

Managing Watersheds – Short Term and Long Term Paths



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Colorado River Basin Climate

Paleo • Present • Future



Special Publication for Association of California Water Agencies and Colorado River Water Users Association Conference

November 2005

The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States

U.S. Climate Change Science Program
Synthesis and Assessment Product 4.3

Global Climate Change Impacts in the United States

U.S. GLOBAL CHANGE RESEARCH PROGRAM

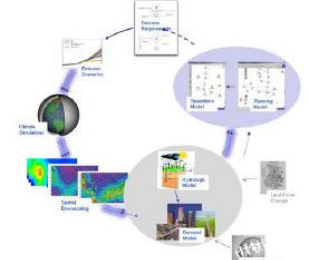


RECLAMATION

Managing Water in the West

Technical Memorandum No. 86-68210-2011-01

West-Wide Climate Risk Assessments: Bias-Corrected and Spatially Downscaled Surface Water Projections



CLIMATE CHANGE AND WATER

IPCC Technical Paper VI



Climate Change in Colorado

A Synthesis to Support Water Resources Management and Adaptation

A REPORT FOR THE COLORADO WATER CONSERVATION BOARD



Colorado
University of Colorado at Boulder

COLORADO CLIMATE PREPAREDNESS PROJECT FINAL REPORT

Prepared by
the Western Water Assessment
for the State of Colorado



Intergovernmental Panel on Climate Change



Climate Change Impacts

Water cycle has already been altered by climate change. The past century is no longer a guide to the future for water management.

- 2009 *Global Climate Change Impacts in the United States*

Modest declines for Colorado's high-elevation snowpack. Shifts in timing, intensity of streamflows and runoff.

Decreases in runoff.

Reductions in late-summer flows.

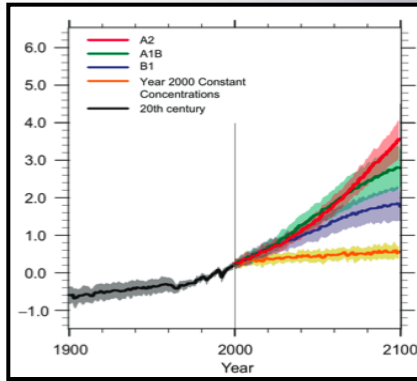
Increases in drought.

-- 2010 *Climate Change Preparedness Project*

Multi-model average reductions for the Colorado River runoff range from -6 to -20 percent by 2050.

- 2008 *Climate Change in Colorado*

Climate Scenarios: Sensitivity Studies



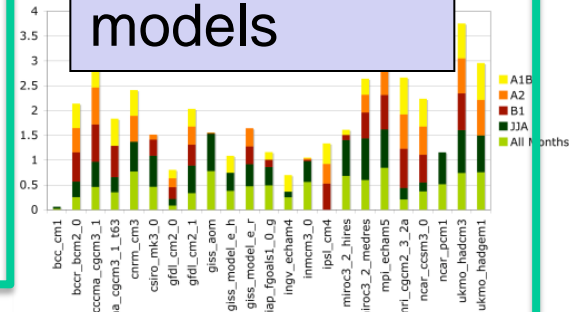
IPCC AR4 GCM projections

Hydrologic projections at watershed scale.

