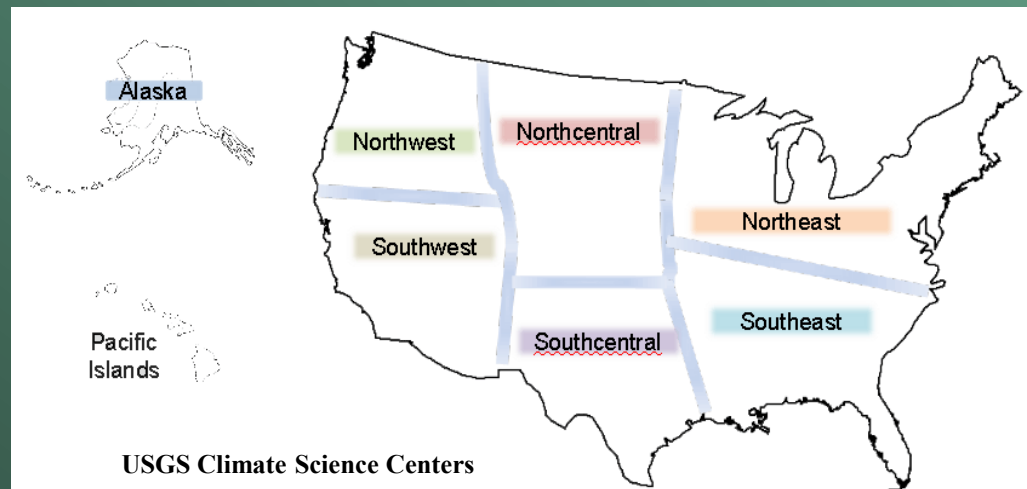
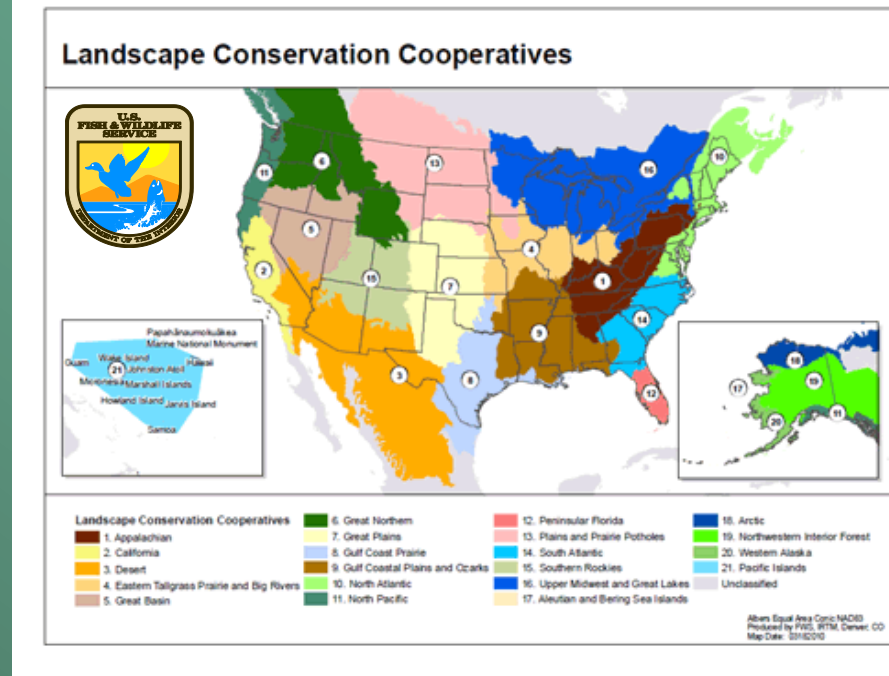
- implement partner-driven science to improve understanding of past and present land use change,
- develop relevant climate and land use forecasts, and
- identify lands, resources, and communities that are most vulnerable to adverse impacts of change from the local to global scale

Goal

By the end of 2012, for 50 percent of the nation, the Department will identify resources that are particularly vulnerable to climate change, and implement coordinated adaptation response actions.

