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Managing Water in the West

Summary of Past "Requirements" Surveys related to Workshop Theme:

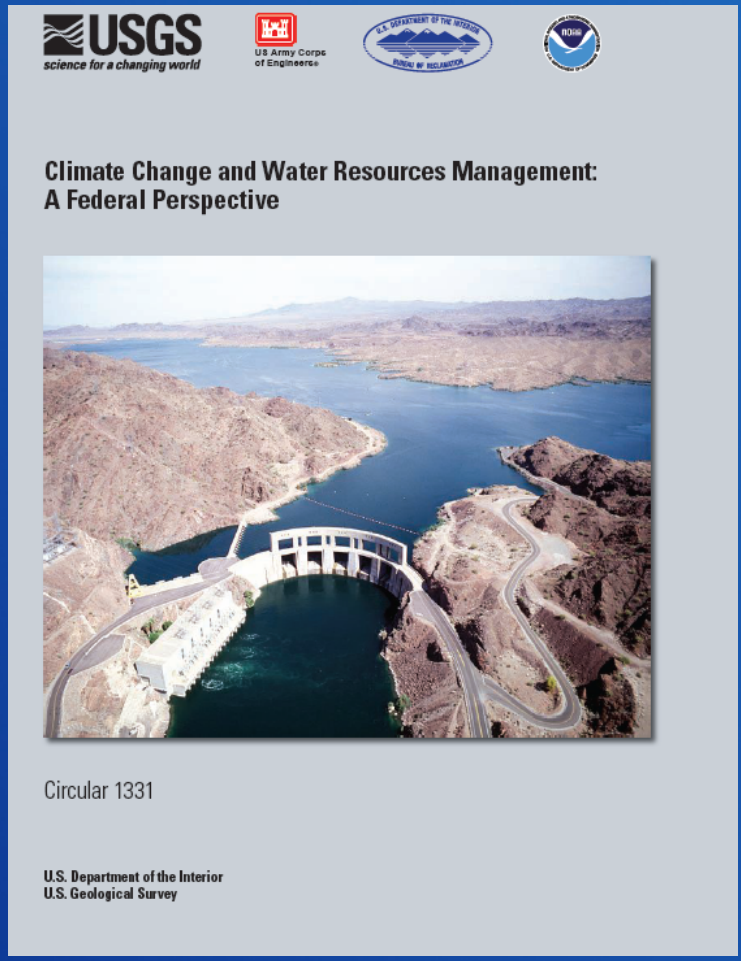
Understanding and predicting conditions associated with either too much or too little water

Levi Brekke, Reclamation Research and Development Office (Denver, CO) –
Water Cycle Science Challenge Workshop, Denver, CO – 30 Aug 2011

U.S. Department of the Interior
Bureau of Reclamation

Framing Thoughts

- Views on Climate Change Impacts and Hydrologic Nonstationarity has motivated several “needs” assessments related to Water Cycle Science
  - E.g., Circular 1331
- Common Themes among Needs Assessments
  - Better use of existing predictions
  - Better predictions
  - Better communication of risk and uncertainty during decision-support processes