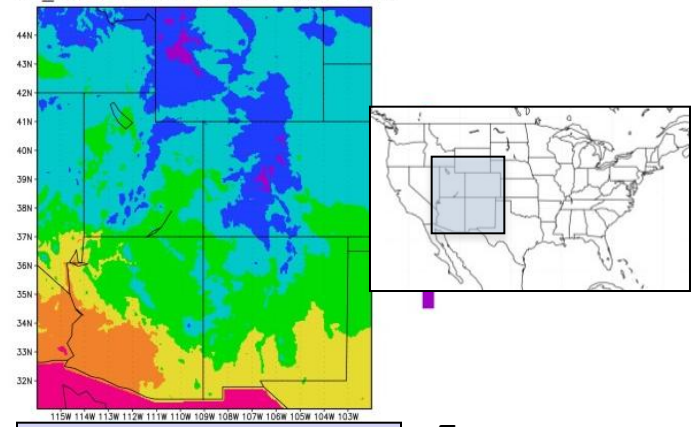


Water Management Models

Select the "best" models



MPI_ECHAM5 SRESA1B Winter 2075-2098

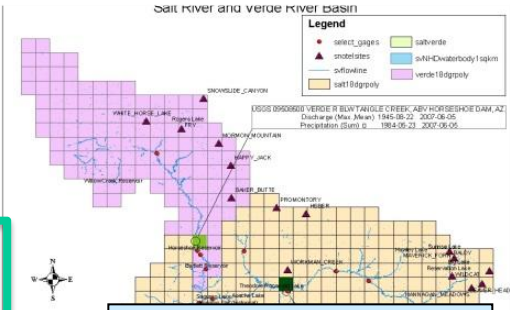


Spatial Downscaling

From approx. 200 km to 4 km.

Temporal Downscaling

From Seasonal to Daily



Hydrologic models

Evaluate Management Options

VUCA is the “New Normal”

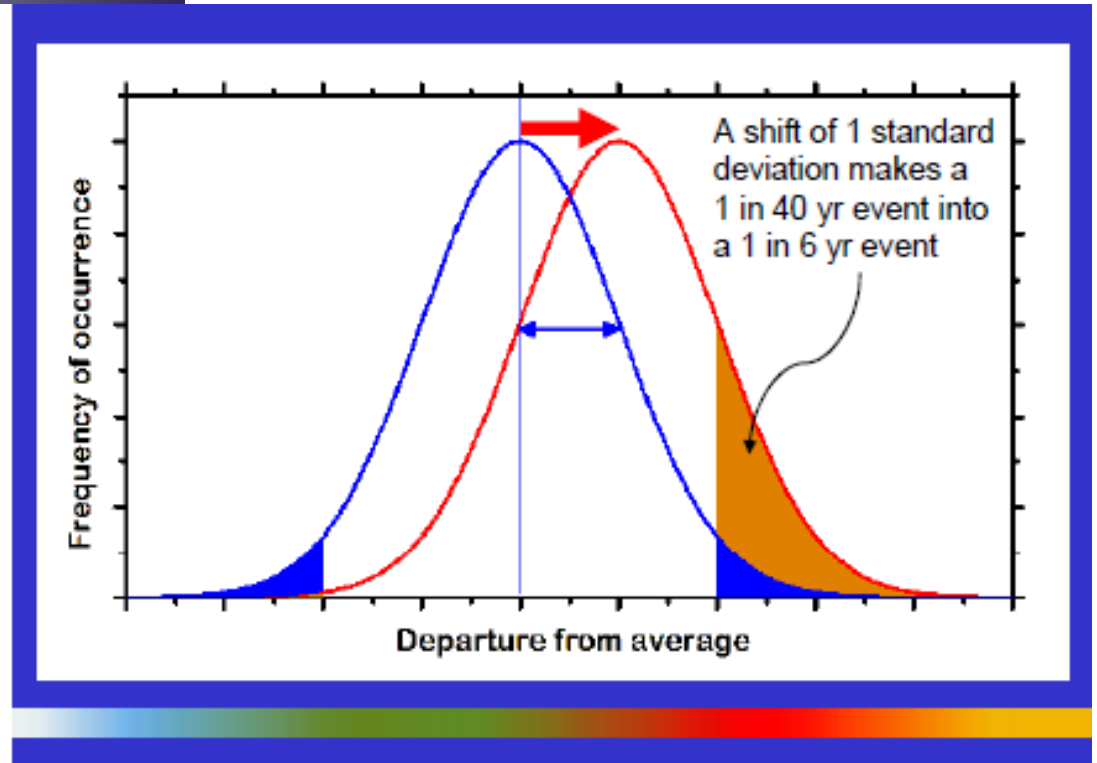
Volatility

Uncertainty

Complexity

Ambiguity

Institute for the Future



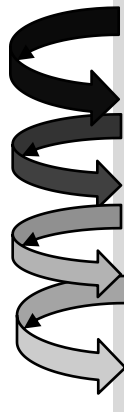
IPCC WG1

“Accept – really accept – that climate change will often be painful.”
(R.K. Craig, 2010)

Policy and management dilemmas: committing too soon vs. deciding too late.

