Addressing Climate Change in Long-Term Water Resources Planning and Management

User Needs for Improving Tools and Information

Appendix C - Record of Perspectives Contributed by Other Organizations – Table Comments

U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION

US Army Corps of Engineers®

January 2011

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U.S. Army Corps of Engineers Civil Works Technical Series CWTS-10-02

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Under: USACE Campaign Plan Goal 2 and Bureau of Reclamation Science and Technology Program

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)	1			Maintaining a current bibliography of relevant papers would be an important and useful project. Agency coordination to reduce duplication of effort would be valuable. Although literature reviews are available through the IPCC and other groups, the lag in publication time and the fast pace of research in this area necessitates a real-time approach to accessing the most current information.	
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt Fed - NOAA			1		This information will be critical in evaluating potential natural system (ecosystem) and socioeconomic responses.	
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)	1			Would focus on Gap 1.2 first	
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)	1			Useful but can be accomplished by other means	

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1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.	1			Not sure if clearinghouse is necessary. Regional Climate impacts groups already have lots of climate change information.	
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt Fed - Reclamation	Carly Jerla (LC Region)		1			
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)		1		I recommend that the clearinghouse be highly focused and contain only the most current literature that informs the climate change analysis. It should cover the broader topics, with separate region-specific literature summaries maintained separately.	
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1			In general, the seems to be more applicable for water supply and river related applications. Would not apply quite as much to coastal activities.	

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1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District	1				
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt Fed - USEPA	NCEA, NRMRL, OW			1	Provides foundation; would help avoid duplication of effort and source of reliable information for water resource managers. A lot of people are asking for this, and many organizations have attempted to do their own version. A consolidated approach would be highly welcome - but not another standalone reinvention of the wheel.	
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager			1	The state of the art needs to be continually monitored, evaluated, documented, and easily accessed.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations	1				

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1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director	1			AWWA and AMWA would caution against the development of a new clearinghouse for climate change information. There are several clearinghouses in existence already including ones developed by both federal partners and water sector associations such as the climate change clearinghouse (www.theclimatechangeclearinghouse.org). Reclamation and USACE should consider partnering with one of these existing efforts to ensure that their needs are adequately met through the inclusion or identification of relevant information.	www.theclimatechangeclearinghouse.org
1.01	Summarize Relevant Literature	Access to a clearinghouse of climate change literature relevant to water management, or access to a bibliography of recommended literature to represent in literature syntheses.	Organization - Family Farm Alliance	Dan Keppen			1	A summary of any peer-reviewed reports or other support /criticism of documents by outside parties should also accompany any documents included in the clearinghouse.	

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1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)	1			The term "extreme" is often used differently between climatologists, hydrologists, and dam safety engineers. A literature review framework which uses a consistent definition of an extreme event would be valuable. Summarizing the statistical relevance and physical basis of the findings would also be helpful. Compiling the relevant research into summaries which could be used by multiple agencies would reduce duplication of effort. However, a consistent federal inter-agency opinion on climate change impacts in a given region would be difficult to obtain since researchers even within a single organization often publish studies with different and sometimes conflicting results.	
1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt Fed - NOAA			1		In coastal areas these types of efforts should be coordinated with regional committees established under the Interagency Ocean Policy task force. http://www.whitehouse.gov/sites/default/files/microsites/091209-Interim-CMSP-Framework-Task-Force.pdf	
1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)			1	Desired Capabilities: Would be helpful if these were incorporated into a Share Point system.	

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1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)		1		This information would be more useful & more time-consuming to obtain	
1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.			1	Most studies up to feasibility level warrant only a literature review of climate change. It is great to have one on the shelf. The one done by Levi Brekke as part of a recent S&T proposal is very useful for planning studies. Unfortunately it will become dated quickly.	
1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt Fed - Reclamation	Carly Jerla (LC Region)		1			
1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	This would be very valuable.	
1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District	1				
1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			

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1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt Fed - USEPA	NCEA, NRMRL, OW			1	Provides context for place-based work. Helps provide actionable climate change impacts at the local level decision-maker	Report on the U.S. EPA Southeast Climate Change Adaptation Planning Workshop, 2010, forthcoming (available soon-http://epa.gov/region4/clean_energy/conferences.html). EPA Region 4 is considering working with others to develop a southeast region climate change clearinghouse.
1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager			1	The state of the art needs to be continually monitored, evaluated, documented, and easily accessed.	
1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1		While regional information is useful, this would be most helpful if the information is searchable by subregions because climate change impacts will vary greatly across the PNW (e.g., westside vs. eastside of Cascade Mountains).	
1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources		1			

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1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations			1		
1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		While region-specific literature summaries will be helpful, we would suggest that Reclamation and USACE also consider watershed-specific literature summaries where appropriate. Water is typically managed on a watershed basis and in areas where watersheds can cross traditional regional boundaries (i.e. Colorado River), this approach to a literature summary might be more useful to water resource managers.	
1.02	Summarize Relevant Literature	Region-specific Literature Summaries, regularly maintained and peer-reviewed.	Organization - Family Farm Alliance	Dan Keppen			1	Peer review should be conducted by the National Academy of Sciences or another truly independent body and should conform to the requirements of the Information Quality Act (IQA).	
2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	Improvements in simulating regional and global climate, especially hurricane processes, the equatorial Pacific (i.e., ENSO), and other low-frequency oscillations (NAO, PDO, etc.) are critical for providing reliable climate projection information to water managers. In addition, feedback mechanisms such as the role of clouds in the energy balance of the planet and atmosphere need further consideration by the research community.	

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2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)			1	I agree with improving global and regional climate prediction capabilities would improve planners' inclination to incorporate them them into investigations. The reason for this distrust, that I hear so often, is the **uncertainty** factors of the climate models.	
2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Govt Fed - Reclamation	Michael Tansey, Regional Climate Change Coordinator		1		This work is important but will occcur without Reclamation support	
2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.	1			Not sure skill is what is necessary at this time. If you use a suite of outputs from GCMs the "skill" of an individual GCM is not that important.	
2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1	Data available thanks to Reclamation/LLNL/SCU effort. Will want next round of climate modeling (AR5) as accessible.	
2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	As part of the Upper Lakes Study, we are comparing the use of Regional Climate models for downscaling versus traditional statistical downscaling: http://pub.iugls.org/en/Other_Publications/IUGLS_Final_Report.pdf (see Chapter 7).	http://pub.iugls.org/en/Other_Publications/IUGLS_Final_Report.pdf
2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist			1		

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2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1	IMPERATIVE NEED FOR CLIMATE MODELS THAT CAN REALISTICALLY SIMULATE REGIONAL CLIMATE	
2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Govt Fed - USEPA	NCEA, OW		1		Useful mainly in a prediction-based decision framework (of course ultimately beneficial - but likely not achievable in the near term) 2- For precipitation specifically.	
2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager			1	This is the foundation of considering the effects of climate change and determining how best to adapt. Every other tool or data are built on this foundation.	
2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1	Having clearinghouse of climate projections would be good.	
2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources		1			
2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			

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2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director			1	When obtaining climate change data, it is necessary to consider outputs from a number of different global climate models instead of just relying on one model. Every climate model has a bias and using data from a single model may result in water resource plans that are not robust or resilient. Additionally, the method by which data is downscaled should be considered when evaluating data. The downscaling process can result in a generalized data set that does not account for localized impacts.	
2.01	Obtaining Climate Change Data	Improved skill in simulating long-term global to regional climate.	Organization - Family Farm Alliance	Dan Keppen		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	As stated on page 26 of the draft document, practitioners have the perception that the state of the science is not currently adequate to use downscaled information from GCMs for reliable water management decisions at small spatial and temporal scales. Improvements in the understanding of the physical linkages between climate drivers and hydrologic conditions are needed. Another approach (see research by Dr. Katie Hirschboeck) is to use a physically-based approach called "up-scaling" in which the synoptic patterns associated with observed extreme storm events are linked to climate conditions. Combining "up-scaling" with "downscaling" could improve our skill in projecting future hydrologic conditions under different climate scenarios as opposed to using "downscaling" alone.	
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Fed - NOAA					Coastal - regional to local scale for drougt and flood.	
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)			1	Directly related to Gap 2.3. If you have more finely downscaled data, you might run into challeges of undrstanding and portraying it correctly.	

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2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)			1	Additional daily climate variables such as CO_2, RH & U would be useful for simulating demands	
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.			1	This is important because most studies are local. Topography is very important.	
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1	Would like to have this data available at temporal scales needed for hydrologic models. For example, Reclamation/LLNL/SCU data was disaggregated to daily for VIC modeling.	
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1			Would be more useful at the regional scale.	
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		

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2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Fed - USEPA	NCEA, NRMRL		1		Potentially useful in various decision frameworks, but only if the downscaling adds real information that is meaningful in the given decision context.	
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Fed - USEPA	OW			1	I think a lot of people would like a central place to obtain downscaled data - but it should include data that uses various methods with explanations, caveats and guidance on how to use the info. 2.2 should be accompanied by 2.3	
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager		1		Important but secondary.	
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1	Current resolution limits ability to assess impacts to hydrology in local watersheds. Our organization would like to have daily- and monthly-time-step for hydrology data.	
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources			1		
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations			1		

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2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director			1	See comment on 2.01	
2.02	Obtaining Climate Change Data	Downscaled data at finer space and time resolutions and for different variables.	Organization - Family Farm Alliance	Dan Keppen		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	It is extremely important for water managers to understand the limitations of the information they employ when making decisions. This could be addressed by educating engineers and other practitioners on the types of methods available for obtaining climate information, and the assumptions inherent in those methods. The question of scale is extremely important. For example, if a hydrologist is concerned with peak streamflows, monthly data is not adequate. Depending on how the monthly data is downscaled into daily data, there may still be problems. Engineers have a tendency to rely on published datasets. If they don't understand how the values were estimated, they could be placing too much confidence in the results. Finally, understanding the methods would enable the water manager to evaluate the strengths and weaknesses of each approach. This would promote the use of the most appropriate methods for the given application.	