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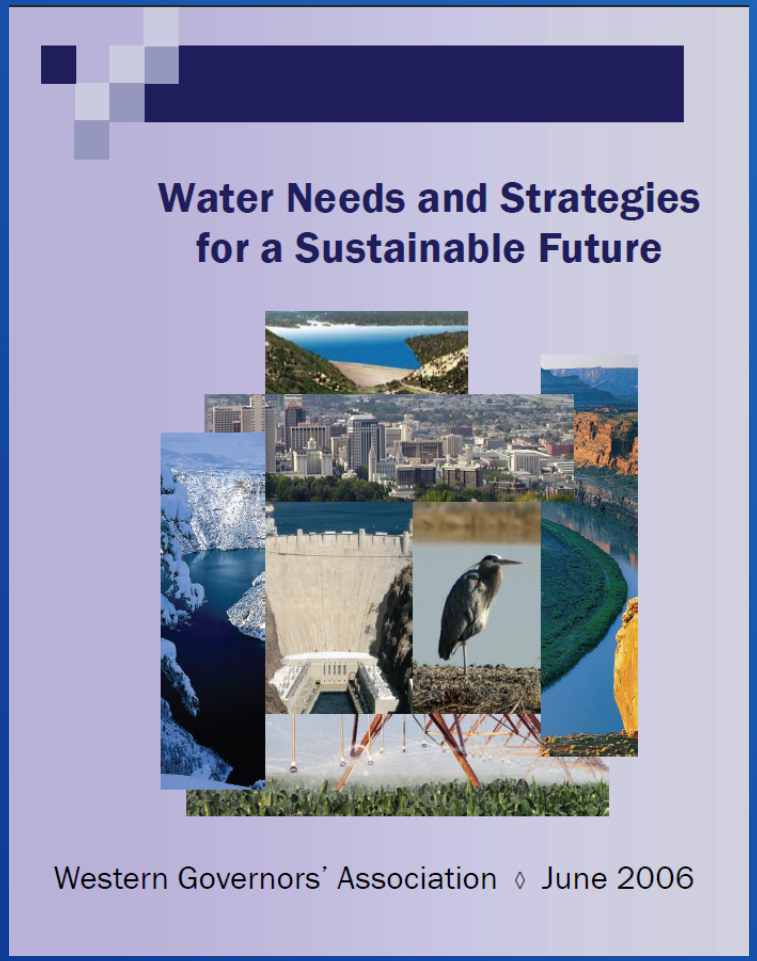
Framing Thoughts

- Requirements Surveys…
  - Tend to reflect the pressing or emerging issues facing those being surveyed
  - Tend to be good measures of relevance
  - Do not necessarily reflect research feasibility
  - May be limited if the survey targets people participating in a weak science-management nexus

- Many have been generated
  - Depth and Audience varies

Examples

- Western States Water Council 2006
  - Several Categories, including Preparations for Climate Change Impacts
  - Emphasized
    - enhanced hydrologic data collection
    - prediction/modeling/ impact assessment,



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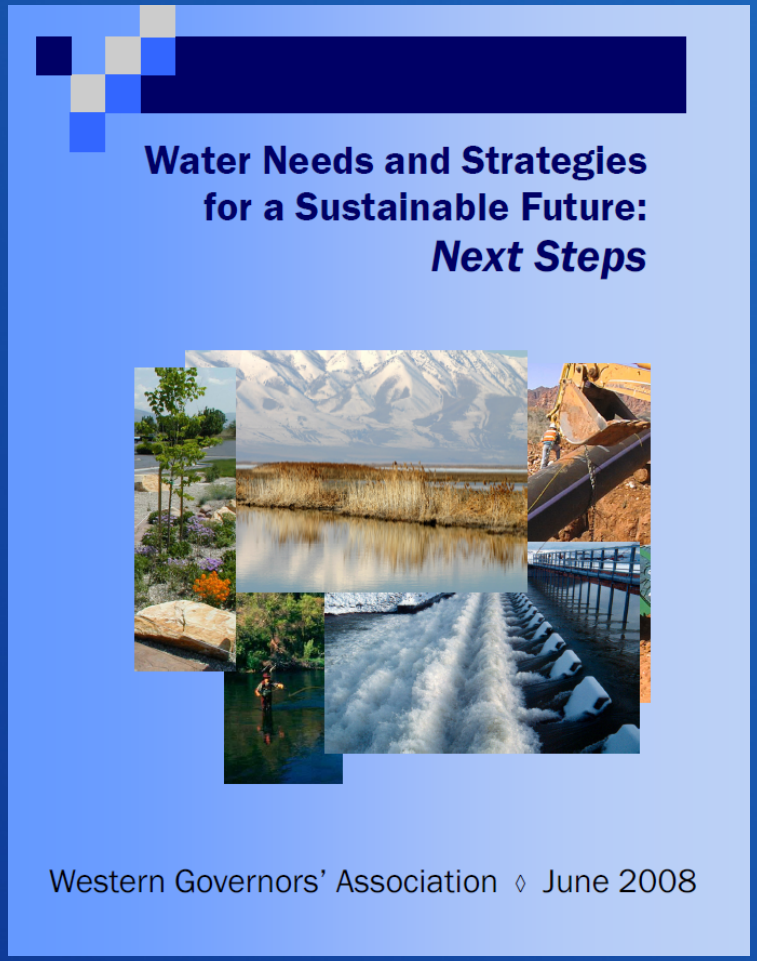
Examples