Typical Planning

Planning for a Desired Future

- 
- Defining goals
 - Taking stock
 - Examining trends
 - Setting targets, thresholds
 - Directing management

Choosing Among Alternatives

Outcomes

A

B

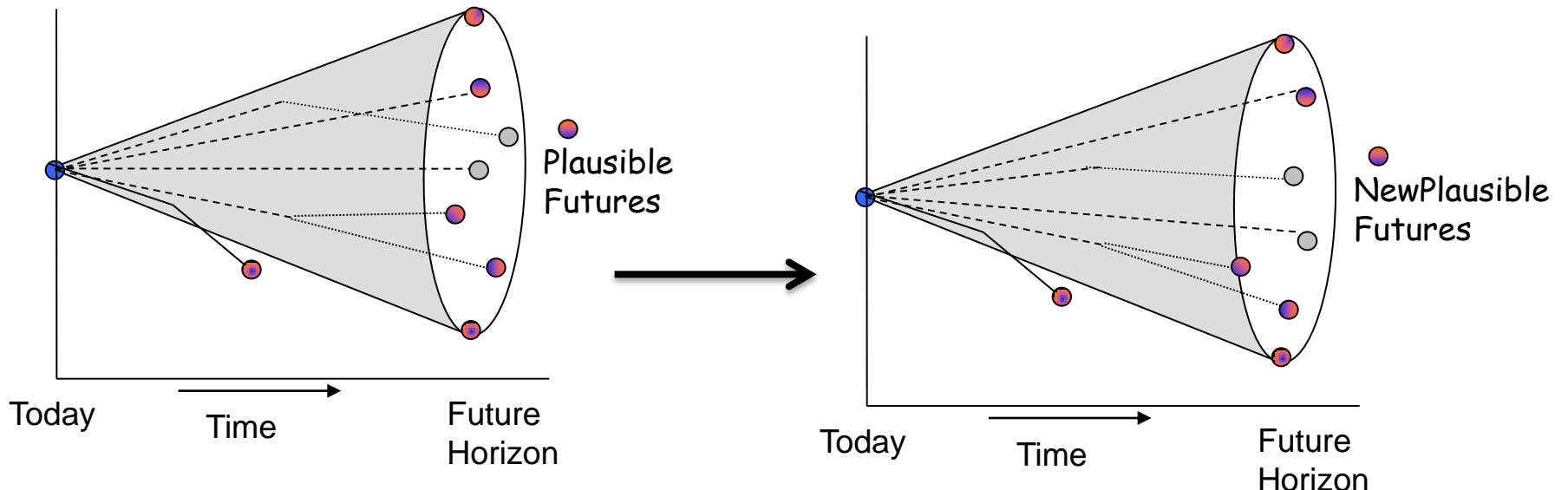
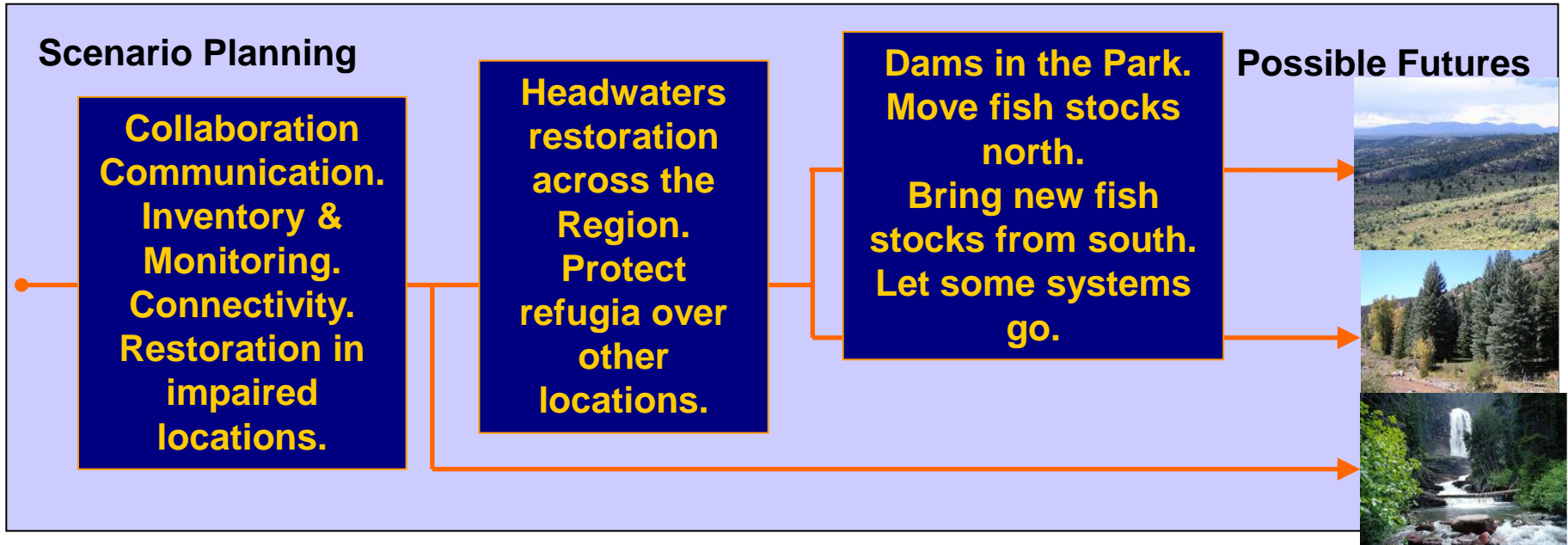
C

