

WESTERN WATER ASSESSMENT

<http://wwa.colorado.edu/>

Demand Side Assessment

- Who are the major stakeholders for your RISA?

The WWA has a very wide diversity of stakeholders, loosely grouped into four categories: (1) climate-information providers (National Weather Service including NWS River Forecast Centers, National Interagency Fire Center, Colorado Drought Task Force, USDA NRCS); (2) operational water managers (e.g., federal, regional and municipal reservoir managers); (3) planning and policy interests (e.g., municipal water providers, regional water planners, legislators, county commissioners); and 4) finally, we are often called upon to appear at or make presentation to meetings that include the general public or major interest groups, and to provide information to the media. With very few exceptions, these interests all share a focus on water resources in the interior West. As noted elsewhere, this diversity of stakeholders necessitates an equally diverse set of processes and products.

- What processes are used to include stakeholders in the research planning process, the research implementation process, and the research reporting process?

The WWA uses a variety of meetings, workshops, conferences, and other face-to-face meetings with stakeholders. Examples include a major “summit meeting” with officials from Denver Water; meetings of water management groups, the periodic meetings of the Drought Task Force; annual conferences of the Natural Resources Law Center; and so on. In most cases, we find that interactive, two-way communications have more utility than one-way “briefings,” although each mode of communication has its place. For example, briefings and presentations at conferences can be useful in inviting follow-up conversations with stakeholders. Similarly, presentations of basic climate information/processes can help establish a baseline of common knowledge necessary to set up more focused discussions. Other tools used mostly for information dissemination include web pages and the Intermountain Climate Summary (a recently established publication of the WWA). Some limited surveys have also been used to elicit stakeholder needs and wants. Finally, in the case of the one project, periodic face-to-face meetings and progress reports with water management personnel have been a successful means to plan and carry a collaborative research program.

- How are stakeholder interactions evaluated?

While this is a subject that has been discussed several times within the WWA, the formal evaluation of stakeholder interactions is generally absent from our program as we have not identified a practical way to collect measures that promise useful information. Some exceptions exist, such as a recent survey of users of Klaus Wolter’s forecasts and a planned survey of recent stakeholder interactions by our CSU program element. Many WWA products generate responses from stakeholders; e.g., Denver Water has gone out of their way to praise the value of the Intermountain Climate Summary. But in general, the quality of stakeholder evaluations is measured by the extent to which stakeholders choose to continue or expand their interactions with WWA, by the number and “importance” of invitations to present information or collaborate on problem-solving, and so on. Repeat (and new) business is a sign of success. Success is also shown in stakeholders willingness to write letters of support for WWA-related proposals to NCTP (for 2005 and 2006 RFPs) and SARP; funding for WWA-related activities, both in the form of grants/contracts (USBR/WCAO and CWCB) and in-kind support (e.g. Denver water and CRWCD hosting meetings). We are aware of some poorly executed stakeholder evaluations conducted by outsiders at other RISAs and hence are leery of utilizing this pathway without adequate supervision.

- What has your RISA learned from the process of stakeholder interaction, and how have its decision processes changed as a result?

Several lessons have emerged. First, the most productive interactions involve developing partnerships with key stakeholders and stakeholder groups that involve two-way communications. One-way communications are generally valuable only to the extent that they are likely to encourage and set-up the two-way communications useful in better understanding the relationship between information supply and demand. (For example, a presentation on climate basics or the distribution of a “primer” may be a necessary first-step before a potential stakeholder is comfortable having a more focused conversation.) Healthy stakeholder partnerships are characterized by: (1) recurring and iterative interactions over time; and (2) mutual development of fora for communication, learning, and bringing perspectives together. Such partnerships lead to innovation in both science and management from interaction. It takes significant time to develop these relationships. (The antithesis of the WWA approach is “drive by consulting”—i.e., one-way, one-time communication.) Within these parameters, the mode of communication (e.g., phone, email, meetings) is best left to the discretion and preferences of the stakeholder. Our strong beliefs about the high value of stakeholder interactions are reflected in our criteria used internally to design and evaluate projects for funding. Another key lesson has been: **take advantage of windows of opportunities!** The drought created a wonderful opportunity as it focused the needs of water management in an area that had largely been ignored (drought planning). In the case of the paleo work, the drought resulted in the lowest annual streamflows on record for many gages, motivating interest in assessing this drought in a longer-term context than provided by the gage records. It also had the effect of calling into the question the appropriateness of basing drought planning on the length-limited gage record.

- How did you develop your process for eliciting stakeholder needs/wants?