- Western States Water Council 2008
  - Built on 2006 effort
  - Expanded list of needs in several areas, including
    - Water planning & management (drought)
    - Climate Change Impacts (downscaling, monitoring)



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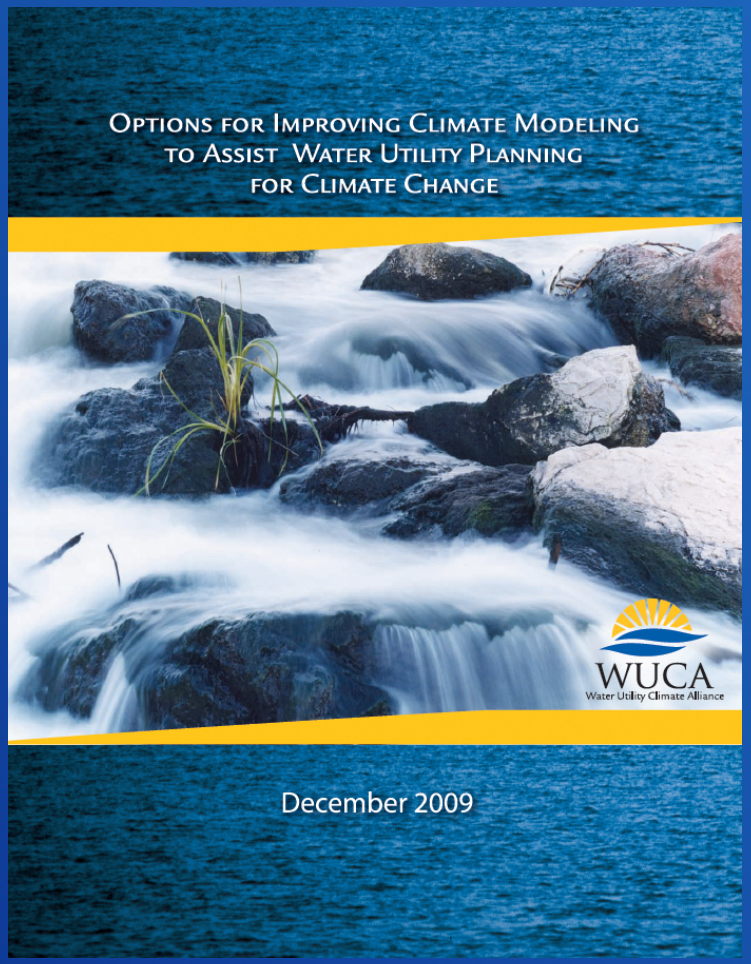
Examples

- Water Utilities Climate Alliance 2009
- Review of:
  - Case studies on Utilities' use of Climate Projections
  - State of Science in Climate Modeling
    - Global, Regional, and Statistical Downscaling
  - Prospects for improving Science



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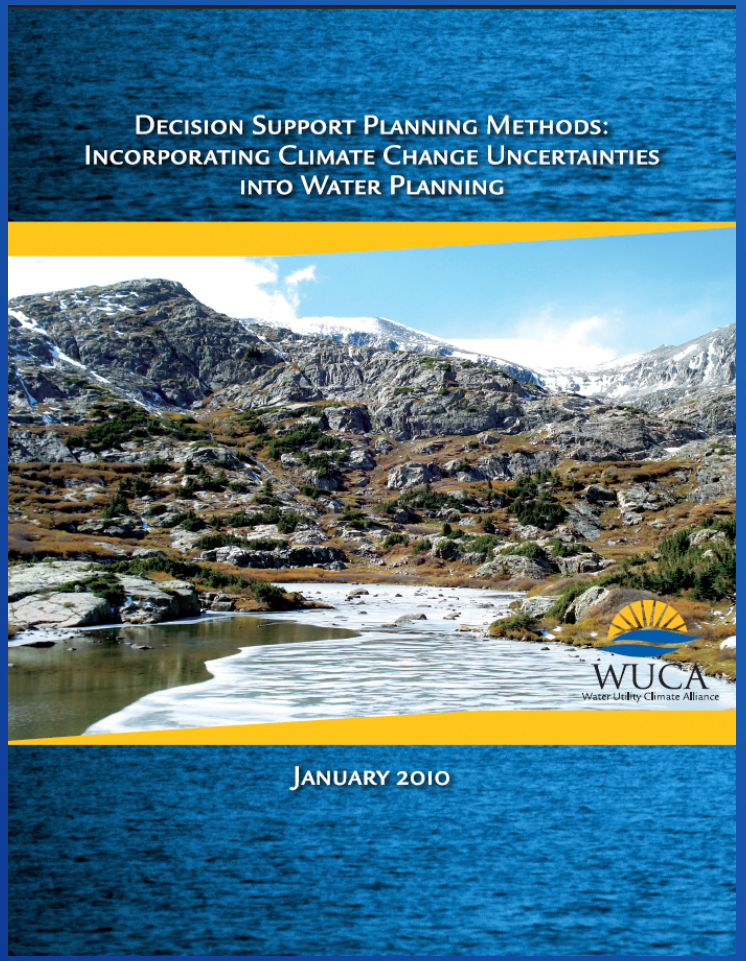
Examples

