PILOTING UTILITY MODELING APPLICATIONS -- MODELING ADVISORY COMMITTEE SURVEY RESULTS

Question:	1	2	3	4	5
MODELING ADVISORY COMMITTEE MEMBER	**Describe your experiences in using global climate modeling outputs**	**Did you access these data directly from the Lawrence Livermore National Laboratory/PCMDI repository, or through a downscaling or processing portal like the Reclamation/Santa Clara University (Maurer et al. 2007), Climate Central web site, or some other portal? Do you have comments on the utility and ease of use?**	**Have you used NARCCAP data or other regional climate modeling outputs? Describe that experience.**	**Under which circumstances do you believe statistical downscaling should be used, and under which circumstances should dynamical downscaling be used?**	**Are there other publicly available statistically downscaled datasets not listed that you know of or have used? (see separate sheet for familiarity question results)**
John Abatzaglou	I have performed a group of downscaling exercises using daily statistical outputs as well as examined changes in large-scale features from GCMs including storm tracks and modes of atmospheric variability. I have used runs both historical and scenario driven, as well as control runs.	PCMDI ftp site; however I have accessed the Bureau of Rec's website and enjoyed its simplicity.	I am currently doing hybrid stat-dynamical downscaling with NARCCAP output. I am intrigued, but not totally sold on RCMs at present, but believe they are a necessary step forward.	Dynamical downscaling should be preferentially used to quantitatively examine extremes. I'd also suggest dynamical downscaling for convective type precip regimes (e.g., southwest monsoon, east coast summer precip). The ease of breadth of ensembles make statistical downscaling advantageous for most applications, although the type of statistical downscaling matters.	
Joe Barsugli	I have extensive experience in running climate models, and in the theory "culture" of these models. I have used raw and downscaled GCM output to inform a climate impacts document for the State of Colorado and to inform the status review of the American Pika, among other projects. I have also advised the Front Range Climate Change Vulnerability project and performed on hydrologic modeling of the Bear River in Utah under climate change scenarios.	I, or my post-docs have accessed GCM data from PCMDI and from NCAR, including daily outputs. I have also accessed the BCSD data through the downscaled CMIP3 portal.	Yes. I (my post-docs primarily) have used NARCCAP outputs for several projects looking at precipitation, and surface energy balances in the Colorado River Basin. In addition another post-doc is further dynamically downscaling the NARCCAP runs to 1-km resolution to study thunderstorms and flooding processes. NARCCAP data can be very hard to use, even for experts.	It all depends on the purpose of the study, and its approach to characterizing uncertainty. For many applications, dynamical downscaling needs further statistical processing to a) remove biases, and b) downscale to the project level. Ideally, a statistically post-processed dynamical model would be the way to go, in combination with process-level studies on the raw dynamically-downscaled output.	Soon to be - Westwide risk assessment and Basin Study hydrologic model (VIC) runs by Reclamation. CLIMAS Arizona dynamically downscaled GCMs. Hostetler (USGS) 15 km dyn downscaled data.
Levi Brekke	I've been involved with projects that have related downscaled climate projections to impacts on watershed hydrology, reservoir system water supplies and demands, reservoir systems operations, and various environmental conditions. Projects have feaatured various methodologies, ranging from different sources of downscaled climate projections, different ways of using those projections (e.g., sampling period-changes from the projections to blend with historical information or using the projections in a transient sense), and use of different hydrology and other systems models.	For studies above, we used downscaled climate projections rather than raw GCM information from PCMDI. For downscaled climate projections, we mostly make use of the Reclamation/Santa Clara University (Maurer et al. 2007), Climate Central web site (BCSD archive) mentioned above (http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/dcpInterface.html). However, we've also made use of region-specific information sources (e.g., UW CIG's HB2860 information set at: http://www.hydro.washington.edu/2860/). Both information sources offer similar levels of access to information, which generally requires the user to be familiar with gridded time series datasets and be nimble at working with either ascii or netcdf datafiles.	I haven't personally, although I'm part of the steering committee on an effort that involves assessing Colorado River Basin runoff and operations projections when driven by different downscaled climate projections datasets (i.e., NARCCAP, the BCSD archive, and a simpler Delta method). Work is being carried out by a post-doc at NOAA ESRL.	I don't believe there's a clear boundary on this. Some related impressions are offered at the BCSD archive's Limitations page (http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/dcpInterface.html#Limitations). As a general rule of thumb, I'll use statistical methods unless I'm convinced that the questions require greater scrutiny on conditions that can only be simulated using dynamical downscaling. The reason is that for risk-based planning, its appealing to be able generate and reference a projections-rich information set, representing a broad collection of available global climate projections. However, statistical downscaling is limited by stationarity assumptions and that it generally focuses on surface climate conditions. Dynaamical downscaling can simulate an evolving relationship between local surface climate and larger scale atmosphere, which cannot generally be done using statistical methods. This might be important in areas where microclimate features and relations with large-scale climate are important to resource management. Also, for questions that go beyond surface climate conditions and focus on the atmospheric column (e.g., atmospheric conditions related to convection and storm development), dynamical downscaling can provide insight where statistical downscaling would seem limited.	Has Katherine Hayhoe (Texas Tech) developed any new datasets through her work with USGS BRD in the Southeast?

