Water Needs and Strategies for a Sustainable Future: *Next Steps*

Western Governors' Association ◊ June 2008

Executive Summary - Priorities in Moving Forward

Background

The 2006 WGA report entitled "Water Needs and Strategies for a Sustainable Future" (WGA Water Report) contains numerous recommendations and action items to encourage and assist local, state and federal planners and managers to coordinate effectively and to prepare for and meet the ever-increasing challenges associated with water management in the arid West. It was crafted with the assistance of a large and diverse group of stakeholders, and it provides a roadmap for addressing the water challenges facing the West.

The WGA asked the WSWC to assist in the implementation of the WGA Water Report's recommendations. Accordingly, the WSWC prepared a "scope of work" outlining several tasks. In carrying out these tasks, a varied and diverse group of stakeholders made significant contributions in the context of a number of conferences and workshops sponsored by the WGA and the WSWC, in association with other agencies and organizations.

Further, given the significant role of the federal government in water resources management in the West, the WGA and the WSWC invited several federal agencies to assist in providing information and technical assistance. The Corps of Engineers in particular received funding to support the WGA/WSWC effort and undertook various tasks to do so, in collaboration with other federal and state agencies. Together, these tasks are designated as the Corps' "Western States Watershed Study", hereafter referred to as the "watershed study".

Where applicable, "findings and recommendations" or "next steps" are included in this report as they were identified in the process of implementation of the respective tasks. These include some based on information contained in the working drafts of various multi-agency "project delivery teams" in the course of preparing the watershed study. Importantly, the listed findings and next steps are limited to those that are relevant to the priorities and recommendations contained in the WGA Water Report.

Each of the six major sections of the WGA Water Report is discussed; namely:

1. Water Policy and Growth
2. Water to Meet Future Demands
3. Water Infrastructure Needs and Strategies for Meeting Them
4. Resolution of Indian Water Rights
5. Climate Change Impacts
6. Protecting Aquatic Species under the Endangered Species Act (ESA).

The Governors have reviewed the findings and "next steps' identified in this report. In addition to those listed above in the foreword, the Governors believe the following action items represent the most important next steps to further their recommendations regarding the West's most vital natural resource.

Water Policy and Growth

1. States (who have the legal responsibility associated with the resource), working with interested stake-

holders, should identify innovative ways to allow water transfers from agricultural to urban uses while avoiding or mitigating damages to agricultural economies and environmental values.

2. States should offer technical/financial support for watershed groups dealing with water issues associated with growth, and assure these groups are sufficiently empowered to deal effectively with these issues.

3. In order to better integrate water and land use planning, states should examine their related laws and institutions and evaluate the merits of implementing the following steps, recognizing that states should not overtake local planning; rather growth planning should come from the bottom-up, but take place within the planning framework established by the state.

   (a) Establish state policies that facilitate the flow of information from water resources agencies to local planning agencies, to enable local governments to create more accurate, meaningful water resources elements in their comprehensive plans.

   (b) Enact legislation to enable localities to impose impact fees on developers so as to pass on the costs of acquiring new water supplies.

   (c) Identify and implement the most effective means to consider growth management plans or other land-use regulations and decisions during the water right appropriations process.

   (d) Permit and monitor exempt domestic and livestock wells as part of water right regulatory schemes.

   (e) Require local governments, after providing them with funding and technical assistance from the federal, state and/or private sector, to create and adopt local comprehensive plans that include a water resources element.

Water to Meet Future Demands

Water Information

4. Congress should immediately provide funding sufficient to include the emissive thermal infrared (TIR) instrument on Landsat 8 as part of the Landsat Data Continuity Mission (LDCM) as a unique and cost-effective means to measure agricultural and other consumptive water uses.

5. The National Aeronautics and Space Administration (NASA) should immediately begin preparing a request for proposals (RFP) and take other steps needed to ensure TIR is included on Landsat 8, and request supplemental and future funding sufficient to minimize any necessary delay in the scheduled launch.

6. Congress should: (a) fully fund the US Geological Survey's National Streamflow Information Program (NSIP) to establish and add an additional 881 streamgages in the western states; (b) increase funding for the USGS Cooperative Water Program (CWP) to preserve long-term streamgages; and (c) equally match state CWP contributions.

7. State and federal water resource agencies should work together to provide universal access to the water-related data collected by all state, local, and

federal agencies, as well as tools and models that better enable the synthesis, visualization and evaluation of water-related data, including that to be shared with local governments.