- Water Utilities Climate Alliance 2010
- Review of:
  - Decision-making frames for handling climate change uncertainties
  - Case Studies
  - Research Needs
    - E.g., info on data and modeling uncertainties



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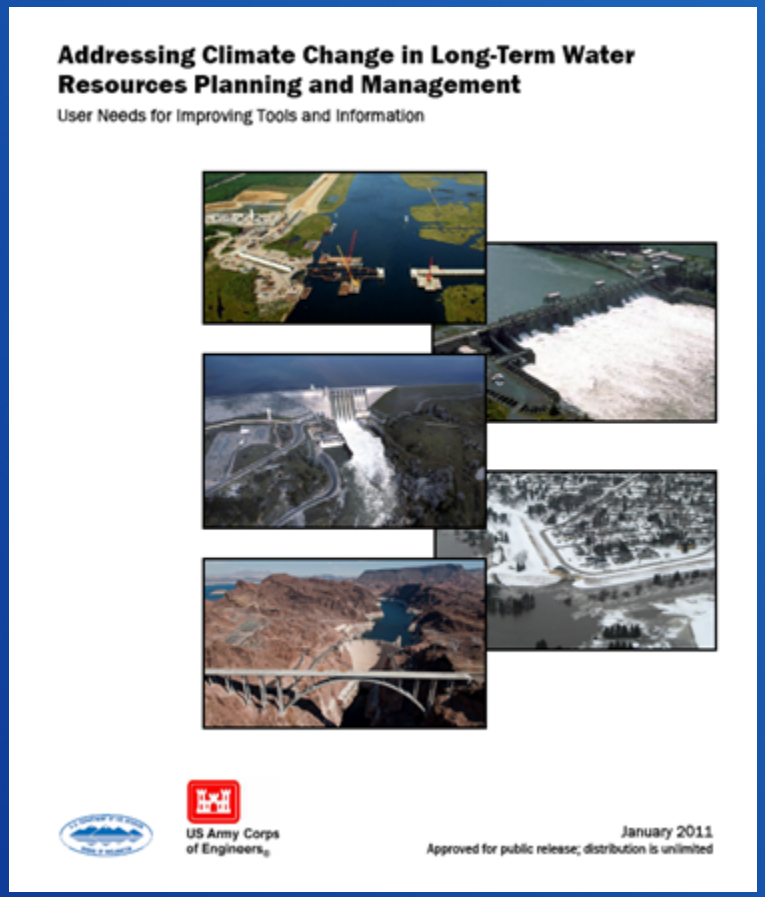
Examples

- WRF/NOAA/EPA/NASA/WERF/UCAR
  - The Future of Research on Climate Change Impacts on Water
    - Five topics, including Flooding and Wet Weather, Water Supply and Drought, and Water/Energy Nexus
- America's Climate Choices, Chap 17
  - Major Scientific and Technological Advances Needed to Promote Effective Adaptation to Climate Change
    - Higher level overview of needs related to adaptation, including several for the water sector (but none explicitly focused on better hydrologic prediction)