Measures

1. Vulnerability Assessments.
2. Adaptation Strategy.
3. Data Collection and Integration



DOI/USGS Climate Science Centers (est. 2009)

http://www.usgs.gov/global_change/

U.S. Fish and Wildlife Landscape Conservation Centers:

<http://www.fws.gov/science/SHC/lcc.html>

**LCC-Desert: Christina Vojta LCC-Southern
Rockies: Kevin Johnson**

2011 CSC's

- SW CSC – Univ. of Arizona, lead consortium
(Contact, David Busch, dave_busch@usgs.gov)
- NC CSC – Colorado State Univ., lead consortium

A New Paradigm

- **Linking Physical, Biological, and Social Science**
- **Scenario/Forecasts of Future Possibilities**
- **Link Research, Modeling, Synthesis, and Monitoring in a Landscape/System Perspective**
- **Science Collaboration/Resource Management Collaboration**
- **Stakeholders set priorities/Provide Review & Feedback**
- **Share Data and Information**



Creosote scrub habitat (one type of preferred desert tortoise habitat) in the Mojave Desert. Ken Nussear, USGS.



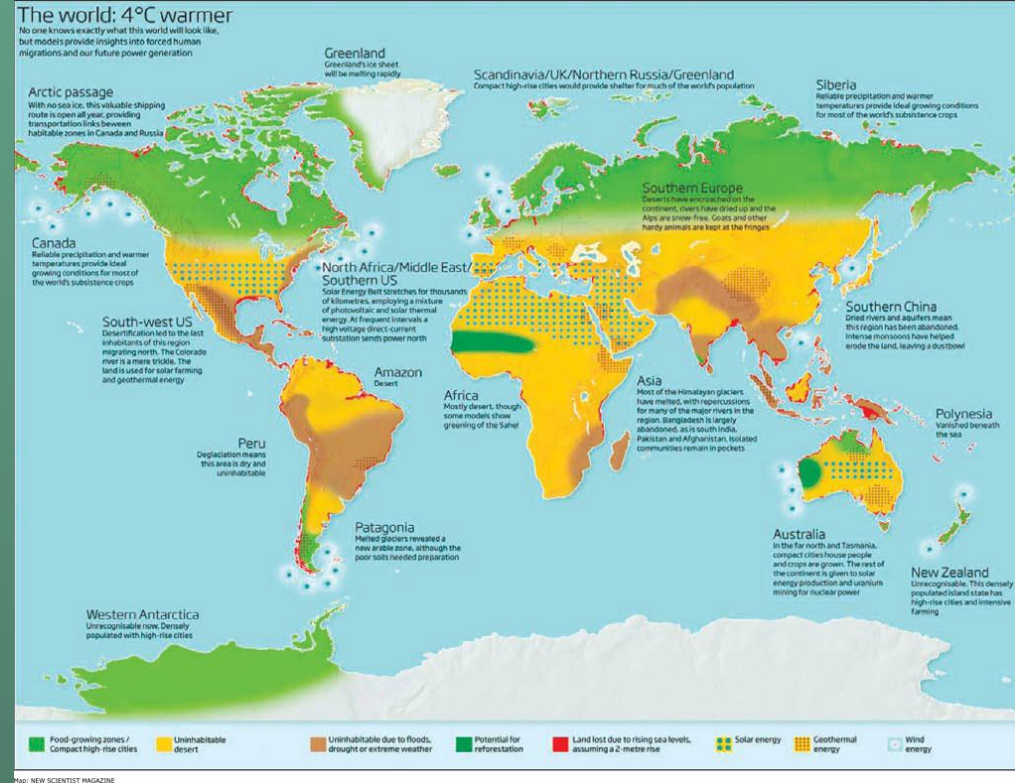
The salt marsh harvest mouse is a federal endangered species. Its salt marsh habitat could be highly impacted by sea-level rise (photo credit: M. Bias)

DOI LCCs and CSCs:

- public-private partnerships that recognize these challenges transcend political and jurisdictional boundaries
- more networked approach resource assessment and evaluation. Strategic Habitat Conservation (SHC)

CSC Science priorities:

- Assessments of current climate change information
- • Understand climate from natural effects on plants/animals
- • Synthesize forecasting of adaptation to climate change
- • Quantify species and habitat vulnerability
- • Develop clearinghouse & network capacity for data
- • Develop management tools



Climate Change Education Partnership
(CCEP) Program

Some examples of current CSC/LCC programs

Airborne Dust—Land-Use Management and Effects on Water Supply



Climate Models Forecast Future Water Supply



Fish Futures and Changing Riparian Habitat in the Colorado River Basin



Invasive Species & Fire: Great Basin Restoration Initiative Solutions :restoring native plants, reducing fire frequency



USGS WaterSmart Pursuing water sustainability in the US

DOI Water Smart Clearing House:

<http://www.doi.gov/watersmart/html/>

The WaterSMART Program is helping those working in water resource planning and management tackle America's water challenges. Use this clearinghouse to find and share Web sites providing information on water conservation and sustainability

***Surface Water Availability Studies** – In 2011, USGS will initiate studies and examine the challenges in high priority river basins such as:*

- *Colorado River Basin*

***Groundwater Availability Studies** – The WaterSMART availability and use assessment will require that regional groundwater availability studies be conducted in each of the 30 principal water-use aquifers of the U.S. These studies will be linked with surface water studies to improve our understanding of these as a single resource.*



AZWSC Programs

U.S.-Mexico Transboundary Aquifer Assessment Program U.S.