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Appendix C - Record of Perspectives Contributed by Other Organizations – Table Comments

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt Fed - NOAA	NCDC & NOS & CPC				Provide guidance on local SLR model output and tools.	
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)			1		
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)	1			Significant work has already been done on this topic	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
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2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.			1	Bias correction is a process which appears to use math tricks to create the illusion of good calibration. It is bothersome that a model which is heavily dependent on bias correction is used to predict flow into the future when there is no scientific reason behind the bias correction. More time should be spent on calibration. The problem is that time is usually short and it is not known to me if you get the same solution with a good calibration with minor bias correction as compared to a poor calibration with major bias correction.	
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt Fed - Reclamation	Carly Jerla (LC Region)			1	Information as it pertains to a regional level would be helpful.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist		1			
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt Fed - USEPA	NCEA, NRMRL, OW		1		Useful insofar as it may help us determine whether we can develop scenario datasets more cheaply (and therefore consider a much larger number of futures).	
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager		1		Important but secondary.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1	Our organization has limited capacity to assess the highly-technical climate model output strengths and weaknesses so having a resource that does this as new techniques are developed would be very helpful.	
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources			1		
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		When using global climate models, it is important to remember that water resource planning is done at a regional and local scale. Currently, GCM scales and downscaling methods are too large for most regional and local planning. Statistical downscaling is typically based on 100- to 1,000-year historical patterns but global climate change may result in new patterns that are unlike the past 1,000 years. Dynamic downscaling methods can be better at predicting these new patterns but are expensive and slow to develop. Methods need to be developed that allow for accurate, inexpensive and rapid downscaling of precipitation forecasts to specific watersheds or other relevant scale. It will be important that these modeling efforts address specific regional patterns. Reclamation and USACE are referred to a paper developed by the Water Utility Climate Alliance on the approaches to and needs for global climate modeling. Recognizing the needs of the end users of data from GCMs is key. Participating in the development of GCMs is necessary to obtain relevant data from the models that can be used for long-term water resources planning.	www.wucaonline.org

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
2.03	Obtaining Climate Change Data	Information on the strengths and weaknesses of downscaled data and the downscaling methodologies used to develop these data (including both statistical and dynamical methods, and associated approaches for climate model bias-correction).	Organization - Family Farm Alliance	Dan Keppen			1	Improved understanding and knowledge of existing water supply inventories, the interrelationships between surface and groundwater resources, and the impacts of predicted climate change on watersheds will be critical to water managers and at the local, regional, state, and national levels in adapting to and managing for climate change. Most of the recent reports and studies on climate change and water supply impacts suggest that federal agencies must focus on vulnerabilities and improve knowledge-based data collection activities. Current predictive models for future climate change scenarios, while useful in illustrating general areas of impact, are not particularly accurate at the local or regional scale. We support provisions in S. 2156 to improvement in streamflow measurement and data collection efforts. We also support the development of more cost-effective methodologies in accomplishing these goals.	

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					Low	Med	High		
2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)		1		One basic problem with dynamical downscaling is that we currently do not have a comprehensive physical understanding of extreme hydrologic events from the event up to the storm, to the mesoscale and synoptic weather patterns, to the climate conditions. In addition, until physicists solve turbulence, it will always be difficult to construct a robust model of turbulent heat and mass transfer which would be required for a complete physical solution to the problem. We are therefore left with approximations, which are typically based on matching our model to observations, which leads us to statistical approaches. One basic problem with statistical downscaling is that it lacks physical cause-and-effect relationships. A desired outcome would be a combined statistical-dynamical approach in which our best approximations of the physical processes (cause-and-effect) are combined with statistical correlations (i.e., the data are also statistically related). If the physical processes were better understood, changes in the relationships with changing conditions (nonstationarity) may become more tractable.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			
2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Govt Fed - Reclamation	Michael Tansey, Regional Climate Change Coordinator	1			Significant work has already been done on this topic	
2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.		1		The question on when has the climate changed enough to take a different action is a difficult one. In a very simplistic way it would nice to have a policy that the agencies should assume climate has changed and we should factor up or down historic flow data to reflect it. It would be great to have a national map, like the generalized skew coefficients map in Bulletin 17B, that shows how much to factor historic data to reflect the non stationarity of hydrology for each part of the country.	

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2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		
2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District			1		
2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			

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2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Govt Fed - USEPA	NCEA, NRMRL, OW		1		It doesn't necessarily follow that if we find flawed stationarity assumptions in our statistical downscaling that we then expect dynamical downscaling will be more valuable. It depends on what we're hoping to use the scenario data for.	
2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager		1		Important but secondary.	
2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1	same as comment above	
2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources			1		

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2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			
2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 2.03	
2.04	Obtaining Climate Change Data	Indication of conditions of where and when the stationarity assumption of statistical downscaling may not hold (defined above), and should motivate use of dynamical downscaling techniques rather than statistical.	Organization - Family Farm Alliance	Dan Keppen		1			

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	While consistency is usually good, programs or studies may require that different aspects, projections, or subsets of data be used for specific purposes. For example, one agency or program may be interested in designing for a "worst case" scenario while another agency may need to use a more moderate condition. Due to the dynamic nature of projecting future conditions, consistency in the near term may limit our flexibility in making updates over time.	
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Fed - NOAA NOS			1			
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)	1				
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Fed - Reclamation	Bonnie Van Pelt, Natural Resource Specialist				Land subsidence information/guidance; both processes need to be understood to inform long-term operational decisions of CVP.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)			1	Lots of information and USACE methods available; need consistent methods for investigating the failure of structures due to sea level rise/seismic events	
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.	1			It is difficult to see how sea surface elevation effects Reclamation projects.	
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Fed - Reclamation	Carly Jerla (LC Region)	1				
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)	1			Guidance has been produced by USACE and an ETL is underway. Not important for the Great Lakes and Ohio River Division, but recognize its important to the coastal regions.	
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist			1	How will this type of information be incorporated into the P&G that is currently being revised?	

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2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Fed - USEPA	NCEA, OW			1	Syntheses are good. Guidance is good, so long as it is guidance that is appropriately tailored to a particular decision context. For use by any agency planning in coastal areas, not just BuRec and ACE.	
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager		1		Important but secondary.	
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)	1			While it is a major problem, sea level rise is unlikely to affect our organization's infrastructure to significant degree.	

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					Low	*Med*	*High*		
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt State - CA Dept of Water Resources	Jamie Anderson, Ph.D., P.E.; Senior Engineer				A topic that would enhance section 2 would be the addition of the need for field monitoring. Topics could include long term monitoring, increasing monitoring at transition zones, use of satellite data, etc.	http://www.energy.ca.gov/research/notices/2008-08-20-22_25_research_plan_meetings/draft_papers/
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1			Duplicates NRC SLR study now being initiated for CA, OR, WA	
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 2.03	
2.05	Obtaining Climate Change Data	Synthesis of sea level projection information and guidance on consistent use in planning for all Reclamation and USACE coastal areas.	Organization - Family Farm Alliance	Dan Keppen		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	Most water managers recognize that the climate has historically experienced variability on many different timescales, from annual variations to decadal cycles on up. It is therefore difficult to interpret our relative position within the set of nested cycles. For example, a 10-year downward trend may be a fluctuation on an overall upward cycle at a larger timescale. Or, it may suggest that the larger upward cycle has ended and the downward trend will continue. Improvements in our understanding of the physical processes may shed some light on where we are within the larger cycles and patterns. One important point is that the levels of carbon dioxide in the atmosphere appear to be unprecedented (in historical times). Therefore, any historical fluctuations that may have occurred in the past would have been due to a different mechanism. A critical research gap is to translate the observed variability from different, unknown historical mechanisms into a reasonable prediction of variability under new mechanisms.	

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					Low	Med	High		
3.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)		1		If the inputs required for the hydrologic models were available, existing physical models of hydrologic processes should be adequate. However, the problem is determining the inputs to use for future, unknown conditions. This is directly related to the gaps above regarding GCMs and downscaling, although the multitude of input parameters for most hydrologic models is beyond the scope of the projections anyway. One goal for future research would be to improve our understanding of how storms are likely to change in different regions under future climate scenarios.	
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Govt Fed - Reclamation	Michael Tansey, Regional Climate Change Coordinator		1			

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3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.			1	There is a big push to allow reservoirs to be more full in the future to mitigate for droughts brought on by climate change. The effort to maximize storage conflicts with flood control requirements which are designed for extreme events. It is currently very difficult to justify adjusting historic peak flows to simulate future flood events.	
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist		1			
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District			1		
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1	A CRITICAL NEED FOR BETTER HISTORICAL(INSTRUMENTAL) AND PALEO CLIMATE DATA	
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Govt Fed - USEPA	NCEA, NRMRL			1	Additional research on variability and how it relates to existing planning assumptions should give us a lot of insights into adapting planning for the future.	Yang, Y.J. and J.A. Goodrich, "Timing and Prediction of Climate Change and Hydrological Impacts:Periodicity in Natural Variations" *Env.Geology, doi:* 10.1007/s00254-008-1392-z.