D

Joshua Tree NP: What would you do differently?



Scenario Planning



Scenario Planning

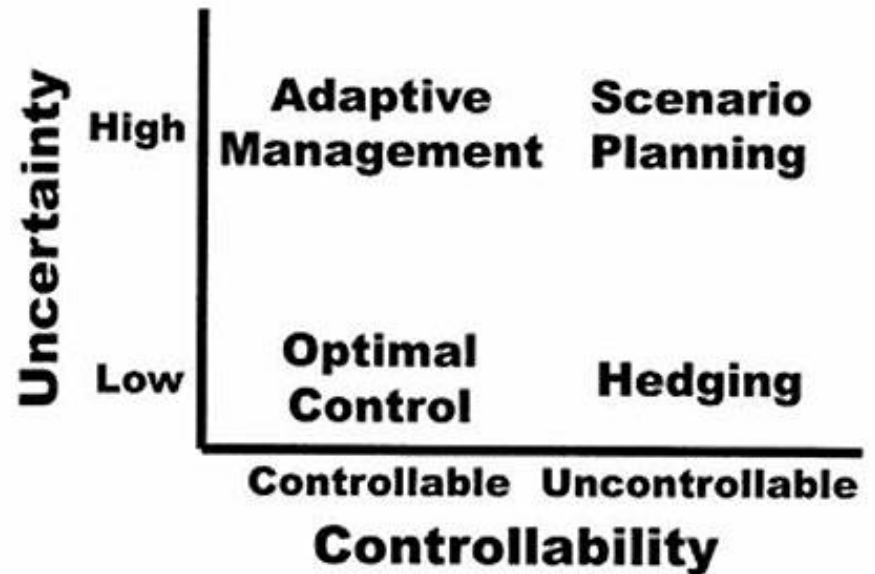
Goal: **Challenge thinking** about the future. Foster **strategic thinking** about responses to different possibilities.

Scenarios Are:

- A tool for long-term strategic planning
- Compelling narratives of alternative environments in which decisions may be played out
- Coherent, internally consistent, and plausible

Scenarios Are

- **Not** Predictions or Forecasts
- **Not** a method for arriving at the “most likely” future



Peterson et al., 2003. Conservation Biology