Question:	6	7	8	9	10
MODELING ADVISORY COMMITTEE MEMBER	**Are there other approaches or models you have used that are not in this inventory? Were the results a success or useful?**	**Are there other limitations or issues using the data identified in this inventory that were not addressed?**	**Do climate modeling tools today provide "actionable science" in the sense that they provide "data, analysis and forecasts that are sufficiently predictive, accepted and understandable to support decision-making, including capital decision making." Why or why not?**	**Without considering cost or time to complete, do you believe utilities would be best served today by utilizing data currently or soon to be available in CMIP3 or CMIP5 databases or by performing original dynamical or statistical downscaling customized for a particular watershed and set of evaluation objectives?**	**What do you hope to gain from your involvement in PUMA?**
John Abatzaglou			They are the best tools for which we have to work with. However, taken out of context they can be used inappropriately. I'd be reluctant to say models provide forecasts, and more willing to use the term scenarios.	I believe the results of CMIP5 at least for long term horizons will not be outside the uncertainty envelope of CMIP3 models. I do not believe we will have new answers pertaining to precipitation extremes, and rather that the regional scale features from CMIP3 downscaled intelligently to meet the needs of utilities will provide working information and actionable science.	Added insight into needs/questions of user groups such as the utilities, as well as dialogue with scientists working in the field.
Joe Barsugli	Attribution studies, including the attribution (or not) of extreme events to anthropogenic climate change may be useful. In addition the idea of "time to detection" studies, or "time to threshold" studies may be useful in mapping decision points in the future. For example, when will we be able to tell whether we are on a path towards a 10% or a 30 % decline in the Colorado River. A addition, more consideration should be given to the interaction of global climate change with regional forcings (dust, land cover changes)	Downscaling uncertainty is not adequately communicated: most of these datasets/portals do not communicate adequately the strengths and weaknesses at the spatial scale of the project, and do not investigate how assumptions in the statistical processing can influence the results that are used to inform decisions.	Apart from sea-level rise, not yet. Though the meaning of actionable depends on the utility and the context of the decision being considered. More interaction between the decision process and the modeling and analysis may help to develop better ways of dealing with the range of climate projections.	That depends on the answer to the following question: Are the meteorological processes that the utility deems essential (thunderstorms, ENSO, etc.) represented, even parametrically, in the GCMs? In the existing downscaled data? If not, the I would invest in custom downscaling ONLY IF it addresses this.	Western Water Assessment - We have chosen not to create a downscaled product for our region. Involvement in community efforts by us and our stakeholders is our chosen approach, and PUMA will hopefully support this. I am involved in the team developing the NOAA effort to provide climate projections as a service. PUMA's experience synthesizing the needs of water utilities, and their experience using this data, will be valuable in this developing and implementing this effort.