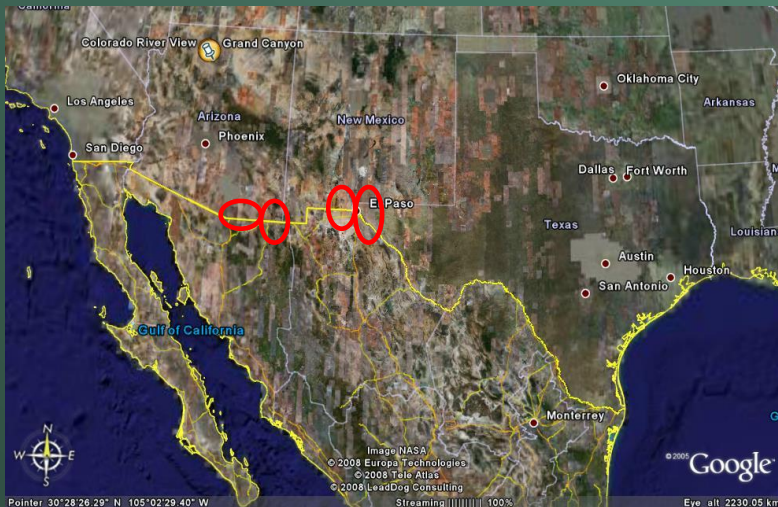
Public Law 109-448 (Dec. 22, 2006)

Legislated objectives

- Integrated scientific approach to assess priority transboundary aquifers
- Provide the scientific information needed by water managers and natural resource agencies on both sides of the border

Technical objectives

- Land-use, land-cover, hydrostratigraphy, and bedrock data sets
- **Trends in ground-water quality including salinity, toxins, and pathogens**
- **Flow and storage change along with human- and climate-induced effects**
- Calibrate numerical models to evaluate strategies to protect water quality and enhance supplies



USGS and TNC collaboration on freshwater issues

TNC support of a scientific foundation for water resources management and USGS scientific credibility in providing water information and developing general approaches that can be applied nationally



FOR:

Environmental flow components

- Daily variation
- Monthly variation
- High flow duration
- Minimum daily streamflow
- **Anthropogenic and climate change**

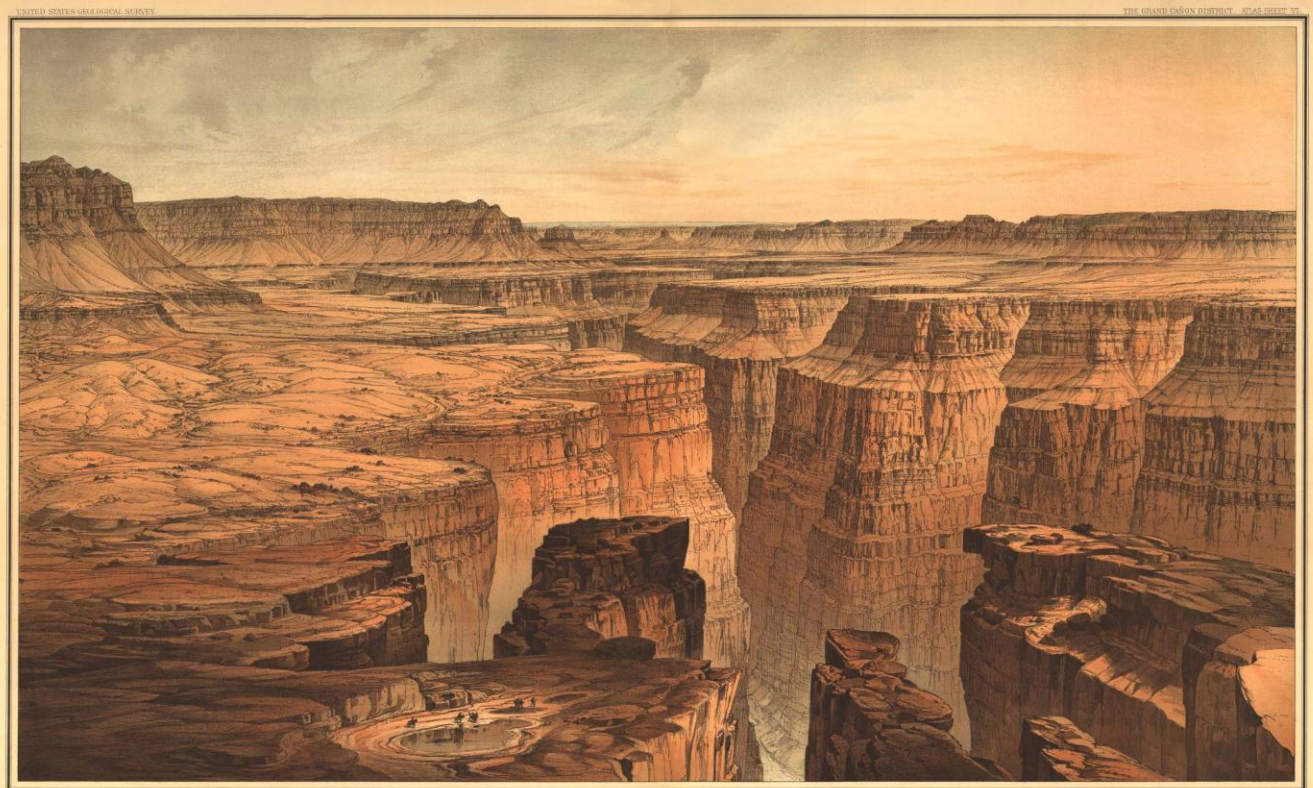
Questions?