Water Planning and Management

8. Federal agencies with long range water supply planning responsibilities should:

   (a) Work in cooperation with states to help communities develop drought preparedness plans, drought contingency plans, establish or enhance federal reservoir drought contingency plans, and be visible and engaged in all drought-related forums: nationally, regionally and locally.

   (b) Support the implementation of the National Integrated Drought Information System (NIDIS) by

      (i) providing drought information, such as reservoir storage levels, linking Federal web sites with the NIDIS site;

      (ii) supporting state and local drought planning within an integrated water resources management framework;

      (iii) providing information on drought impact assessment in areas where they have expertise, such as navigation, hydropower, ecosystem needs, and recreation; and

      (iv) participating in NIDIS pilot studies, particularly in studies involving water resources management.

   (c) Ensure there is an accurate assessment of the Nation's water availability and water demands, with the goal of integrating the information into state water resources planning, recognizing that a truly national assessment must begin at the state and local level with appropriate technical and financial support from the federal government.

9. Congress should:

   (a) modify the applicable authority of the Corps of Engineers so that storage can be more readily reallocated for water supply and not for just municipal and industrial purposes, and

   (b) instruct the federal water resource agencies to include Integrated Water Resources Planning and Assistance as one of their primary missions.

10. States should encourage the use of water banks, rotating fallowing and dry year leasing, as well as other voluntary means to improve agricultural water use efficiency and to provide water for other uses during periods of shortage. Modifications to statutory measures regarding forfeiture and abandonment may be necessary as they apply to participants in these programs.

Promising Technologies and Strategies

11. The Congress and the Administration should support more spending for research and development related to innovative water conservation and supply augmentation strategies, including ground water recharge and recovery, desalination, recycling and reuse, and weather modification. Finan-

cial assistance should be provided as well where there is a significant national or regional benefit.

12. The Bureau of Reclamation, Corps of Engineers, Department of Agriculture, Department of Energy, EPA, NOAA and USGS should support and coordinate research and development of such strategies, focusing on reducing the costs and maximizing the benefits, as well as defining the scope of any potential adverse effects or obstacles to implementation, such as the impact of emerging contaminants on drinking water as it relates to reuse and recharge.
13. Federal, state, and local agencies should further their efforts to investigate the availability and use of brackish waters to meet future water needs, particularly those of rural communities without other readily available sources of supply, and to identify ways to mitigate adverse impacts of brine disposal.
14. States should evaluate their current capacity and fill the need as appropriate for institutional mechanisms to further encourage water conservation, reuse and supply augmentation strategies, as well as promote education and outreach activities to improve public acceptance of such strategies.
15. States should also provide administrative, financial and technical assistance to research and evaluate the potential to enhance these strategies through new and innovative uses of technology.
16. State and federal water management agencies should evaluate the potential for integrating artificial groundwater storage and recovery opportunities with existing and future project operations, new construction and rehabilitation and betterment work.

Water Infrastructure Needs and Strategies

Water and Wastewater Treatment

17. Congress should maintain and increase Clean Water Act and Safe Drinking Water Act State Revolving Fund appropriations, as it represents a comparatively small but vital percentage of overall infrastructure investment.
18. Congress should remove the state volume caps for private activity bonds used for water and wastewater projects, provide loan guarantees, and otherwise support and encourage necessary alternatives to direct federal investment of limited general funds.
19. Although not a panacea for all our infrastructure financing challenges, private and public/private financial partnerships can be useful and should be encouraged.
20. All levels of government, along with appropriate private sector involvement, should cooperate in the development and implementation of appropriate criteria for prioritizing infrastructure needs, asset management strategies, policies, standards, techniques and technologies.
21. States should encourage adequate and progressive local asset management plans, programs and best management practices through technical and financial assistance.
22. States, with assistance from relevant federal agencies, should provide institutional mechanisms and

otherwise encourage regional water and wastewater projects to maximize economies of scale and minimize environmental impacts from smaller, piecemeal project development.

23. Utilities should adopt transparent planning and rate setting processes that include stakeholder/public education and participation, with rates reflecting life-cycle costs and acceptable risk.

Water Resources

24. In cooperation with federal, state, local and private landowners, states should identify and prioritize anticipated future water resources infrastructure needs as a component of western state water plans and planning processes.