Levi Brekke	This seems pretty focused on use of projected climate information. Thought might be given toward use of paleoproxies like tree-rings, at least to get insight on potential spells of wetter and drier periods. We have experience blending paleo (spells) and instrumental record (distributions) hydroclimate information to frame water supply assumptions for reservoir operations analysis. We have also recently experimented with blending paleo spells with projected hydroclimate information for the same types of analyses	There is an issue area not addressed in this survey: After selecting a downscaled climate projections information source, what aspect of the information are you going to sample and relate your planning study? Your answer will depend on your judgment of which projection aspects are credible and worthy enough to bear influence on your planning study. Any answer leads you to eventually blending projected climate and historical climate information in some way to define weather assumptions that drive subsequent analyses (e.g., hydrology, demands, etc); the range of choices leads to a different level of blend. For example, in UW CIG's HB2860 they feature a technique called "Transient BCSD" that essentially sets the blend boundary where monthly time series information comes from climate projections and sub-monthly sequence possibilities come from observed historical. Alternatively, they also feature a technique called "Hybrid-Delta", which is another variant on a broad class of period-change techniques, that reflects observed historical monthly and sub-monthly sequencing information, but only in a relative sense and with the monthly distribution of possibilities stretched to match the monthly distributions from the climate projections. Put another way, usage choices can involve sampling projections for step-changes in period climate means, step-changes in period climate distributions, or beyond that making driect use of the projection sequences to portray time-evolving changes. Choices in this category can feedback to preferred downscaled climate information set and feedforward to preferred impacts analysis tools.	The answer depends on what aspects are sampled from projections. Generally speaking, there's probably more actionable information from temperature projections than from precipitation projections, and at coarser space and time scales compared to finer scales. To the extent that you focus on long-term trends in warming, it seems that you can make some fairly robust statements about hydrologic impacts (e.g., change in runoff seasonality for snowy basins, or change in annual water balance where watershed ET is an important fate of precipitation). On adding precipitation projections to the mix, sticking with long-term projected trends in mean-annual precip, if you keep a view of the transient ensemble-median, it seems that you can land on some reasonable judgements of likely direction of future precipitation change, roughly supported by physical paradigms (warmer air holds more moisture ' wetter storm tracks; Hadley Cell expansion in the tropics ' more atmopsheric subsidence ' broader desert latitudes ' storm tracks shoved poleward). These assessments are also more robust from a larger region view rather than a local view. As you telescope your focus more locally and to finer time steps (e.g., what's going to happen to extreme thunderstorm potential over Tampa), you're asking more challenging questions and I'd doubt that you could rationalize the information as actionable at this time.	Utilities would be best served by making use of available downscaling resources today - there are many available (questions 3 and 5). Technically: suggest picking an information source that looks convenient to work with, and then figure out the end-to-end analytical mechanics (e.g., which models, data management, simulation management). Decision-making: suggest picking some typical planning processes (e.g., CIP development), get together with relevant actors, and discuss what managed system conditions are most important to that process. Then work backword through the technical work serving that process to identify where weather assumptions and context come to play ' this may give you a sense on how detailed the climate information needs to be and what type of choices need to be made under Question 7.	Insights from utilities experiences using this information, and track their strategies with incorporating projected climate information into analyses that underpin capital improvement plans or system master plans. These latter processes seem like "first responder" vehicles for broad scale climate change adaptation in the water sector, which seem like they'll offer many lessons-learned over time that could benefit other government levels (e.g., how was the process framed, how did this feedback to level of analysis, how were analytical results packaged for decision-makers and investors, what worked and what didn't?). I realize PUMA won't approach these latter questions, but in time I'd expect participating utilities to start assembling case histories and offer these perspectives.

Question:	1	2	3	4	5
MODELING ADVISORY COMMITTEE MEMBER	**Describe your experiences in using global climate modeling outputs**	**Did you access these data directly from the Lawrence Livermore National Laboratory/PCMDI repository, or through a downscaling or processing portal like the Reclamation/Santa Clara University (Maurer et al. 2007), Climate Central web site, or some other portal? Do you have comments on the utility and ease of use?**	**Have you used NARCCAP data or other regional climate modeling outputs? Describe that experience.**	**Under which circumstances do you believe statistical downscaling should be used, and under which circumstances should dynamical downscaling be used?**	**Are there other publicly available statistically downscaled datasets not listed that you know of or have used? (see separate sheet for familiarity question results)**
Mike Dettinger	I have downscaled half a dozen or so AR4 projections, by (statistical) constructed analogs method, myself over the conterminous US, and I have overseen downscaling of a couple dozen more. Previously I downscaled the occasional simulation or projection, but usually for just a few grid cells and observation stations. I have analyzed GCM outputs both historical and projected in terms of California impacts, El Nino conditions, Hadley circulations, etc, many times over the years.	AR4 projections were obtained thru PCMDI mostly. Previous (and some recent) GCM analyses were obtained via individual connections with other modeling groups. GFDL's NOMADS online archive is an example of what all the GCM groups should be doing; many more variables and many more scenarios are provided there than on any of the AR4 portals, for their particular models and for specialists who need more than the standard outputs.	No.	Statistical downscaling still is the only way to get long projection periods, or multiple realizations of a given scenario setup. Dynamic downscaling outputs still require the additional bias correction provided by most statistical downscaling methods, so dynamical downscaling cannot really be used alone, in most cases. My usual recommendation-at present--is that national projections should turn to statistical archives (like Maurer et al) for a standard set of downscaled scenarios that allows cross-country intercomparability, with dynamical downscaling explored, when time and resources also permit, on a regional basis to identify possible flaws in the statistical versions and to potentially improve the regional aspects in key areas.	USGS (Lauren Hay) has an archive of 100s of del-temp/precip downscaled scenarios based on 30-yr statistics within the same scenarios as downscaled (by more involved means) in Reclamation/SCU.