Our processes are varied, evolving, and sometimes ad hoc. Different stakeholders are reached in different ways. We have used methodologies including questionnaires and surveys, formal and informal interviewing, and acting as participant-observers in several water management fora. We have also used environmental scanning, document analysis, and process tracing techniques to identify critical water management decisions and the stakeholders in those decisions. Again, to the extent that personal relationships exist or can be developed with key members of key stakeholder groups, the opportunities for eliciting stakeholder needs/wants increases dramatically. To the extent that we rely upon personal networks to identify and flesh out research needs and opportunities, it is important to employ team members with excellent social skills. Researchers with self-defined agendas that prefer to remain locked in their labs are not the ambassadors we rely upon. Eliciting stakeholder needs/wants is viewed as an ongoing activity to which all team members are engaged; it is not viewed as an activity best suited to periodic surveys.

Supply Side Assessment

- Briefly describe the research agenda for your RISA.

The WWA has carefully developed the following mission statement to explain our agenda: *The mission of the WWA is to identify and characterize regional vulnerabilities to climate variability and change, and to develop information, products and processes to assist water-resource decision-makers throughout the Intermountain West.* Ultimately, our activities are designed to help a variety of stakeholders in the intermountain West identify and address the vulnerability of water systems to climate variability and change. This mission is very broad in terms of substantive and geographic scope, so our selection of projects within this broad mission is guided by practical considerations, such as the expertise of personnel, budget constraints, and other factors.

- How does your RISA set its own research priorities?

Through internal discussions and our discussions with stakeholders, the WWA attempts to identify projects and research priorities within our defined agenda that are important, “manageable” (i.e., likely to yield tangible benefits to society), and that provide service to our full spectrum of stakeholder groups. It should be noted that WWA’s policies and procedures in this area have evolved over time. The following criteria are used to compare (internally) competing projects:

1. *NOAA Vision and Mandates.* Projects must be compatible with the NOAA mission, NOAA strategic goals, NOAA cross-cutting priorities as well as Congressional NOAA mandates such as the U.S. Global Change Research Act of 1990 and Administration initiatives such as the Climate Change Science Program which involve NOAA. Acceptable projects will help NOAA line offices meet their current responsibilities, and will seek to identify, and ideally fulfill, information needs that are currently poorly provided by NOAA. Other creative projects meeting any of the NOAA goals, mandates and initiatives as envisioned by NOAA, Congress, and the Administration are encouraged.
 2. *RISA Criteria.* Projects must meet one or more RISA activities criteria (see the RISA vision document for more details). These include (a) integrated research; (b) regional assessment; (c) links to decision-makers; (d) links to operations; (e) education; and (f) cross-RISA activities.
 3. *WWA Mission.* Projects must be consistent with the WWA Mission Statement and Research Objectives. In particular, projects should:
 - (a) involve research, education, and/or outreach that directly addresses the WWA mission.
 - (b) be of significance, interest and use to decision-makers in the water-related decision-making community.
 - (c) address issues related to climate variability and change.
 - (d) provide products and information in a reasonable timeframe.
 - (e) be based on a strong understanding of user needs, or alternatively, include a user needs assessment.
 - (f) provide for two-way communication and feedback between the research community and the community of water-related decision-makers.
 - (g) be conducted in partnership with climate-sensitive users (e.g., Denver water) and/or information providers (e.g., the State climatologist).
 - (h) explicitly consider the mechanisms, opportunities, and constraints (i.e., the “decision environment”) associated with the application of research results and/or products.
 - (i) dedicate resources to evaluate what worked, what did not work, and what results can be more broadly applied to meet user needs for decision support so that NOAA and WWA can perform at a higher level.
 - (j) explicitly consider how products and information can be transferred from a research context to an operational context.
 - (k) not be redundant of other work both within WWA and in other science-programs—the intent should be to synthesize, integrate, and/or transform existing work into knowledge and products that are new and innovative.
 4. *Project Length.* Multi-year projects are encouraged. Proposed projects should not, however, require a level of funding that is beyond the scale of what WWA can support or can commit to in a given budget year. Projects that are envisioned as multi-year undertakings will only be supported if the project can be distilled into annual phases with associated products—multi-year undertakings will require a proposal every year. This said, extra credit will be given for building on WWA successes.
 5. *Deliverables.* Journal articles are usually not sufficient, and generally must be accompanied by other deliverables. Examples of suitable deliverables are (a) articles written for a general audience; (b) sustained interactions with users and/or information providers; (c) web sites; and (d) models and datasets.
- How has this agenda evolved over the duration of the RISA? What new projects have been started that were not anticipated at the beginning of the RISA? What projects have been terminated, and why?