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager		1		Important but secondary.	
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1	Variability in temperature and hydrology is thought be a significant issue in our watersheds in the future.	
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources			1		
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.01	Make Decisions about How to Relate Climate Projections Data to Planning	Understanding on observed climate variability from daily to multidecadal time scales, which underpins interpretation of future variability in climate projections and it's relation to planning assumptions.	Organization - Family Farm Alliance	Dan Keppen		1			
3.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Organization - Family Farm Alliance	Dan Keppen		1			
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	An important consideration is that hydrologists and water managers are often concerned with the tails of the distribution, not the mean. Climate models that provide reasonable estimates of mean future conditions do not necessarily provide reasonable information about the extremes. As discussed on page 28 of the draft document, projected variability in estimates from hind-casted GCMs are often in poor agreement with observed variability. A desired outcome for research would be to improve the skill of climate models in defining the tails of the distribution of hydrologic variables.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)		1			
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.		1			
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	We are currently exploring this issue as part of the Upper Lakes Study.	
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt Fed - USACE-NWW	Mark Lindgren, Ch H & H Br., Walla Walla District (see Disclaimer footnote)			1	We need to be confident that our adjustmen for climate change is an improvement; Build verification checks into the approach; Don't let our need to take action cause us to make mistakes especially in the short term. We need to understand the risk of no action compared to the risk of the proposed action.	
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District					

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt Fed - USEPA	NCEA, NRMRL			1	This is a key question, about which there is a intellectual battle. The divergent viewpoints need to be aired and integrated. Need guidance on best application of various downscaling methods/approaches relative to the user's temporal and spatial scales.	
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager			1	Key application needed to plan for required adaptive measures.	
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1		

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Appendix C - Record of Perspectives Contributed by Other Organizations – Table Comments

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources		1			
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations			1		
3.02	Make Decisions about How to Use the Climate Change Data	Understanding on how to interpret future variability in climate projections and relevance to operating constraints on shorter- to longer-term time scales (from daily to multidecadal).	Organization - Family Farm Alliance	Dan Keppen			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)		1		By using all available climate projections in a large number of experiments, the average should be close to the expected value (according to the Law of Large Numbers). However, if all of the projections are relying on the same simplification, or assumption, or mistake in physical processes, the results will be biased. Therefore, it would make sense to evaluate the methods associated with the projections to determine their biases, simplifications, and assumptions. Guidance on which projections (and methodologies) are most appropriate for specific management applications would be useful.	
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)	1			Significant work has already been done on this topic	
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.		1		We need to get a range of outcomes for risk analysis. But each projection requires more work which takes time and $.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	We are currently exploring this issue as part of the Upper Lakes Study.	
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist		1			
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist					
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Govt Fed - USEPA	NCEA, OW		1		Probably not that useful unless we're more within a prediction-based decision framework Maybe rephrase: Guidance on how to select which climate projections, or range of projections, to use in planning. Seems related to 6.1	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1				
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1	Expert information on use of indiviudal or ensemble model output is important given the wide array of analyses being conducted by researchers.	
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			
3.03	Make Decisions about How to Use the Climate Change Data	Basis for culling or weighting climate projections (if at all) when deciding which projections to use in planning.	Organization - Family Farm Alliance	Dan Keppen		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Med	High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)		1		If the climate change paradigm has an influence on the outcome, it appears that additional testing of each method is needed. For example, the skill of each method in matching historical changes should be evaluated. An obvious point is that some changes are due to a step change or shift (favoring a Period-Change approach), while others are gradual (favoring a Time-Developing approach). Each method could be used for both types of nonstationarity to determine which one has greater error when misapplied. Although climate projections typically consider gradual changes (not shifts), historical changes have often occurred abruptly. If projections were to consider abrupt shifts, identifying the timing and mechanism of the shifts could be a difficult but important problem.	
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1		Do not have a comfortable understanding of these two paradigms in practice.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Govt Fed - Reclamation	Michael Tansey, Regional Climate Change Coordinator	1			The pro & cons of these approaches were discussed in the the report.	
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.	1			This is not a research issue. It is a policy issue. Do we use the climate change information to plan a project or not? It is possible to create a plan that may work well in the future, but it is tough to determine the time to implement the plan because natural variability masks the climate change. It is a lot easier to see in hindsight that the climate has changed but identifying that point in real time is very difficult..	
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Govt Fed - Reclamation	Carly Jerla (LC Region)	1				
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Med	High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1		There is some concern that climate change may affect the frequency or intensity of hurricanes in the Atlantic Basin. However, I could not find that this was mentioned in the draft report. I think this is an information need for those managing water resources in the Atlantic Hurricane Basin.	
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Govt Fed - USEPA	NCEA, OW			1	If you changed the word "guidance" to "research," then think this is a high priority.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager		1			
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1	Can standard analytical approaches be developed so that most appropriate technique is used and studies be compared?	
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1			Unclear on intent of this item	
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		It is important to realize that there will never be one perfect solution for long-term water planning in a changing climate. As previously stated, Reclamation and USACE should not rely on one GCM for a prediction of future climate. Instead, a suite of models should be utilized to develop a range of future options and then various planning scenarios should be developed to respond appropriately to each potential outcome. Integrating water resource planning with data evaluation, and responding with the appropriate solutions, will help Reclamation and USACE stay ahead of potential climate change impacts on our water resources.	
3.04	Make Decisions about How to Use the Climate Change Data	Guidance on how to appropriately relate planning assumptions to either Period-Change or Time-Developing aspects of climate projections, when deciding how to use projections in planning.	Organization - Family Farm Alliance	Dan Keppen			1		
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	See 3.1	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt Fed - Reclamation	Bonnie Van Pelt, Natural Resource Specialist				What is meant by "surplus" possibilities? Perhaps a glossary of terms would help inform readers with less technical background in the discipline areas being described.	
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)			1	This information would be useful for constructing more extreme scenarios to represent droughts and wet periods.	
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.		1		Paleo hydrology has much to offer in some circumstances like water supply studies. Not sure how to use it.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt Fed - Reclamation	Carly Jerla (LC Region)		1			
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)		1		We are currently exploring this issue as part of the Upper Lakes Study.	
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt Fed - USEPA	NCEA, NRMRL, OW			1	Provides a range of sources of information to support scenario planning approach. "Drought and surplus" are water supply constructs. Edit to say "drought and flood" (?) to capture changes in patterns of flow.	Chang, N., et al., "Development of the Metropolitan Water Availability Index (MWAI) and Short-term Assessment with Multi-scale Remote Sensing Technologies, *J of Env. Management* 2010, doi:10.1016/j.jenvman.2010.02.024
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
3.05	Make Decisions about How to Use the Climate Change Data	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.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources			1		
3.05	Make Decisions about How to Use the Climate Change Data	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.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.05	Make Decisions about How to Use the Climate Change Data	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.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director			1	Several drinking water utilities are developing their own set of paleoclimate data for use during water resources planning. Tree ring studies have been performed by Denver Water to assist with the identification of extreme drought conditions. Reclamation and USACE are encouraged to review this data or partner with research institutions to collect this type of data in areas where it does not already exist.	
3.05	Make Decisions about How to Use the Climate Change Data	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.	Organization - Family Farm Alliance	Dan Keppen			1	Our country has tremendous, but limited, resources available to fix our problems, so accordingly we must prioritize and sequence our actions. An initial priority research item should be a comprehensive validation of West-wide changes in climate change-driven streamflow.	
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	Some suggestions for research would be to improve our understanding of the physical processes associated with extreme hydrologic events, to combine downscaling with an "upscaling" framework (from the event => up to the storm => up to the weather patterns => up to the climate conditions), and to improve the statistical tools for nonstationary flood frequency analysis.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)	1			Although important, this seems a little more difficult and most likely highly uncertain to be spending significant research time on.	
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt Fed - Reclamation	Bonnie Van Pelt, Natural Resource Specialist				What are the opportunities that these "extreme" events present for helping to better predict events in the future? Events that were once considered "extreme" may someday be the norm. Regional predictive tools are exactly what Reclamation needs: how can we maximize the hydrology in the systems we manage to ensure confidence in our water supply predictions and allocations to water contractors.	
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)			1	This information would be useful for constructing more extreme scenarios to represent droughts and wet periods.	
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.			1	Working with extreme events is very problematic. Especially as related to flood control. Some project operation plans are based on a single large flood event. It is difficult to determine how that event would be different in the future. What will be the 500 year peak runoff in year 2080?	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt Fed - Reclamation	Carly Jerla (LC Region)		1			
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	Has significant relevance in the design of flood risk management projects and levee certification.	
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District					
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt Fed - USEPA	NCEA, OW		1		Maybe most useful only in prediction-based decision frameworks?	
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager			1	Important to update criteria used to protect/mitigate unacceptable risk.	
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1	Extremely important to our organization's operation of hydroelectric projects	
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources			1		
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director			1	This is currently a major gap in climate science. There is a need for research to explore the validity of statistical downscaling using weather generators as opposed to using dynamic regional models for downscaling of event. Also, a methodology is needed to anticipate the range of extreme events such as flooding and drought. This will be particularly critical when working with FEMA to address climate change in their regulatory activities.	
3.06	Make Decisions about How to Use the Climate Change Data	Method and basis for estimating extreme meteorological event possibilities, deterministically or probabilistically, in a changing climate.	Organization - Family Farm Alliance	Dan Keppen	1				
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt Fed - NOAA/NWS/OH & NOS				1	This information is critical to develop planning efforts at the regional or basin watershed scale which is a more appropriate scale for implementation than described in Gap 2.5	
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)	1			This information would be useful and much is already known on this topic.	
4.01	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Govt Fed - Reclamation	Michael Tansey, Regional Climate Change Coordinator			1		
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.	1			Hate to get into modeling wars. The uncertainty of climate change overshadows the uncertainty of models. Institutions like their own models, so probably will not change them. Agencies without models will seek simplicity and "good enough" answers rather than precision.	
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1	More specifically, need an understanding of hydrologic model parameters and how sensitive the model results are to adjustments in these parameters. Are some parameters more sensitvie than others? Also need to know how credible the assumptions are about how the parameters will be impacted to climate change. (Maybe these are additional gaps in this section?)	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)	1			Most of the widely used hydraulic and hydrology models have known strengths and weaknesses by experienced modelers.	
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt Fed - USEPA	NCEA, NRMRL, OW		1		Understanding our existing tools is crucial; there are some important issues here that are often overlooked Rephrase as guidance on how to assess strengths and weaknesses of models.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1				
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1		
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1			Would rank higher if applicable to items in addition to scoping planning decisions	
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.01	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of watershed hydrologic models/methods to support scoping decisions in planning.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		Reclamation and USACE are encouraged to turn to their fellow federal agencies to develop solutions to these problems. EPA, NOAA, USDA and USGS can assist in evaluating the impacts of climate change on watershed hydrology, water quality, ecosystems and land cover. State and local agencies have been involved in this type of research and could share their results with Reclamation and USACE. Other information on these topics has been developed by non-profit research organizations such as the Water Research Foundation.	www.waterresearchfoundation.org
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)	1			Isn't there significant research already out there on this?	
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Govt Fed - Reclamation	Michael Tansey, Regional Climate Change Coordinator			1	Such information would be useful for simulating soil moisture and runoff under altered climate conditions.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.		1		This is important in undeveloped regions like the forests. Not so important in farm country. ET will change, but crops will change too. The prior appropriation doctrine often dictates water withdrawals as much as need. Irrigators now often take there water right, they can not take more so will adapt.	
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	We have placed eddy-covariance instruments in Lake Superior and Lakes Michigan-Huron for first-ever direct lake evaporation measurements as part of the Upper Lakes Study to better understand this relationship.	http://www.gllka.com/education/beacon
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				