Phil Duffy	As a climate change researcher I've done extensive evaluation of climate model results, mostly as part of the process of trying to develop better models. (So, for example, evaluating two competing versions of a model to see which one does better at reproducing relevant observations.)	In most cases I ran the model(s) myself! But I have used the interfaces you describe. A key disadvantage of using raw GCM data from the PCMDI site is that each model has its own spatial grid, so one has to put all the output on a common grid before simple operations like differencing are possible.	I have not used NARCCAP output (although I generated some of it).	An important advantage of statistical downscaling is that its computational inexpensiveness makes it possible to downscale results from many GCMs. This provides the basis for uncertainty quantification (although how exactly to quantify uncertainty remains an area of research). In my opinion assessing uncertainty, or at least consensus among models, is ALWAYS important. Dynamical downscaling has the advantage of being able to represent feedbacks such as enhanced warming in a region where snow/ice cover disappears. If such feedbacks are likely to be important than this class of method should be used.	Assuming you mean US-domain data sets, you've named all the major data sets that are based upon a significant # of GCMs. There are others based upon only one GCM (e.g. availabel from NCAR).
Tom Johnson	My main experience using global climate modeling outputs is developing scenarios for assessing hydrologic and water quality sensitivity to alternative future climatic conditions using watershed models (HSPF, SWAT, SWMM, SG WATER).	The main sources of climate data I have used to develop scenarios are NCAR NARCCAP, Reclamation/Santa Clara University, Nature Conservancy's ClimateWizard, Penn State University's CARA (summarized GCM data from AR3) site. NARCCAP data was provided to us in summary form (aggregated to monthly average deltas interpolated to NCDC weather stations) from NCAR. I did not personally access the Reclamation/Santa Clara University data but supervised contractors who did, and we've had no problems. The other sites I mention provide projection data in an easily accessible, summary form.	Yes, we are currently using 6 of the NARCCAP scenarios (those that were available as of spring, 2010) to conduct watershed modeling with SWAT and HSPF in 20 watersheds across the country. NARCCAP data was provided to us in summary form by NCAR (aggregated to monthly average deltas interpolated to NCDC weather stations). The meteorological time series used as input to watershed models are being created using the delta method on daily historical data for SWAT, and hourly historical data for HSPF. We've had no problems	I'm a hydrologist so this is outside my expertise, but to me it seems to boil down to balancing what the questions are you are trying to address (i.e., what's the purpose of you modeling, what impacts model do you want to run, what climate variables do you need as inputs?), synoptic climate factors (e.g., confidence that relevant statistical relationships will hold true in the future), and practical (available budget, level of effort you can expend on the problem). Note I think there is also merit in considering the value added of using ensembles based on both methods simultaneously, as well as the need or value of doing any downscaling at all.	Not that I'm aware of.
Ed Maurer	I have downscaled raw CMIP3 data from most models and three emissions scenarios. I have then used these to drive hydrologic models, and to feed to others for further impacts studies	All of the above, and I have obtained data directly from modeling groups. Since I helped create the Reclamation dataset, it seems intuitive. The ClimateWizard is better. For non experts, netCDF formats are still a barrier, even though progress is being made on different tools.	Not yet	All regional studies should include statistical downscaling. Its skill is well established, and it is readily available, which allows some estimate of (one source of) uncertainty. Where a high degree of topographic complexity exists, regional modeling can provide details on how local climate changes may be expressed differently in the future (e.g., where surface albedo may change in the future in ways not seen in the historical record). The classic example is near the existing snow line.	