The selection of projects is perhaps the area where the WWA has enjoyed the greatest innovation and maturation. Initially, participating researchers all submitted one-page summaries of individual research proposals that, generally, were all pursued within budget confines. This approach suffered from four major problems: (1) the agenda was set almost entirely by researchers, not stakeholders; (2) linkages between projects were poor; (3) there were no explicit criteria used to select among projects when necessary; and (4) the high diversity of projects made it difficult to build real strengths in a smaller set of issues. The first 3 of these issues was resolved by an internal competition of proposals that included explicit design and selection criteria (specified above). The final problem has been addressed recently by a decision to take less of a scattershot approach to research and instead focus on a smaller set of themes.

New projects generally reflect stakeholder requests (e.g., Klaus Wolter's forecasts) or special opportunities, many of which were provided by the regional drought that began soon after WWA's formation. "Terminated" projects are generally those that did not generate or sustain a critical level of stakeholder involvement and support, or that provided technical or budgetary problems that were not easily overcome. The most prominent example of a terminated program area is our focus on water quality (and the resulting ecological impacts), terminated due to a lack of stakeholder demand and a difficulty in maintaining sufficient expertise within the WWA. For practical reasons, we try to "play to our strengths" in terms of personnel, expertise, resources, and stakeholder contacts.

- In your RISA, what is the balance between research on new subjects, and assessment/compilation of existing knowledge? How is this balance determined?

We balance our work by selecting projects that provide the desired budgetary balance for the different categories of our mission. Projects related to new, cutting-edge research include forecasting work by Wolter and Clark, among others. Generally, this is work that is to be handed-off to existing information providers (e.g., river forecast centers) or water operations personnel (e.g., reservoir operators) already familiar with climate research and products. At the other end of the spectrum, many planning and policy stakeholders are not familiar with climate research, concepts, or products. In these cases, primers, briefings, and conferences (such as the Natural Resources Law Center activities) are often more appropriate. In other cases, it is a combination of both. For example, we spent several meetings with water managers from Denver Water explaining how tree-ring data are used to reconstruct streamflow, but in subsequent meeting, the focus shifted to how traditional tree-ring methods might be refined or advanced to meet the planning needs of Denver Water. The decision to focus on "new" or "existing" knowledge is not driven by ideological considerations, but rather by a desire to make the most significant impact possible in helping our diverse community of stakeholders respond to the many, multi-faceted challenges associated with climate variability and change.

- Please describe the specific ways that knowledge is disseminated from your RISA. How would you assess the relative importance of various dissemination mechanisms, such as peer-reviewed publications, other types of publications, web-based presentations, public fora, etc.?

A tremendous variety exists. What is most appropriate or "important" is largely determined by the desired audience. Technical innovations are often best disseminated in professional journals (e.g. BAMS), however, some audiences—including many in the operational and policy and planning communities—have expressed a preference for less formal publications (summary reports, newsletter, letters) or oral presentations. Publishing in journals read by professional water managers, such as the American Water Works Association publications, remains a goal. Documents are often distributed directly to target audiences, and of course, on the web. The web pages of the WWA include forecasts, primers, reference materials, contact information, and a variety of other information. Workshops, conferences, briefings, and other face-to-face interactions are also a staple of WWA activities. Being responsive to media requests is also a major activity of several WWA personnel, as is appearing at various conferences and other public settings. WWA personnel have also written press releases and regular newspaper columns. E-mail 'alerts' are used to inform our stakeholders of new information, frequently with an associated web address for additional information. In general, most "products" are disseminated in multiple ways. In general, traditional academic knowledge distribution pathways are ill-suited for most of our stakeholders.

Reconciliation/Managing Ecology of S&D

- In what ways have considerations of supply for research shaped the evolution of your research agenda?

WWA views the supply side of research as larger than that produced in the WWA itself. It has been a challenge to follow through on identified user needs (many key needs were identified early in the project), by developing applied research products to generate useful products as prototypes, then to cultivate the interest of operational entities to issue them as products. Even when the research is from within the WWA community (although not necessarily funded under that umbrella) it is a challenge to adequately fund applied work, which may take several years to produce prototypes, and maintain user interest, then re-iterate on prototypes. Examples include the paleoclimate research, hydroclimatology research, and intraseasonal forecast research that originated outside WWA, but within CIRES or CDC. Another challenge is when the research relevant to user needs is external to WWA. In these situations we continue to seek relevant research and to cultivate partners for applied projects wherever the results are suited to user needs. Currently, WWA is seeking to identify the needs of more users, but we have a backlog of needs we are working on applied projects to meet.

- What tensions have arisen between stakeholder needs, demands, and expectations, and the scientific capabilities and priorities of the RISA? How have those tensions been addressed or resolved?