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4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District			1		
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Govt Fed - USEPA	NCEA, OW			1	This is process-level knowledge that relates to appropriate model structure, type and quality of available data, but a key concern for simulating future hydrologic change	
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager			1	Key to determining future shift in agricultural irrigation requirements and associated impacts on available water supplies and demands.	
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources		1		How different from literature review question above?	
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations	1				
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 4.01	
4.02	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact potential evapotranspiration, and how it is represented in watershed hydrologic models.	Organization - Family Farm Alliance	Dan Keppen		1			

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.06, but focused here on hydrology rather than meteorological variables)	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	See 3.06. Meteorology and hydrology are linked.	
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.4, but focused here on hydrology rather than meteorological variables)	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)	1				
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.04, but focused here on hydrology rather than meteorological variables)	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)			1	This information would be useful for constructing more extreme scenarios to represent droughts and wet periods.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to **Gap 3.6** but focused here on hydrology rather than meteorological variables)	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.			1	This is similar to 3.6, not 3.4. Working with extreme events is very problematic. Especially as related to flood control.	
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.4, but focused here on hydrology rather than meteorological variables)	Govt Fed - Reclamation	Carly Jerla (LC Region)		1			
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.4, but focused here on hydrology rather than meteorological variables)	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	Has significant relevance in the design of flood risk management projects and levee certification.	

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4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.4, but focused here on hydrology rather than meteorological variables)	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.4, but focused here on hydrology rather than meteorological variables)	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District			1		
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.4, but focused here on hydrology rather than meteorological variables)	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.4, but focused here on hydrology rather than meteorological variables)	Govt Fed - USEPA	NCEA, OW			1		
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.4, but focused here on hydrology rather than meteorological variables)	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager			1	Important to update criteria used to protect/mitigate unacceptable risk.	
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.4, but focused here on hydrology rather than meteorological variables)	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1	Estimating frequency and severity of extreme temperature and precipitation events is very important to our organizatio for assessing impacts to our hydroelectric projects	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.4, but focused here on hydrology rather than meteorological variables)	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources			1		
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.4, but focused here on hydrology rather than meteorological variables)	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations			1		
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.4, but focused here on hydrology rather than meteorological variables)	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 4.01	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
4.03	Assess Natural Systems Response	(Watershed Hydrology) Method and basis for estimating extreme hydrologic event possibilities, deterministically or probabilistically, in a changing climate. (Similar to Gap 3.04, but focused here on hydrology rather than meteorological variables)	Organization - Family Farm Alliance	Dan Keppen	1				
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	Research on the physical processes linking extreme flood events to mesoscale and synoptic weather patterns would be valuable. However, there are limitations on the datasets, including length of record and spatial distribution of stations. Categorizing the datasets for different uses would be beneficial. As a further area of research, exploring future weather under changing climate conditions for various regions would be extremely useful. This could include changes in the tracks of major storm systems, frequency of convective initiations, locations of semi-permanent highs, etc.	

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Appendix C - Record of Perspectives Contributed by Other Organizations – Table Comments

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Govt Fed - Reclamation	Michael Tansey, Regional Climate Change Coordinator		1			
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.		1		It is good to know which models produce the best calibrations for a specific region. Hate to give the same weight to a model which calibrated poorly and used bias correction to match historic flows. Would prefer to use a model that calibrated well and did not depend so much on bias correction.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
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4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)		1			
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Med	High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Govt Fed - USEPA	NCEA			1	Improving our understanding of existing tools, resources, models, datasets, etc. is important.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
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4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager		1			
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations	1				
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 4.01	
4.04	Assess Natural Systems Response	(Watershed Hydrology) Guidance on strengths and weaknesses of available versions of spatially distributed hydrologic weather data that may be used for both watershed hydrologic model development (Step 4) and in climate model bias-correction (Step 2).	Organization - Family Farm Alliance	Dan Keppen	1				

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	In terms of potential drought disasters, this could be an important area of further research.	
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)			1	Does not get much attention but, is needed for many areas in Great Plains region.	
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Govt Fed - Reclamation	Michael Tansey, Regional Climate Change Coordinator	1			This information would be useful but much is already known on this topic.	
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.		1		Not much has been done in PN Region with GW impacts.	
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Govt Fed - Reclamation	Carly Jerla (LC Region)		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Govt Fed - USEPA	NCEA, NRMRL, OW			1	Groundwater-surface water interactions have important implications for both current management and climate change impacts, yet are not well represented in most studies/models. In addition to direct groundwater/soilwater concerns, this is particularly important for understanding effects on low-flow streamflow events and stream temperature which are very important/limiting for many ecosystem endpoints	
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1			This activity could stand alone as a need to improve analytic capabilities in water resource investigation.	
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1	Groundwater-surface water interaction is very important for understanding impacts on aquatic habitats and biota, but is poorly understood in terms of how climate change will affect it.	
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 4.01	
4.05	Assess Natural Systems Response	(Watershed Hydrology) Understanding on how climate change should impact groundwater recharge and groundwater interaction with surface water supplies.	Organization - Family Farm Alliance	Dan Keppen		1			
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt Fed - NOAA				1	Specific attention should be provided on changes in salinity regimes relative to the distribution of spawning and nursery habitats of anadramous fish.	
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)	1				

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					Low	*Med*	*High*		
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt Fed - Reclamation	Bonnie Van Pelt, Natural Resource Specialist				Are we interested in life stage development impacts due to a rise in water temperatures? What biotic response are we interested in studying? Physiological responses to changes in hydrology and temperature; timing of spawning/migration; changes in anadromy; competition for spawning grounds and prey; non-native species invasions, etc.	
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)		1		This information would be useful but much is already known on this topic.	
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.					
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt Fed - Reclamation	Carly Jerla (LC Region)	1				
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		

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					Low	Med	High		
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist			1		
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District					
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt Fed - USEPA	NCEA, OW IO, OW OST			1	1- Now we're getting into sector-based prioritization (4.6 to 5.3) ... sure, they're all important to someone, or some part of EPA, etc. I'm not sure I can prioritize them. 2- The Clean Water Act protects aquatic life designated uses through protective water quality criteria. Knowledge of how climate change could alter ecosystems including the designated uses themselves and the conditions that they require would be critical information to protect uses that are threatened before water body impairment occurs. It would aid state and tribal water management agencies in prioritizing resources and management activities.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1			Too many variables (urban runoff, ocean harvest, management practices, etc.)	
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1	T&E anadromous fish species are associated with our hydroelectric projects and we need better information on range of climate change impacts. Need to assess direct impacts of water temperature and instream flows as well as indirect effects such as increased stream bed aggradation downstream of glaciers, relative to species' life cycle.	
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations	1				

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					Low	Med	High		
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director	1			See comment on 4.01	
4.06	Assess Natural Systems Response	(Ecosystems) Understanding on how climate change should impact inland and coastal anadromous fisheries.	Organization - Family Farm Alliance	Dan Keppen		1			
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Govt Fed - NOAA ORR				1	There should be a focus on assessment of changes in ecosystem services provided by these habitats and what appropriate mitigative actions to preserve and/or restore these functions could be.	
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			

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					Low	Med	High		
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Govt Fed - Reclamation	Michael Tansey, Regional Climate Change Coordinator			1	Reclamtion's Mid Pacific Region & TSC have been performing research & model developments which could be used to advance this understanding.	
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.					
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		

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					Low	*Med*	*High*		
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist			1		
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			

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4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Govt Fed - USEPA	NCEA, OW IO, OW OST			1	Vegetation health is intrinsically linked to aquatic life designated uses under the Clean Water Act, and water quality criteria protect vegetation and are based on the lastest scientific information. More specifically, sedimentation is a water quality criteria that more states and tribes may become interested in adopting as climate change and land use change create a greater awareness of the increasing threat to water resources and aquatic life from sedimentation impacts for direct and indirect (e.g., pathogens sorbed to sediment) water quality impacts. Impervious cover also remains a challenge to water quality management as pollutants originating on land are transported to water bodies, particularly during extreme events with deleterious effects.	
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1			Outside of scope.	

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4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources		1			
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations	1				
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 4.01	

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					Low	*Med*	*High*		
4.07	Assess Natural Systems Response	(Ecosytems) Understanding on how climate change may impact riparian ecosystems and vegetation that affect both longer-term water budgets and ecological resources.	Organization - Family Farm Alliance	Dan Keppen		1			
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Govt Fed - NOAA				1	Unclear why there is specific focus on non-native riparian vegetation unless for invasive species control. Again the focus should be on assessment and quantification (if possible) of changes in ecosystem services provided by habitats. Specific emphasis can be directed towards targeted or managed species however an ecosystem approach to management is more desireable.	
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Govt Fed - Reclamation	Michael Tansey, Regional Climate Change Coordinator			1	Reclamtion's Mid Pacific Region & TSC have been performing research & model developments which could be used to advance this understanding.	
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.					
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist			1		
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Govt Fed - USEPA	NCEA, OW IO, OW OST			1	See Clean Water Act comments to 4.6. Steps 4.6 and 4.7 need to happen first. Restate as Understanding on how water quality depends on climatic variables and the interaction with land cover, land use, and other variables.	