Question:	6	7	8	9	10
MODELING ADVISORY COMMITTEE MEMBER	**Are there other approaches or models you have used that are not in this inventory? Were the results a success or useful?**	**Are there other limitations or issues using the data identified in this inventory that were not addressed?**	**Do climate modeling tools today provide "actionable science" in the sense that they provide "data, analysis and forecasts that are sufficiently predictive, accepted and understandable to support decision-making, including capital decision making." Why or why not?**	**Without considering cost or time to complete, do you believe utilities would be best served today by utilizing data currently or soon to be available in CMIP3 or CMIP5 databases or by performing original dynamical or statistical downscaling customized for a particular watershed and set of evaluation objectives?**	**What do you hope to gain from your involvement in PUMA?**
Mike Dettinger			Depends on whether you mean "sufficient to support a deterministic decision": If so, then no, current (and all foreseeable) projections remain broad examples of how the future COULD look but not predictions of how it will look. Indeed, they are "projections" in the sense that they only purport to indicate what the future might look like IF ALL OTHER THINGS ARE HELD CONSTANT EXCEPT FOR THE ANTHROPOGENIC EMISSIONS OF GREENHOUSE GASES AND KEY AEROSOLS. Since all other things won't be held constant, they are not to be evaluated as actual predictions or forecasts in any circumstances. If on the other hand, you mean "sufficient to provide a context and some guidance for evaluation of a universe of plausible climatic outcomes from anthropogenic GHG emissions," then even the current set provides, I believe, a basis for many actions, especially those which increase the range of future conditions within which facilities and procedures would be robust. Even so, with time, the ability of projection ensembles to support such interpretations should be expected to improve, albeit slowly.	I think a combination of both is the best approach. NO one downscaled set of scenarios, or downscaling process, is best in all circumstances. That is, the value of a particular scenario/downscaling will vary from application/setting to application/setting, not because of flaws in the scenarios/downscalings but because the demands on the scenarios/downscalings vary with place and application. Some applications would ideally have a very precise depiction of the ice/water temperature transitions; other applications need to have the North American monsoon or Atlantic hurricane processes represented very well; and so on. None of the statistical or dynamical methods, or GCMs for that matter, should be assumed to do everything better than the others; they all will have strengths and weaknesses. Thus a combination approach that provides for some necessary continental-scale intercomparabilities AND some local specialization (see #4 above) is the more reasonable approach for the utilities to work with the climate community on, imho	I hope to see more reasonable uses and decisions made of current cliamte science made by utilities than might be the case if folks like me do not get involved.
Phil Duffy	No.	There are other significant limitations. Perhaps the most important of these are that dynamically downscaled data tends to inherit biases from the driving GCM, and gridded statistical datasets can be produced only where there are gridded observational data sets (and inherit any biases in these).	In some cases, if carefully applied.	There are enough ongoing or planned statistical downscaling projects that I don't see what would be gained by doing custom statistical downscaling. Custom dynamical downscaling could be useful if one could downscale a large # of GCMs, but this has not been possible due to a lack of boundary condition data. CMIP3 vs CMIP5? In principle CMIP5 results should be superior, but who knows if they really will be.	I am interested in figuring out how to use climate model output effectively in real-world applications.