Some stakeholders ask questions that are beyond our expertise (e.g., when will the drought end?) or request information in an impractical format (e.g., a desire for absolute rather than probabilistic forecasts). In general, these requests are easily converted to more practical conversations exploring the existence of opportunities for matching information supply and demand, or initiate discussion that reframe questions. (For example, in the absence of absolute information, we can help stakeholders think about how to best understand and deal with scientific uncertainty.) More problematic is finding the right balance between being an operational entity that directly helps stakeholders solve problems, and being an intermediary entity that helps to build the strengths of other information providers (both public and private) already established to serve stakeholders. This tension was evident when the WWA was asked by NOAA to rename our Outlook newsletter to the Intermountain Climate Summary, as the first name implied a more operational mission than was considered appropriate. There is a problem of developing long-term relationships with stakeholders, yet maintaining scientific integrity (we are not consultants) AND not becoming service providers. “Experimental” products unfortunately have a way of becoming quasi-operational, while not being transferred (yet) to operational entities who may or may not be enthusiastic about this. The need for evaluation of experimental products takes time since climate forecasts are not issued daily. Both of these problems limit our ability to quickly move funds from one endeavor to another. Finally, WWA members operate in an academic setting yet some of our work products do not lend themselves to scientific papers which are necessary for advancement. NOAA’s definition of the RISA role is evolving and, at times, somewhat contradictory, ensuring that the RISA’s are all “shooting at a moving target” when it comes to defining our role.

- How does your RISA evaluate the appropriateness of stakeholder needs (e.g., from the standpoint of public/private sector roles and responsibilities)?

The WWA has had (surprisingly) few issues where a concern over public/private roles emerged. (There are relatively few private climate information providers in the region, which is perhaps one explanation for this lack of conflict.) Many potential conflicts are avoided by WWA ground-rules. First, we make it clear that we are not consultants, and a primary WWA goal is to help NOAA learn how to provide and implement Climate Services. In addition, we avoid collaborations where we are likely to lose control of how scientific findings are interpreted and disseminated in public settings. We enter into relationships (e.g. paleo streamflow reconstruction work) with a clear understanding with our stakeholders and collaborators that we expect such efforts to produce *public* products, or techniques, that will be made available to other similar stakeholders. We are also well aware of NOAA constraints and sensitivities with respect to certain products and activities.

- How are stakeholders identified? Which stakeholder groups are most important in influencing your RISA research agenda? Why? Which stakeholder groups are least important? Why?

Early on in WWA, we used environmental scanning and critical water problems approaches to determine some of the major water problems and user groups in the WWA domain. In general, we seek out collaborations with the largest and most powerful water interests in the region (e.g., Denver Water, Colorado River Water Conservation District). We have been fortunate in that these large groups feature “early adopters” regarding the use of climate information/products, and in some cases (paleo) these entities have contacted us first. (We attribute these contacts to widespread publicity and subsequent interest in this work.) We utilize a “bang for the buck” mentality in seeking collaborations, hoping to exploit the most promising and practical opportunities for matching information supply and demand. Additionally, some groups come to us, asking usually for presentations or articles for specialized journals (e.g., the nursery industry). The ideal stakeholder is one that can aid and inform our work and that, conversely, can implement and benefit from the resulting information/products. Relationships of this nature that have two-way benefits are likely to be lasting and are ideally suited to publicly funded enterprises such as RISAs.

- How does your RISA evaluate its research planning process?

There are apparently two aspects to this question. The first is evaluation of the criteria that we use to judge projects. The second aspect is the judgment of research results. The former is evaluated by discussing our criteria in meetings to make sure that we are not either overlooking important criteria that should be added, or removing unnecessary criteria that serve no purpose. With regard to the latter question, we match our criteria to project results. For example, given the high value of stakeholder interactions, projects that generate ongoing stakeholder interactions and support are an obvious sign of success. Annual Reports from funded personnel, and quality and timeliness of deliverables are other important factors used to decide if research should continue to be funded.

- What lessons in the process of the reconciliation of supply of and demand for science are relevant to the broader implementation of the CCSP?

Despite thousands of popular press articles on climate change over the last twenty years, many of our stakeholders are unaware of even very basic scientific findings and the structure of climate change research. For example, during WWA public presentations knowledge of the basic physics of greenhouse gases is absent and a question about what is the Intergovernmental Panel on Climate Change is likely to result in blank stares. Without this fundamental foundation, stakeholders can not provide the necessary ‘demand’ for science. (WWA has, and will continue, to spend a significant amount of resources providing this educational function.) And without a well enumerated demand function, the supply side operates without any guidance on what to produce. While it may seem simple to educate the stakeholder ‘consumers’, the dynamic nature of climate science means that this is not a simple one-stop job. Confounding the educational process is that many water manager stakeholders are older, risk averse, and very busy. In our fast growing region of the country, population growth may serve as an analog to future climate change impacts.