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4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1			Outside of scope.	
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			

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Appendix C - Record of Perspectives Contributed by Other Organizations – Table Comments

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
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4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director	1			See comment on 4.01	
4.08	Assess Natural Systems Response	(Ecosystems) Understanding translated into model frameworks for assessing climate change responses for fisheries, non-native riparian vegetation, and other species or habitat conditions.	Organization - Family Farm Alliance	Dan Keppen		1			
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Govt Fed - NOAA CSC					Coastal vegetative change analysis (CCAP) needs to be incorporated into model efforts.	
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)		1			
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.					
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		

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4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Govt Fed - USEPA	NCEA, OW			1	sector-based, hard to prioritize	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
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4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1			Outside of scope.	
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)	1				
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations	1				

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 4.01	
4.09	Assess Natural Systems Response	(Land Cover) Understanding on how climate and/or carbon dioxide changes should impact land cover communities that control natural evapotranspiration and soil erosion potential.	Organization - Family Farm Alliance	Dan Keppen			1		
4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Govt Fed - NOAA NOS CSC				1	Impacts from sea level rise on hazardous material storage facilities, including hazardous waste sites, should be evaluated from a socioeconomic and natural systems (ecosystem) perspective. Risk analysis for public financed infrastructure in high hazardous areas.	
4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.10	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Govt Fed - Reclamation	Michael Tansey, Regional Climate Change Coordinator			1	Reclamtion's Mid Pacific Region has been performing research & model developments which could be used to advance this understanding.	
4.10	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)			1	The influence of changes in upland fires on basin sediment yield should also be examined	
4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.			1	There are few river/reservoir system water quality models. Water quality monitoring and modeling is in drastic need for upgrading. Staff needs experience and training with this. Lots of work needs to be done. Seems like primarily a EPA function but Reclamation needs expertise.	
4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
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4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		
4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		

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4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Govt Fed - USEPA	NCEA, NRMRL			1	There is a lack of research regarding climate change impacts on water quality to protect designated uses (being management objectives in state, tribal, and territorial water quality standards for individual surface waters, e.g., aquatic life is a category of designated uses). This originates from the basic uncertainty in GCM precipitation projections and their compounded uncertainty when this information is used to drive hydrologic models. The focus of the output for these hydrologic models in most cases is water supply but OW is interested in how this will impact water quality, not just quantity, and if current water quality standards under the Clean Water Act are sufficient to protect human health and the environment. Climate change induced temperature and flow changes may result in drought, erosion, increased toxicity of certain pollutants, and the introduction of greater pollutant loads for many nonpoint source pollutants (e.g., nutrient, sediments, pathogens). Additionally, some of the present water quality standards (WQS) may be defined too broadly to adequately protect aquatic life or human health (e.g., the use “cold water fisheries” does not specify the biological components of use) while some uses may not be practicably attainable in the future. More information on potential impacts could help states	Tong. S.T.Y, et al., "Climate Change Impacts on Nutrient and Sediment Loads in a Midwestern Agricultural Watershed, *J of Environmental Informantics,* 9(1) 18-28, (2007)

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1			Will be dependent on improvements to other capabilities.	
4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources			1		
4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations	1				

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4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director			1	Much of the climate change research in the drinking water community has been on the impacts on water availability. Water managers also recognize that there will be impacts to water quality. However, research in this area has not proceeded with the same intensity as that on water availability. Reclamation and USACE are encouraged to support research on climate change and water quality either through one of their federal partners or outside research entities.	
4.10	Assess Natural Systems Response	(Water Quality) Understanding on how water quality characteristics depend on climatic variables, and how dependencies may evolve in a changing climate.	Organization - Family Farm Alliance	Dan Keppen		1			
4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			

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4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.	1			This is important in undeveloped regions like the forests. Not so important in farm country. ET will change, but crops will change too. The prior appropriation doctrine often dictates water withdrawals as much as need. Irrigators now often take there water right, they can not take more so will adapt.	
4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)		1			
4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				

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4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			
4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Govt Fed - USEPA	NCEA			1	sector-based, hard to prioritize	
4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager		1			

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4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)	1				
4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			

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4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		Reclamation and USACE are encouraged to turn to their fellow federal agencies to develop solutions to these problems. EPA, NOAA, USDA and USGS can assist in evaluating the impacts of climate change on watershed hydrology, water quality, ecosystems and land cover. State and local agencies have been involved in this type of research and could share their results with Reclamation and USACE. Other information on these topics has been developed by non-profit research organizations such as the Water Research Foundation.	www.waterresearchfoundation.org
4.11	Assess Natural Systems Response	(Consumptive Use in Irrigated Areas) Understanding on how climate and carbon dioxide changes should impact plant physiology, how impacts vary with crop type, and how impacts affect irrigation demand.	Organization - Family Farm Alliance	Dan Keppen			1	The potential water impacts associated with use of alternative fuels must also be studied. Another growing demand that will be placed on Western water resources is driven by power requirements. The total water consumed by electric utilities accounts for 20 percent of all the nonfarm water consumed in the United States. By 2030, utilities could account for up to 60 percent of the nonfarm water, to meet the water needs required for cooling and pollutant scrubbing. This new demand will likely have the most serious impacts in fast-growing regions of the U.S., such as the Southwest.	

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4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Govt Fed - NOAA			1		This gap is applicable to water quality endpoints and natural system responses, including habitat quality for anadramous fish.	
4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			
4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.	1			There are lots of unknowns about how climate change will effect sediment. Not sure it is important. Plant cover will change along with climate.	

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4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)		1			
4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist			1		

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4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			
4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Govt Fed - USEPA	NCEA, OW-IO, OW-OST			1	Not just sediment, but other pollutant loadings as well. Suspended and bedded sediments are a water quality concern for which criteria is being developed in many states. Changing runoff patterns and more intense precipitation events will alter sediment transport by potentially increasing erosion and runoff. It would be advantageous to further evaluate the degree of the impact in order to develop criteria and standards comensurate with the impact.	

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Appendix C - Record of Perspectives Contributed by Other Organizations – Table Comments

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager					
4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			
4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 4.11	
4.12	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate and/or land cover changes will change watershed sediment yield, changes in sediment constituency, and the resulting impacts on water resources.	Organization - Family Farm Alliance	Dan Keppen		1			
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.		1		The likelihood of rain-on-frozen ground should be explored.	
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Govt Fed - Reclamation	Carly Jerla (LC Region)		1			
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District	1				

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Govt Fed - USEPA	NCEA			1	sector-based, hard to prioritize	
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1				
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1	Streambed aggradation and increased sedimentation in reservoirs from loss of glaciers in North Cascades is a potential impact in our watersheds.	
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations	1				
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 4.11	
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.	Organization - Family Farm Alliance	Dan Keppen			1		
4.13	Assess Natural Systems Response	(Sedimentation and River Hydraulics) Understanding how climate, land cover, and/or sedimentation changes will affect river and reservoir ice-event potential.							

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Appendix C - Record of Perspectives Contributed by Other Organizations – Table Comments

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	As discussed on page 46 of the draft document, generating and providing information to state and local decision makers would support local adaptation efforts. Although Flood Insurance Rate Maps (FIRMs) prepared for implementation of the National Flood Insurance Program use existing conditions, local communities can manage increased flood risks due to future conditions. Research activities which would provide improved projections of future flood risks under changing climate conditions for various regions of the nation would be extremely useful for local floodplain management efforts.	
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Govt Fed - NOAA NOS				1	Specific analysis on flood protection for facilities that store hazardous materials and hazardous waste sites need to be considered from a water quality standpoint. Risk analysis for public financed infrastructure in repetitive loss coastal areas.	
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1		same as comment in 5.2	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Govt Fed - Reclamation	Michael Tansey, Regional Climate Change Coordinator		1		This understanding could useful to examine economic benefits of flood protection	
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Govt Fed - Reclamation	Carly Jerla (LC Region)		1			
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist			1		
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Govt Fed - USEPA	NCEA			1	These socioeconomic research needs are highly ranked because we're simply lagging so much in integrating social sciences into climate change work.	
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1				
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			
5.01	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect flood risk reduction and reservoir regulation objectives in a changing climate (e.g., flood protection values, land management).	Organization - Family Farm Alliance	Dan Keppen			1		
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Govt Fed - NOAA				1	Impacts from sea level rise on hazardous material storage facilities, including hazardous waste sites, should be evaluated from a socioeconomic and natural systems (ecosystem) perspective. Risk analysis for public financed infrastructure in repetitive loss coastal areas.	
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)			1	I would think as water becomes more and more controlled and scarce, this aspect would be extremely important and a major driver in water management.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)			1	For project planning activities, understanding the interactions of climate and socioeconomic factors is important and has not had lots of attention focused on it.	
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Govt Fed - Reclamation	Carly Jerla (LC Region)			1	Need a better understanding on how socioeconomic factors related to climate change may affect all resources (deliveries, hydropower, recreational, environmental, etc.) that Reclamation operates for. This will help us better understand future water demands of these resources.	
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District					
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Med	High	Your Perspectives	Optional: Citation or Link to Supporting Information
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Govt Fed - USEPA	NCEA, OW			1	sector-based, hard to prioritize	
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1				
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director			1	This is an extremely important component of water resources planning. The state and local level is where most of the decisions are made regarding water management. Knowledge on historical socioeconomic and institutional responses is part of the day-to-day operations of a drinking water system. This information is vital to the development of a robust long-range water resources plan by Reclamation and USACE. Without information on changes in societal behavior, water demands or growth patterns, the plans will not be able to stand the test of time.	
5.02	Assess Socioeconomic and Institutional Response	Understanding on how socioeconomic factors may affect water and power delivery reliability, water allocations, as well as decisions on source of supply under a changing climate (e.g., groundwater pumping versus surface water diversion).	Organization - Family Farm Alliance	Dan Keppen			1	Congress should also authorize the USDA to work with national agricultural associations to assess the collective impacts to agricultural land and water use changes in western states over the last 10 years, as well as predicted trends.	
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)	1			Adaptation strategies will likely involve the reworking of institutional "realities." The ongoing efforts of the Council on Environmental Quality's Interagency Climate Change Adaptation Task Force should be useful in addressing this gap.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt Fed - NOAA NOS					Coastal, decision process mapping.	
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)				What are institutional realities? Example?	
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt Fed - Reclamation	Bonnie Van Pelt, Natural Resource Specialist			1	I was unclear how this would be articulated to the research community--what would this study look like and what do we hope to gain from it.	
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)			1	For project planning activities, understanding the interactions of climate and socioeconomic factors is important and has not had lots of attention focused on it.	