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E-mail: djbills@usgs.gov

From USGS
Monograph 2,
1882



THE GRAND CANYON AT THE FOOT OF THE TOROWEAP-LOOKING EAST

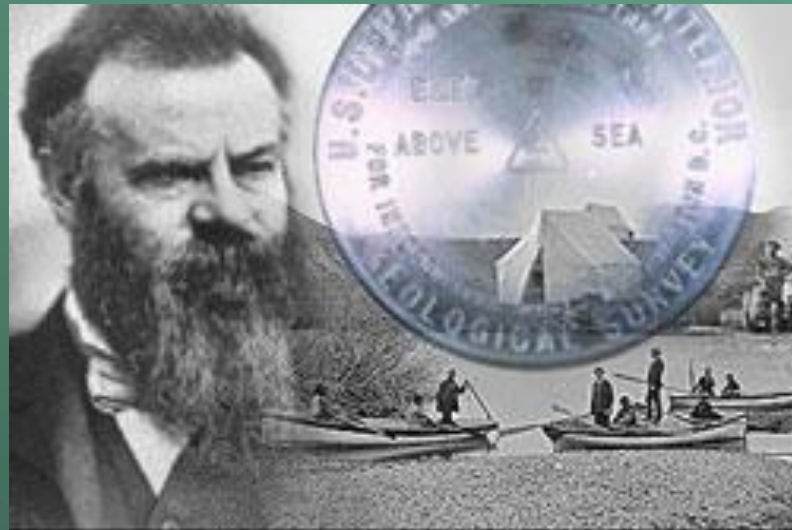
USGS, water resources, and climate change in the southwest

Powell Center

LCCs

CSCs

15 slides max.



Bureau of Reclamation – Reclamation is the largest supplier and manager of water in the 17 western States. The 2011 Reclamation budget includes \$62.0 million for water sustainability efforts through WaterSMART grants, basin studies, and water reclamation and reuse programs. for competitive cost-share grants that will fund the following types of on-the-ground water conservation projects Water marketing projects Water efficiency and conservation projects Projects that improve water management Pilot and demonstration projects that showcase the technical and economic viability of treating and using brackish groundwater, seawater, or impaired waters within a specific locale.

The Department's WaterSMART program is working to achieve a sustainable water strategy to meet the Nation's water needs. Integrate existing science efforts across Interior to focus resources on water availability questions.

- Set forth a strategy to answer the questions: 1) Does the Nation have an adequate quantity of water, with sufficient quality and timing-characteristics, to meet both human and ecological needs? 2) Will this water be present to meet both existing and future needs? Estimates of the distribution and abundance of freshwater resources over time.
- Evaluation of factors affecting water availability including energy development, changes in agricultural practices, increasing population pressures, and competing priorities for limited water resources. Assessments of water use and distribution for human, environmental, and wildlife needs.
- Estimates of undeveloped potential water resources such as saline and brackish water and wastewater.
- Data and information needed to forecast likely outcomes of water availability, quality, and aquatic ecosystem health due to changes in land use and cover, natural and engineered infrastructure, water use, and climate.
- A grant program to assist State water resource agencies in integrating State water use and availability datasets with Federal databases for a more comprehensive assessment of water availability.