Examples

- Climate Change and Water Working Group
  - Reflects views from Reclamation, USACE, USEPA, FEMA, other federal and non-federal entities
  - Several “gap” subjects were shared to inform planning for this Workshop



Climate Change and Water Working Group (CCAWWG)

- Defining User Needs, Developing Research Strategy
- Fostering collaborative R&D
- Workshops on emerging topics (e.g., Nonstationarity)
- Developing Training Resources

CCAWWG Objectives

- Consolidate the Needs of the Water Management Community
  - Desired Capabilities, Current Capabilities, and Gaps
- Inform the Scientific Community
- Teamwork
- Flexible and Inclusive

CCAWWG Broader Strategy

- Part I: Addressing Climate Change in Long-Term Water Resources Planning and Management (**LTdoc**)
  - Part 1-A: Needs Assessment (Reclamation and USACE leads) - **COMPLETE (Jan 2011)**
  - Part I-B: Research Strategy to address User Needs (NOAA and USGS leads) – **ongoing, R. Webb's comments**

CCAWWG Broader Strategy

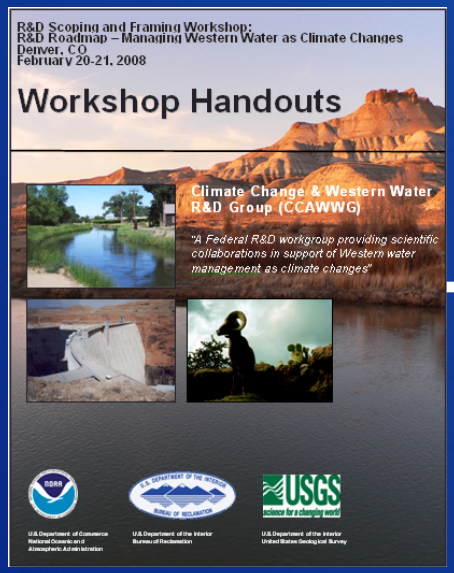
- Part II: Addressing Climate Variability in Short-Term Water Resources Planning and Management (**STdoc**)
  - Part II-A: Needs Assessment (Reclamation and USACE leads) - **expected early 2012**
  - Part II-B: Research Strategy to address User Needs (NOAA and USGS leads) – **expected Spring/ Summer 2012**

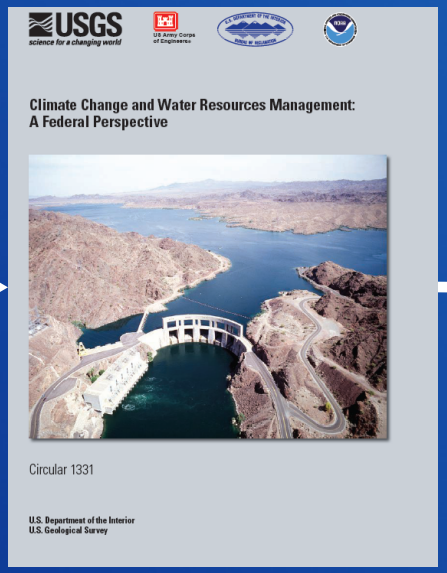
CCAWWG Audience

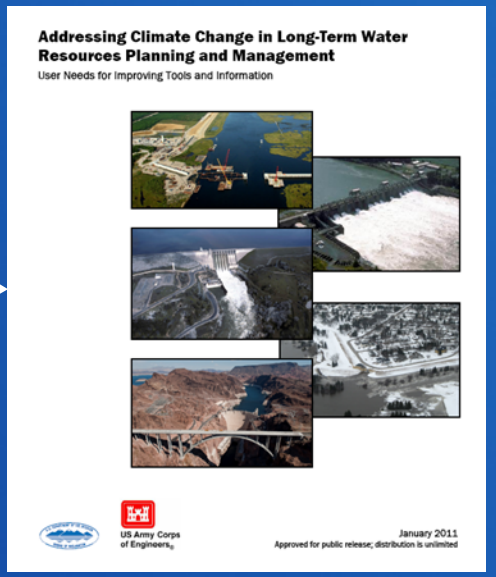
- Primarily entities in position to steer research to address capability gaps
  - CCAWWG Science Agencies (NOAA, USGS)
  - Broader community of federal and non-federal entities in position to support research

- Also the water management community on the matter of describing current capabilities, desired capabilities and gaps.