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5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt Fed - Reclamation	Carly Jerla (LC Region)		1			
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)		1		I think this issue should be considered in reverse: Understanding how socioeconomic responses to climate variability will impact established institutional structures and how rigidity of those structures may prevent adaptation to climate change.	
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District			1		

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5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt Fed - USEPA	NCEA, OW		1		Edit or add new line: Understanding of barriers to adopting and using results of climate studies by decision makers.	
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1				
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			

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					Low	Med	High		
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations	1				
5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director			1	Evaluating shifts in water demand as a result of climate change is an important part of water resources planning. Long-term behavior of our customers does not remain constant. Extreme weather patterns such as drought can lead to changes in water use patterns that remain long after the drought is over. Reclamation and USACE are commended for including this evaluation in the long-term water planning process.	

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5.03	Assess Socioeconomic and Institutional Response	Understanding on how institutional realities currently control socioeconomic responses to climate variability, and could control socioeconomic responses under a changing climate.	Organization - Family Farm Alliance	Dan Keppen	1				
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	Strategies for incorporating climate change information into flood risk and dam safety evaluations are needed. These strategies should be based on the best available science and tools, considering the limitations from the gaps listed above. If the best available science is not yet adequate to inform adaption, guidance on interim approaches should be developed.	
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt Fed - NOAA				1	Evaluation of adaptation alternatives and development of optimization strategies at the watershed or basin level is critical for future planning efforts.	
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1		I am assuming this means an adaption to climate change. If created, would be a step ahead and probably prove very useful tool to other agencies and land and water management entities struggling with similar issues.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Med	High	Your Perspectives	Optional: Citation or Link to Supporting Information
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)			1	This is a very important research need and non-optimazation approaches should also be throughly explored.	
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.		1		Ranking strategies is important. Optimization rarely ends up with a valuable product when dealing with water systems because institutional and legal constraints lead to non optimal solutions. This can be a "black hole" for funds. Researchers other love optimization, staff with more applied experience do not see much value in it.	
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1	Expand to include guidance on and an understanding of the strengths and weaknesses of decision-making approaches under climate change uncertainty	
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	We learned from the Lake Ontario-St. Lawrence River Study that decision-makers did not want to use an optimization framework that required assignment of weights. Instead, they wanted to use informed expert opinion.	http://www.losl.org/reports/finalreport-e.html
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District			1	Adaptive management, robustness, resilience, and flexibility are some key tools for water managers to deal with climate change. This draft report barely dealt with the need for robustness, resilience, and adaptive management as tools for dealing with climate change. I feel this should be identified as a gap in tools in this draft report. A major impediment to robust and resilient design is focusing on the optimal solution. Policies that need to be revised or changed in order for us to effectively deal with climate change .	
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist	1				
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt Fed - USEPA	NCEA, NRMRL, OW			1	Ranking is ok, but wouldn't stress optimization Related to 3.3.	Yang, Y.J., "Redefine Water Infrastructure Adaptation to a Nonstationary Climate, J of Water Resources Planning and Management, ASCE, May-June, 2010.

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1				
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director			1	We agree that Reclamation and USACE should continue to look for collaborative opportunities with other water management entities, including local agencies and water sector associations. These groups can provide a great deal of technical support to assist in the development of appropriate climate change adaptation evaluations. They also have utility case studies and other resources provide guidance on best practices and lessons learned when applying a wide range of "master planning" techniques.	
6.01	Assess System Risks and Evaluate Alternatives	Guidance on how to conduct an adaptation evaluation that efficiently explores and rank strategy options, potentially using optimization techniques.	Organization - Family Farm Alliance	Dan Keppen	1				
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)	1			Don't really have a good grasp on what this means. Need an example. Is this an adaptive management technique?	
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)	1				

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Appendix C - Record of Perspectives Contributed by Other Organizations – Table Comments

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Med	High	Your Perspectives	Optional: Citation or Link to Supporting Information
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.	1			Operator "learning" has nothing to do with climate change. It has to do with aptitude and experience.	
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Govt Fed - Reclamation	Carly Jerla (LC Region)				This gap is unclear. What is "realistic operator learning"?	
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	This is particularly important in making real-time operating decisions; the LOSLR study demonstrated that the Board of Control's decisions added significant value in lake regulation.	
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District					
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist	1				

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Govt Fed - USEPA	NCEA, NRMRL, OW		1			
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1				
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations	1				
6.02	Assess System Risks and Evaluate Alternatives	Guidance on how to portray realistic operator "learning" in evaluations supporting planning for climate change adaptation.	Organization - Family Farm Alliance	Dan Keppen	1				

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt Fed - NOAA			1		Long term monitoring of the effects of implemented mitigation and restoration projects should be performed to support future planning efforts.	
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)	1			I agree with the current lack of guidance on this issue. In my experience,it is difficult to estimate greenhouse gas emissions from complex activities. "greenhouse gas "calculators" can vary in results depending on inputed data.	
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt Fed - Reclamation	Bonnie Van Pelt, Natural Resource Specialist		1		I'd liked this category--we need this sort of information to complete our effects analysis in NEPA documents. One application for this information is in assessing the impacts of our operations (e.g., execution of long term water contracts (40-years)) on water supply. How are these actions affecting climate change?	
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)		1		Some work has already been done on quantifying the carbon emissions of reservoir and hydroelectric projects.	
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.	1			Not too worried on Reclamation's impact on climate. More concerned with impact of climate on water supplies.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt Fed - Reclamation	Carly Jerla (LC Region)	1			This is a little unclear as well. Is it referring to weather modification?	
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)	1			It's not clear to me that the scale we can effect on our water resources projects will have significant climate feedback; the one exception is the Great Lakes, but even on this scale with limited regulation capability, its not clear that alternate regulation plans will have large impacts on climate.	
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt Fed - USEPA	NCEA, NRMRL		1		Perhaps needs some clarification on specific meaning	Liu, A.L., et al., "Land Use as a Mitigation Strategy for the Water Quality Impacts of Global Warming: a Scenario Analysis of Two Watersheds in the Ohio River Basin, *Environmental Engineering and Poliy,* (2000), 65-76.
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1				
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations	1				

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Appendix C - Record of Perspectives Contributed by Other Organizations – Table Comments

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		AWWA and AMWA support the decision by Reclamation and USACE to turn to other federal agencies for guidance on tools and methods associated with greenhouse gas emissions calculators. This work is best suited to research groups with a great deal of experience in this area as the simple decision on how to "bound" a GHG emissions calculation can become extremely complex. These groups can provide the guidance on how to most appropriately apply the calculators to achieve information that can be evaluated in the context of water resources planning.	
6.03	Assess System Risks and Evaluate Alternatives	Guidance on how to assess the effect of planning proposals on climate.	Organization - Family Farm Alliance	Dan Keppen		1			
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	This comment pertains to gaps 7.1 through 7.05. It is extremely important for water managers to understand the limitations of the data they employ when making decisions. An important point to consider is not just the uncertainty associated with individual steps, but the propagation of aggregated uncertainties throughout the process.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)			1	I think these Gaps (7.1-7.5) are the most important to work on and produce the most conflict with acceptance and use of the projections. They affect all other gaps in some way.	
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)		1		This information would be useful but may be very difficult to quantify reliably.	
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1	For this gap and 7.2, maybe be more specific than just "uncertainty information". It seems like there is a lot of uncertainty information out there but finding it packaged in a way that is understable, meaningful and useful seems to be more difficult. What we really need to know is how sensitive our results (decision variables and inputs leading to those variables) are to these uncertainties. This is perhaps another gap: Understanding of how methodological uncertainties and approaches affect decision variables.	
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	For the Upper Lakes Study, we recognize that we cannot quantify these uncertainties; instead we are opting to define "plausible" scenarios and define what plausibility means.	
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District			1		
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt Fed - USEPA	NCEA, NRMRL		1		Uncertainties are everywhere, and we need to understand them, sure, but we need a decision context to help reveal which uncertainties are most important in a given problem.	
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt Fed - USEPA	OW	1			I think there is plenty of this - just needs to be communicated better.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority: Low	Relative Priority: Med	Relative Priority: High	Your Perspectives	Optional: Citation or Link to Supporting Information
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager			1		
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)	1				
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations	1				

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		**1**		While it is important to assess and characterize uncertainties, it would seem most appropriate that this is incorporated into the previous six steps. The uncertainties associated with climate change data are the driving factors when drinking water utilities develop a wide range of potential solutions. If the uncertainties are not evaluated until the end of the process, the decisions made in previous steps become irrelevant. Understanding the variability in the quality and availability of data at the beginning of the process feeds into each of the decision points that are part of water resource planning in a changing climate. AWWA and AMWA would suggest incorporating the information and gaps associated with Step #7 (Assess and Characterize Uncertainties) into each of the previous steps of the quantitative decision-making process. It should not be left to the end of the process but instead incorporated in every step.	

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					Low	*Med*	*High*		
7.01	Assess and Characterize Uncertainties	Uncertainty information on global climate projections data, including uncertainties about climate system science, portrayal in climate models, emissions scenario development, and simulation methods.	Organization - Family Farm Alliance	Dan Keppen			1		
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	See 7.1 above	
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)			1		
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)		1		This information would be useful but may be very difficult to quantify reliably.	
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.			1	The devil is in the details. Downscaling and bias correction could amount to a great deal of uncertainty.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1		
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist			1		
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist			1		

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					Low	Med	High		
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Govt Fed - USEPA	NCEA, NRMRL, OW		1		Same answer as above … (NCEA, NRMRL) 2- I'd rather that the focus be placed on improving the skill of regional projections first, and including associated information on uncertainties second.	
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager			1	Necessary to decision making.	
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)			1		
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources		1			
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 7.01	
7.02	Assess and Characterize Uncertainties	Uncertainty information on regional climate projections data, including uncertainties from choice of bias-correction and spatial downscaling methods.	Organization - Family Farm Alliance	Dan Keppen			1		
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	See 7.1 above	
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)			1		
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Govt Fed - Reclamation			1		This information would be useful but may be very difficult to quantify reliably.	