Tom Johnson	Not that I'm aware of.	Not that I'm aware of.	This, I think is a key challenge going forward. To me it seems totally context dependant. Climate models are remarkable technological tools that are invaluable for understanding the system behavior, how the climate system may respond to various perturbations, and exploring the effects of different policy options. Based on everything I hear and read, I do not think current models provide accurate long-term forecasts. I'm reminded of the saying "all models are wrong - some are useful". Going forward, I think the key challenge for water managers is to better understand how and what useful information we can extract from climate models, fully accepting and despite their imperfections, to inform decision making. This, unfortunately, makes climate change a tricky problem to address, also dependent on social/economic/political factors, decision context, risk tolerance, opportunities and constraints, etc.	There are already a number of excellent efforts underway, and more are sure to follow. The default should be to use existing sources (CMIP3, 5, or other sources).	I'm looking forward to a great meeting and ongoing dialogue. I hope I can in some small way help the water utility community to understand and respond, if and as appropriate, to the challenge of climate change. I'm certain I can also learn a great deal from the really excellent group you've assembled
Ed Maurer		A listing of tools to view or manipulate netCDF would be helpful, especially windows-based software.	Yes. their potential has been demonstrated in countless studies as far as showing there is a lot at stake. The literature seems less convincing in showing that short-term (20 years or less) planning would show benefits from changes to adapt to changes now. Though I am definitely less familiar with that literature.	The existing and soon-to-be-released archives of downscaled climate data have been established so every agency involved in planning doesn't have to also develop expertise in downscaling. without considering cost or time to complete the issue becomes less clear, but I would still advocate against costomized downscaling except where it is clear that existing resources are inadequate.	A better understanding of the issues faced by water utilities related to climate change.

Question:	1	2	3	4	5
MODELING ADVISORY COMMITTEE MEMBER	**Describe your experiences in using global climate modeling outputs**	**Did you access these data directly from the Lawrence Livermore National Laboratory/PCMDI repository, or through a downscaling or processing portal like the Reclamation/Santa Clara University (Maurer et al. 2007), Climate Central web site, or some other portal? Do you have comments on the utility and ease of use?**	**Have you used NARCCAP data or other regional climate modeling outputs? Describe that experience.**	**Under which circumstances do you believe statistical downscaling should be used, and under which circumstances should dynamical downscaling be used?**	**Are there other publicly available statistically downscaled datasets not listed that you know of or have used? (see separate sheet for familiarity question results)**
Linda Mearns	I have used multiple global climate model outputs for over 20 years, both for global climate model evaluation and for applications to the impacts of climate and climate change on agriculture.	I used them directly mainly through NCAR but also through various individual modeling centers as well as PCMDI.	As the Director of NARCCAP, obviously it would be odd for me to answer this question.	I contributed to or led several guidance documents regarding regional downscaling and statistical downscaling that are available through the IPCC TGCIA. Consult these two documents regarding the recommended use of these two methods.	I think there is insufficient distinction used in these descriptions between 'simple' downscaling methods and 'statistical"downscaling methods, see Giorgi and Mearns, 1991, for definitions).
Claudia Tebaldi	I have experience with the analysis of Global Climate Model output, either as single model or as multi-model ensemble simulations. I have mainly dealt with output of temperature and precipitation, in the form of climatological averages (multidecadal/seasonal means treated as snapshots of the climate behavior, often averaged over large regions), or with daily/monthly values treated as time series, sometimes focusing on the behavior of extreme indices. In most cases I've been interested in contrasting current climate simulations to future	I have been lucky to always rely on someone else that extracted the data from the PCMDI website for me. By the time I accessed the data, it was made into nice netCDF files. I have mainly used GCM-scale data, but for a project for the California Climate and Energy Commission I used downscaled data (BCSD and Analogues). And for Climate Central products I have used BCSD. Also in those cases the files had been made available in a directory at SCRIPPS/on Climate Central servers, so I did not have to deal with accessing public repositories.	No	I believe the differential values of the two techniques has not been robustly documented. To me the main points to consider are: is there the need of a set of variables beyond surface T&P, that have to be dynamically coherent (preserving the dependence structure among them)? Because often downscaled output only gives us T&P. Also important, is an ensemble of downscaled simulations available (i.e. do we have a set of models represented by the downscaled output)? Because the uncertainty in the driving GCMs has to be represented. I think one of the valuable lessons from a project like PUMA will be a comparison of what we get from stat. vs. dyn. Downscaling in those cases where the two can be used interchangeably.	Not for the US

Question:	6	7	8	9	10