CCAWWG LTdoc







C-CAWWG February 2008 Workshop

USGS Circular 1331 January 2009

CCAWWG User Needs Document January 2011

http://www.usbr.gov/climate/userneeds/

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CCAWWG LTdoc "gaps" outlined using eight steps of a General Assessment

1. Summarize Relevant Literature

2. Obtain Climate Projection Information

3. Make Decisions about How to Relate Climate Projections Data to Planning

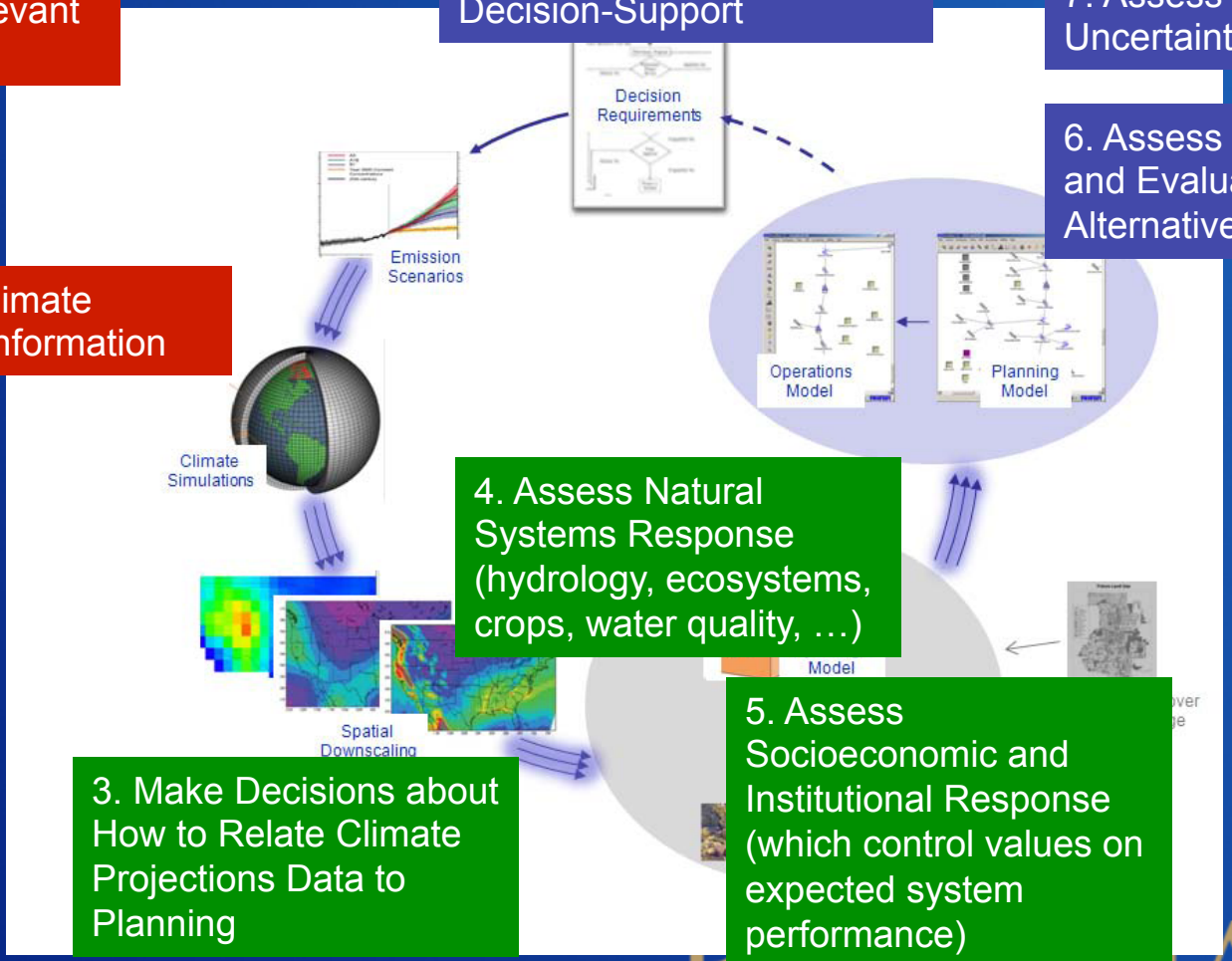
4. Assess Natural Systems Response (hydrology, ecosystems, crops, water quality, …)