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Appendix C - Record of Perspectives Contributed by Other Organizations – Table Comments

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.			1	Transient analysis is very interesting but difficult to understand and communicate. Needs lots of work. Big Gap.	
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Govt Fed - Reclamation	Carly Jerla (LC Region)		1			
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	For the LOSLR, we used steady state climate scenarios but recognized the need to evaluate transient scenarios. For the upper lakes study, we hope to address transience via stochastic generation of supplies based on climate change projections.	
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist	1				
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Govt Fed - USEPA	NCEA, NRMRL, OW		1		Again, characterizing uncertainty is important, but more important is improving the availability and skill of climate projections.	
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager			1	Necessary to decision making.	
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 7.01	
7.03	Assess and Characterize Uncertainties	Uncertainty in planning results stemming from method choices on how to use transient characteristics of climate projections in planning scenarios.	Organization - Family Farm Alliance	Dan Keppen			1		
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	See 7.1 above	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)			1		
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)		1		This information would be useful but may be very difficult to quantify reliably.	
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.			1	The recent RMJOC modeling of the Columbia/Snake has revealed many of the shortcomings of the current models for performing detailed climate change analysis.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	We missed this step in the LOSLR Study; we have been working on addressing this in the Upper Lakes Study.	
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District			1		
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist	1				
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - USEPA	NCEA, NRMRL			1	Well, so here the importance is higher, because we don't necessarily have good process models (e.g., bio, eco, socio) to integrate into climate and hydrology models to actually explore the complex interactions and emergent behaviors that would likely provide the largest challenges for management.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority: Low	Relative Priority: Med	Relative Priority: High	Your Perspectives	Optional: Citation or Link to Supporting Information
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - USEPA	OW		1		Again, characterizing uncertainty is important, but more important is improving the availability and skill of climate projections.	
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager		1			
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 7.01	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
7.04	Assess and Characterize Uncertainties	For each response analysis on a natural system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Organization - Family Farm Alliance	Dan Keppen			1		
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	See 7.1 above	
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)		1		This information would be useful but may be very difficult to quantify reliably.	
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.	1			Socioeconomics seems like a 'black hole" for climate change research funds. Should not be a Reclamation priority.	
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	We missed this step in the LOSLR Study; we have been working on addressing this in the Upper Lakes Study.	
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1				
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - USEPA	NCEA, NRMRL			1	Same answer as above … (NCEA, NRMRL)	
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - USEPA	OW		1		Again, characterizing uncertainty is important, but more important is improving the availability and skill of climate projections.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1				
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations	1				
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director		1		See comment on 7.01	
7.05	Assess and Characterize Uncertainties	For each response analysis on a socioeconomic system, uncertainty information on system science and associated ways of portraying this science in a system model, and the observations used to customize a model for a specific system.	Organization - Family Farm Alliance	Dan Keppen		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)		1		Communicating flood risk to individuals and communities can be difficult, even with deterministic approaches based on current conditions. Developing communication products to convey information with large variability and uncertainty, but with important implications for life-safety, is challenging. It is also important to distinguish between regulatory information (i.e., current flood hazards) and information for local adaptation and floodplain management under future conditions. FEMA Region X has developed a draft guidance document on this topic. Additional work on communication strategies would be useful.	http://www.fema.gov/pdf/about/regions/regionx/draft_handh_guide.pdf
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt Fed - NOAA			1		Communication to stakeholders on the scientific rigor of climate change predictions and potential impacts of climate change are critical for stakeholder awareness.	
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)		1			

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Med	High	Your Perspectives	Optional: Citation or Link to Supporting Information
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)			1	Communicating climate information, results and uncertainties is very necessary to sucessful planning and this area hasn't been well researched	
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.		1		May need training in this. Not sure it requires research.	
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	In the LOSLR study, there was a lot of mis-understanding and mis-interpretation of the current climate results let alone the climate change results. Many people deliberately spread untruths and mis-interpretations to bolster their positions in the selection of a regulation plan.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist			1	The information in the report could be conveyed in a simpler context to be better used by the project technical staff and decision-makers.	
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District			1		
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt Fed - USEPA	NCEA, NRMRL, OW			1	Specifically, communication with decision makers (or more appropriately, methods for collaborative, co-production of knowledge with decision makers rather than communication to decision makers) Rephrase: Guidance on using and communicating climate projection information, including communicating uncertainties. Related to 5.3 comments. See also New Gap.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager			1		
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations			1		

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director			1	AWWA and AMWA suggest that Reclamation and USACE need to understand the wide range of audiences that will be receiving climate change information. Each group might want to hear a different set of information. For example, water managers will be looking for detailed data on changes in water availability and water quality while elected officials might request information on any extreme impacts to their constituents. Reclamation and USACE should be prepared to have the appropriate data in a form that is best for each audience.	
8.01	Communicating Results and Uncertainties to Decision-Makers	Guidance on strengths and weaknesses of various methods for communicating results and uncertainties affected by the use of climate projection information.	Organization - Family Farm Alliance	Dan Keppen		1			

Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)			1	Whenever decisions have to be made using incomplete data and knowledge, there must be a balance between over-designing to achieve a factor of safety, and achieving a reasonable cost-benefit for the project. For flood risk reduction and dam safety, the threat to life-safety is too great to make decisions based on limited information; but, the available information is indeed limited based on the gaps above. As stated on page 51 of the draft document, Reclamation and USACE have yet to establish a common understanding on how climate change should be incorporated in flood risk and dam safety evaluations. This appears to be a critical need. If the best available science is not yet adequate to inform decision-making, guidance on interim approaches should be developed.	
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt Fed - NOAA			1		Decision making guidance should include sensitivity analysis' to identify which impacts are of most ecologic and socio-economic concern balancing the uncertainties. Decision making should identify the combinations of risks (impacts) and uncertainties in developing decision making tools.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority Low	Relative Priority Med	Relative Priority High	Your Perspectives	Optional: Citation or Link to Supporting Information
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt Fed - Reclamation	Laura Wheatley (ECAO) (see Disclaimer footnote)			1	I wouldn't really call this a research type need but, necessary since uncertainty seems to be ever present.	
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt Fed - Reclamation	Michael Tansey, MP Region Climate Change Coord. (see Disclaimer footnote)			1	Perhaps the most important challenge facing planners is how to make decisions under conditions of deep uncertainty. This is the area where reseach could make a big difference.	
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt Fed - Reclamation	Patrick McGrane, Manager of River and Reservoir Operations Group, PN Region.				This is not a research issue. It is a policy issue. Not sure if it should be rated low or high. Do we use the climate change information to plan a project or not? It is easier to do the climate analysis and display it in an appendix but not actually act on it because of uncertainty.	
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt Fed - Reclamation	Carly Jerla (LC Region)			1		
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt Fed - USACE-LRD	Deborah H. Lee, Chief, Water Management Division. (see Disclaimer footnote)			1	Guidance should likely focus on implementation of monitoring and development of an adaptive management plan (see New Gaps tab)	
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt Fed - USACE-SAJ	Vechere Lampley, Senior Regional Environmental Specialist	1			Addressing climate change does not appear to have a linkage to ER 1105-2-100 when it comes to Sea-level Rise.	

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					Low	Med	High		
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt Fed - USACE-SAJ	Jim Vearil Civil Engineer Everglades Division Jacksonville District			1	Need for "Robust Decision Criteria" as mentioned in USGS Circular 1331	
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt Fed - USACE-SAM	Robert Erhardt, Meteorologist		1			
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt Fed - USEPA	NCEA, NRMRL, OW			1	See comment above; need for methods and facilitation of co-production of knowledge with decision makers This is important - while there is a fair amount of local vulnerability assessment work going on, not a lot of it is being used in decision making.	
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt Fed - Western Area Power Administration	Mike Cowan, Technical Services Manager	1			Decision making will be influenced more by other factors, including: location, parties involved, statutory environment, regulatory processes, etc.	
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt Local - City of Seattle, City Light Dept.	Ron Tressler, Environmental Affairs Div. Strategic Advisor (see Disclaimer footnote)		1			
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Govt State - Western Governor's Association, Western States Water Council	Jeanine Jones, Interstate Resources Manager, California Department of Water Resources	1				

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	*Med*	*High*		
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Organization - American Society of Civil Engineers	Michael Charles - Senior Manager, Government Relations		1			
8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Organization - American Water Works Association (AWWA); Association of Metropolitan Water Agencies (AMWA)	(AWWA) Tom Curtis, Deputy Executive Director; (AMWA) Diane VanDe Hei, Executive Director			1	AWWA and AMWA question if this gap should belong in Step #8. Guidance on how to make decisions give the uncertainties of climate change is an extremely important topic and is central to the entire debate on how to adjust to a new planning paradigm. While housed in the step that addresses communication, it seems as though this gap is better suited to be associated with the entire process. It is the key conclusion that we drew when reviewing the whole document. We would suggest elevating the importance of this knowledge gap. This is not to say that Reclamation and USACE should be responsible for developing this guidance. Instead, they should work with their federal partners, state and local water utilities, research organizations, and water sector associations. A collaborative approach that incorporates all the relevant stakeholders is the most effective way to identify best management practices for long-term water resource planning in a changing climate.	

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8.02	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to make decisions given the uncertainties introduced by consideration of climate projection information.	Organization - Family Farm Alliance	Dan Keppen			1		
NEW.01	Make Decisions about How to Use the Climate Change Information	Understanding nonstationarity of historical observations	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)				Additional research is needed to determine the rate at which hydrologic conditions have been changing, and the drivers responsible for those changes. For example, separating the effects of urbanization from climate change is important for floodplain management and land use. Also, it is currently very difficult to detect statistically significant shifts and trends in annual maximum flood data due to insufficient years of record in many locations. Research and development of new statistical approaches for shift and trend detection of extreme events is needed.	