MODELING ADVISORY COMMITTEE MEMBER	**Are there other approaches or models you have used that are not in this inventory? Were the results a success or useful?**	**Are there other limitations or issues using the data identified in this inventory that were not addressed?**	**Do climate modeling tools today provide "actionable science" in the sense that they provide "data, analysis and forecasts that are sufficiently predictive, accepted and understandable to support decision-making, including capital decision making." Why or why not?**	**Without considering cost or time to complete, do you believe utilities would be best served today by utilizing data currently or soon to be available in CMIP3 or CMIP5 databases or by performing original dynamical or statistical downscaling customized for a particular watershed and set of evaluation objectives?**	**What do you hope to gain from your involvement in PUMA?**
Linda Mearns	I have used a number of regional modeling results data sets. There is an impressive list of available data sets in the IPCC 2001 volume, WG1 (Giorgi et al., 2001). Yes, of course. There are many datasets that I have used in the past that are not included in the inventory presented	The main limitation in using any of these data sets relates to the fundamental issue that there has not been a careful assessment of methods, that actually determines the relative and absolute use value and credibility of these various means of downscaling. That is why I am spear heading an effort to convene a National Academy Panel on the Evaluation of, and Appropriate Use of Various Dwonscaling methods. I would be very happy if WUCA supported such an efforts. (LOM	This is a very complex question. Certainly climate model results have been used in developing adaptation plans. The example of adaption planning for New York City comes to mind. It should be noted that they used extremely simple downscaling (i.e., the dela approach) for their downscaling. They essentially used changes from global models. When considering the complex web of uncertainties related to adaptation planning, it is doubtful that dynamical or statistical downscaling would have substantially altered their plans. There is an important lesson here regarding the value of complex downscaling. Again, I must emphasize the importance of supporting a National Academy study on this topic that would include representation of stakeholders. The study should emphasize the investigation of the value of various downscaling methods in the context of decision making (e.g., adaptation planning).	From the IPCC Exerpt Meeting on Multi-model ensembles analysis and use, we recommended using a combination of CMIP3 and CMIP5 for analysis and impacts. Downscaling is likely valuable only if other major uncertainties are also managed, such as large scale uncertainties resulting from the use of various AOGCMs.	I hope to understand more fully the needs of water resource managers, and be involved in the co-production of appropriate knowledge regarding future climate for decision making.
Claudia Tebaldi	I have seen work done by estimating statistical relations among observed data, then applying it to model output, or work done through stochastic weather generators. I think they have been proved effective but they require careful development for different locales and I do not think it is something this project can and wants to get into.	I feel like this is a very general question, that we will address during the meeting. I think these inventory goes a long way addressing the main sources of uncertainties that make the use of climate projections challenging (models' structural uncertainty, resolution limitations, representation of natural variability, alternative scenarios, coherence of the output variables, representation of extreme behavior).	As long as we are clear on the kind of prediction we expect from them. I think they can give us a sense of what are robust "directions of change" and what are "significant" changes ahead. I don't think we are at the point where we could trust the absolute numbers coming out of these models projections. As for the range/probability distributions that we can come up with by looking at an ensemble of models, I think we cannot be adamant that it is it, but I think it is the best we can do at the moment. We also have to be clear on separating the forced signal of change from the natural variability component, and not forget the latter that needs to be superimposed to the former.	I came to believe that customization and expert involvement in evaluating models for a specific region and application is the most robust way to go, but I have no idea if the results of that would be much different from what can be gained by a rather more general approach. Some work in the literature for example has shown that evaluating models for specific climatic areas and ranking or eliminating those that perform worse does not change the final form of the projections, while some other work in the literature has found that the opposite is true…I think we are in virgin territory!	A thorough exposure to a real world application of climate projections, in a rigorous framework, allowing intercomparisons and evaluation of the effectiveness/limitations of the different approaches.

Question 5: The Inventory lists 7 statistical downscaling projects; how familiar are you with each (1=heard of, 2=seen results, 3=used)?

MODELING ADVISORY COMMITTEE MEMBER	Reclamation/SCU	ClimateWizard	NECIA 0	UW Madison	USGS CASCaDE	CRU	UW CIG
John Abatzaglou	3	3	0	1	3	1	3
Joe Barsugli	3	2	2	1	1	3	2
Levi Brekke	3	2	2	0	2	0	3
Mike Dettinger	3	0	0	0	3	2	3
Phil Duffy	3	3	1	1	0	2	2
Tom Johnson	3	3	0	0	0	0	1
Ed Maurer	3	3	3	1	2	3	2
Linda Mearns	0	1	0	0	0	1	1
Claudia Tebaldi	3	1	0	0	0	0	0
AVERAGE	**2.7**	**2.0**	**0.9**	**0.4**	**1.2**	**1.3**	**1.9**
RANK	*1*	*2*	*6*	*7*	*5*	*4*	*3*