5. Assess Socioeconomic and Institutional Response (which control values on expected system performance)

6. Assess System Risks and Evaluate Alternatives

7. Assess and Characterize Uncertainties

8. Communicate Results and Uncertainties in Decision-Support



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CCAWWG LTdoc: Responding Entities

- Perspectives invited from broad community of federal and non-federal *water management* entities (Section 3.1)

- Comments received from:
  - various Reclamation region & area offices
  - various USACE division & district offices
  - 9 Non-Federal entities
    - ASCE, AWWA, AMWA, CA DWR, CWEMF, Family Farm Alliance, Seattle City Light, WUCA, WGA-WSWC)
  - 5 other Federal entities
    - FEMA, FERC, NOAA National Ocean Service CSC, WAPA, USEPA (ORD, OW, Region 8))

CCAWWG LTdoc: Summary of Priorities by Step

Technical Step	Gap Category (aka Technical Step)	Average Priority for Category's Gaps (Low = 1, Medium = 2, High = 3)	Number of Gap Subjects
1	Summarize Relevant Literature	1.5	2
2	Obtaining Climate Change Data	2.4	5
3	Make Decisions about How to Use the Climate Change Information	2.7	6
4	Assess Natural Systems Response	1.9	13
5	Assess Socioeconomic and Institutional Response	2.3	3
6	Assess System Risks and Evaluate Alternatives	2.0	3
7	Assess and Characterize Uncertainties	2.6	5
8	Communicating Results and Uncertainties to Decision-Makers	3.0	2

[1] Averaged across gaps in a given Step
(1 = low, 2 = medium, and 3 = high)

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CCAWWG LTdoc Gaps related to this Workshop

- What are the "forcings" needed for NOAA hydrologic prediction services of the future, and for external partners?
  - Gap 3.05: Guidance on how to jointly utilize the longer-term climate variability from observed records, paleoclimate, and projected climate information when portraying drought and surplus possibilities in planning.
  - (no Gap #) Need for supporting current data collection networks and *understanding their adequacy* to support water management in a changing climate.

CCAWWG LTdoc Gaps related to this Workshop

- What are the “forcings” needed for NOAA hydrologic prediction services of the future, and for external partners?
  - Gap 3.06: Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.
  - Gap 4.03: …similar, focused on hydrologic event possibilities

CCAWWG LTdoc Gaps related to this Workshop

- What will NOAA's future hydrologic models consist of and how to develop them under the Integrated Water Resources Science and Services (IWRSS) interagency framework?
  - Gap 4.01: Guidance on strengths and weaknesses of watershed hydrologic models/methods to support planning
  - Gap 4.02: Understanding how climate change should impact potential evapotranspiration and how it is represented in watershed hydrologic models

CCAWWG LTdoc Gaps related to this Workshop

- What will NOAA's future hydrologic models consist of and how to develop them under the Integrated Water Resources Science and Services (IWRSS) interagency framework?
  - Gap 4.05: Understanding how climate change should impact groundwater recharge and groundwater interaction with surface water supplies

CCAWWG STdoc – Status and Preview

- Status
  - Reclamation led LTdoc effort; USACE is leading STdoc effort
  - USACE preparing “USACE-alone” version (~Nov 2011)
  - Reclamation will then expand document to reflect our unique perspectives, aim for broad peer review early 2012.

- Preview of Gap Themes (as used to invite FY12 S&T proposals)
  - Improved use of existing forecasts (weather, climate and/or hydrology) in the development of operations outlooks (e.g., improved use of forecast uncertainty through novel methods or tool development)
  - Development of better forecasts (weather, climate and/or hydrology) relative to current information products from Reclamation's forecast providers
  - Enhanced communication of uncertainties and risks associated with weather, climate and/or hydrologic predictions in the development of Reclamation's operations outlooks