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Gap Number	Gap Category (Technical Step)	Capability Gap	Agency or Organization	Agency Contact (Name)	Relative Priority			Your Perspectives	Optional: Citation or Link to Supporting Information
					Low	Med	High		
NEW.02	Assess and Characterize Uncertainties	Understanding variability and uncertainty of baseline information (step 7)	Govt Fed - Federal Emergency Management Agency	Nancy Steinberger, Senior Hydrologist (see Disclaimer footnote)				An important point to consider is the overall uncertainty and variability in the hydrologic process under investigation, even under stationary conditions. Consider an example in which the standard error of prediction of a present-day flood discharge is +/- 30%, and climate simulations project a possible increase of 10% (with an uncertainty of +/- 50%) over the life of a project. Addressing the original 30% is just as important as the additional 10% from climate change. One desired outcome would be to improve the use of risk and uncertainty information in hydrologic decision-making.	
NEW.03	Assess Natural Systems Response	Understand impacts on Seasonal Wetlands	Organization - CWEMF	Nigel Quinn (also affiliated with DOE Lawrence Berkeley Laboratory)				There are approximately 170,000 acres of seasonally managed wetlands in the San Joaquin Basin alone. Since other areas such as groundwater, anadromous fisheries, riparian vegetation and ecosystems, and non-native vegetation have been explicitly recognized – it is important to recognize the unique hydrology of these ecosystems. To date there have been no ecosystem impact studies of future potential climate change.	

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NEW.04	Assess Socioeconomic and Institutional Response	Understand Impacts on Land Subsidence	Organization - CWEMF	Nigel Quinn (also affiliated with DOE Lawrence Berkeley Laboratory)				Another related sector subject to climate related impacts is land subsidence. This is not covered by the current descriptor for groundwater impacts which considers only recharge and stream-aquifer interactions. Reclamation is currently struggling with conveyance canal subsidence issues resulting from an unprecedented volume of groundwater extraction that has been fueled by Recovery Act stimulus to production well development – especially in water supply challenged areas such as the western San Joaquin Basin.	
NEW.05	Steps 1, 2, 8	Data Sharing and Dissemination	Organization - CWEMF	Nigel Quinn (also affiliated with DOE Lawrence Berkeley Laboratory)				Another significant oversight is that of data sharing and dissemination. The report properly identifies the need to review the literature and obtain better data and has a separate section dealing with communication of results from climate change analysis. However the difficulties agencies experience sharing databases with each other and providing easy access to data fundamental to long-term impact analysis studies is legion and ongoing. Two federal agencies that appear to have difficulty sharing data are the two involved in this new partnership – Reclamation and the Army Corps of Engineers.	

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					Low	Med	High		
NEW.06	Assess Socioeconomic and Institutional Response	Understanding on how development of local water management features could impact transportation systems.	Organization - American Society of Civil Engineers (Geo-Institute)	Jeff Keaton, Technical Coordination Council (see Disclaimer footnote)				Transportation infrastructure (highways and railroads) are not considered to be water management facilities; however, embankments do divert water and bridge openings do affect local hydraulics. Water management agencies responding to climate change have the potential to create adverse impacts on transportation infrastructure that operate as defacto water management features. Transportation facilities will be depended upon for evacuation and emergency response during flooding. Climate change effects can produce changes in sediment yield, such that water management practices may create additional adverse impacts on transportation facilities that act as water management features.	
NEW.07	Assess Socioeconomic and Institutional Response	Understanding municipal and industrial water use on non-irrigated lands; groundwater substitution	Govt Fed - Reclamation	Bonnie Van Pelt, Natural Resource Specialist				This is important especially as it relates to groundwater recharge in a drought. These types of water transfers--surface to groundwater reliance are becoming more prevalent; long term impacts are not understood.	
NEW.08	Assess Natural Systems Response	(Watershed Hydrology / Geomorphology) Understanding how soil erosion and land subsidence effect hydrogeomorphology	Govt Fed - Reclamation	Bonnie Van Pelt, Natural Resource Specialist				Research in the hydrogeomorphology to help understand long-term climate variability; effects on watershed dynamics and water budget balance	USGS; National Research Program (http://water.usgs.gov/nrp/proj.bib/hupp.html)

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NEW.09	Assess Natural Systems Response	(Water Quality) Understanding bioaccumulation rates and residence times of contaminates in source water and wetlands	Govt Fed - Reclamation	Bonnie Van Pelt, Natural Resource Specialist				Plant communities and mixing rates in source water bodies will likely vary with climate change	USGS; Columbia Environmental Research Center; (http://www.cerc.usgs.gov/Projects.aspx?ProjectId=65)
NEW.10	Assess Socioeconomic and Institutional Response	Understanding groundwater recharge; changes in return flows to natural water bodies (New Sub-Category of CU: M & I use on non-irrigated land)	Govt Fed - Reclamation	Bonnie Van Pelt, Natural Resource Specialist				Increased reliance on groundwater in times of drought--research on long term effects to natural water bodies	
NEW.11	Assess Natural Systems Response	(Sedimentation, River Hydraulics) Understanding sedimentation/erosion rates in light of changing river hydraulics;helping to inform river restoration projects.	Govt Fed - Reclamation	Bonnie Van Pelt, Natural Resource Specialist				This information would be useful to river restoration efforts:e.g., building/re-directing side channels, creating islands and refugia for spawning and juvenile rearing.	
NEW.12	Summarize Relevant Literature	Problem Definition / Formulation: Recognized weakness in planning processes that do not focus on clearly defining the problem being studied, or recognizing that many adaptation issues have probably not yet been recognized or problems may exist that may require adaptations which are ill-defined.	Govt Fed - USACE-NWP	Seshu Vaddey, Portland District (see Disclaimer footnote)				The context for the role and impacts of climate change must come from the problem definition. The difficulty and importance of problem formulation must be recognized. Additionally, one element that is missing from the discussion is assessment of vulnerabilities. Not sure if there is a gap associated with this but it seems to be an important concept that is not discussed. The gaps that are identified should help planners and analysts identify vulnerabilities of their system to climate change.	Willows, R.I., Connell, R.K. (Eds.), 2003, Climate adaptation: Risk, uncertainty and decision-making. UKCIP Technical Report. UKCIP, Oxford. Tversky, A. and Kahneman, D. (1992): Advances in prospect theory: Cumulative representation of uncertainty. Journal of Risk and Uncertainty, 5, 297-323.

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					Low	Med	High		
NEW.13	Obtaining Climate Change Information	Data Management System: An IT system/framework that facilitates the mining, extraction, analysis and distribution of data	Govt Fed - USACE-NWP	Seshu Vaddey, Portland District (see Disclaimer footnote)				This is a fundamental hurdle for anyone looking to work with and utilize climate change information. Without a system for effectively managing and working with the data it ends up being a tremendous gap.	Comments from NPCC and CRITFC on RMJOC climate change workplan
NEW.14	Make Decisions about how to use Climate Change Information	note on pg. iv makes reference to decision-making not being in this report but that research to address gaps should benefit the decision-making process. This particular category is fundamentally what is affected by decision-framework	Govt Fed - USACE-NWP	Seshu Vaddey, Portland District (see Disclaimer footnote)				Pg. 27, ln 33 asks the question, "Which aspects of projected climaet variability should be related to planning?". This can only be addressed when by incorporating the decision-framework into this process for identifying gaps.	see comment
NEW.15	Assess Natural Systems Response	Coastal Dynamics: Coastal issues are not limited to sea-level rise but also changes in wave dynamics, or the processes affecting Coastal nearshore water levels. Wave Surge-Infragravity, Wave Set-up (radiation stress), Wave Run-up at Shores Edge, Total storm Power, etc.	Govt Fed - USACE-NWP	Seshu Vaddey, Portland District (see Disclaimer footnote)				Can we currently define the magnitude, range, and frequency of key forcing variables? Can we identify and define any important trends or changes? Magnitude, frequency, direction/pattern, interaction of components Can we quantify / bracket responses to changing variables and potential impacts on project stability / performance? Do we know how to analyze in a risk-based environment?	

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					Low	*Med*	*High*		
NEW.16	Assess Socioeconomic and Institutional Response	Asset management and economic tools that allow for the consideration of costs and values in weighing adaptation options, including costs of inaction.	Govt Fed - USEPA	OW				Most of the ideas in the Report from EPA's Jan. 2009 Water Utility and Climate Change workshop are contained in this document. However, I don't really see this item represented.	US EPA. (2009). "Proceedings of the First National Expert and Stakeholder Workshop on Water Infrastructure Sustainability and Adaptation to Climate Change" (PDF) (136 pp, 2.8 Mb) Publication No. EPA 600/R-09/010, available at: http://www.epa.gov/nrmrl/wswrd/wqm/wrap/pdf/workshop/600r09010.pdf; Executive Summary attached.
NEW.17	Communicating Results and Uncertainties to Decision-Makers	Guidance on how to communicate and work with decisionmakers to improve use of climate vulnerability assessments	Govt Fed - USEPA	OW (also comments from NCEA, NRMRL)				See comments on 5.3 and 8.1.	
NEW.18	Make Decisions about How to Use the Climate Change Information	Guidance on when and how a project needs to address climate change	Govt Fed - USEPA	R8				See R8 word document [Draft Comments], Issue 1-Scope.	See comment for three links

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NEW.19	Obtaining Climate Change Information	Identify gaps and collect new data to inform modelling based upon this new data. Then as the project develops and is placed on line, data collection to inform adaptive management decisions is also needed.	Govt Fed - USEPA	R8				See R8 word document [Draft Comments], Issue 2-Data Collection.	See attached Montana document.
NEW.20	Assess System Risks and Evaluate Alternatives	Guidance on evaluation of alternatives to build resiliency and incorporate adaptive management into project design and operation.	Govt Fed - USEPA	R8				See R8 word document [Draft Comments], Issue 3- Evaluation of Alternatives	Water Sustainability and Climate (WSC) (NSF 10-524) found at http://www.nsf.gov/pubs/2010/nsf10524/nsf10524.htm?org=NSF found on the www on 5/18/10