25. Federal agencies should work cooperatively with state and local water agencies to identify necessary studies, data and projects and states should actively support funding to assist in implementation.

26. With federal technical and financial assistance, states should identify, restore and preserve high value watersheds and natural features (such as wetlands) that provide ecological service (mitigate flooding, filter and remove pollutants, recharge ground water, etc.), and that may minimize the need for structural alternatives.

27. The WSWC should update information and compile a report on western state water resources infrastructure financing authorities, funding sources, policies and programs.

Resolution of Indian Water Rights

28. Congress should ensure that any land or water settlement, once authorized by the Congress and approved by the President, will be funded and implemented in a timely manner without a corresponding offset to some other tribe or essential Interior Department program.

29. Congress should explore opportunities to provide funding for the Bureau of Reclamation to undertake project construction related to settlements from revenues accruing to the Reclamation Fund, recognizing the existence of other legitimate needs that may be financed by these reserves.

Climate Change Impacts

30. Congress should appropriate sufficient funds to conduct a portfolio assessment of federal projects to evaluate the performance of such projects given current conditions and to determine the vulnerability of projects to changing conditions.

31. Federal agencies should begin a systematic updating of their respective reservoir operating plans and drought contingency plans to assure that operating plans are adaptable to a changing climate.

32. The National Oceanic and Atmospheric Administration should take the lead in improving forecasts on multiple geographic and temporal scales and conduct additional research in collaboration with water management agencies so that forecasts can be incorporated into reservoir operations.

33. The USGS, in cooperation with states, should improve monitoring and data collection to identify and respond to changing regional and local trends, and allow for better early warning systems

"Population growth is continuing at an unprecedented rate in the West with ramifications not only for cities but rural communities and agricultural areas." (WGA Water Report, p.3)

that (a) focus on critical or vulnerable systems; (b) deliver real-time data; (c) improve data access, storage and retrieval; (d) allow for real-time "smart" analysis; and (e) provide feedback and evaluation.

34. The federal government, in cooperation with states, should take the lead in putting together a web site to provide more useful and scaled output from climate models for the water management community.

35. Water managers should take the initiative to clearly communicate their needs for applied science to the climate research community, and must seek opportunities to guide hydroclimate research in directions that will support real-world problem solving.

36. Planning for climate changes should be undertaken at all levels, from the federal government to private and public water utilities, with participation from non-governmental organizations.

37. More water storage should be considered, accompanied by an extensive risk and cost-benefit analysis, together with an analysis of the potential for reducing demand and increasing water use efficiency.

38. States that share river basin or groundwater resources should consider jointly addressing potential future supply reductions resulting from climate change.

39. States should examine their existing water laws and institutions to determine if they are adequate to provide sufficient flexibility to address potential climate change impacts, with a particular focus on water initiatives and programs associated with demand management, efforts to "stretch" existing supplies, water banking, and water transfers.

40. States should anticipate an increased need to address the forecasted effects of climate change in administrative, regulatory, and legal agreements involving water resources.

Coordination and Cooperation in Protecting Aquatic Species under the Endangered Species Act

41. While recognizing the existence of tools and remedies under federal law, those seeking to protect and enhance instream flows for Endangered Species Act (ESA) and other purposes should first consider utilizing existing state tools to address their concerns before resorting to other means, as this approach can not only avoid conflict but provide enhanced protection within the regime of state laws and administration.

42. In instances where proposals to protect or enhance instream flows for ESA or other purposes cannot be accommodated under state law, a process of negotiated compromises resulting in formal agreements should be pursued to resolve conflicts.

"[P]ublic support continues to grow for instream uses, which include bays and estuaries.… Water for increasing energy needs is expected to raise additional demands on available supplies. Unquantified Indian water right claims represent further challenges which strain water resources and institutions throughout the West. Climate change represents another threat to reliable and sustainable water supplies for the West."
(WGA Water Report, p.3)

Water Needs and Strategies for a Sustainable Future: Next Steps

Introduction

In each of the following sections of the report, implementing activities associated with the respective recommendations of the WGA Water Report are described, followed by findings and next steps identified in the process. Some "next steps" are repeated because they were identified in connection with more than one implementing activity, and lend additional support to the respective recommendations. On the other hand, "findings" are generally not reiterated.

For purposes of clarity, only those specific recommendations from the WGA Water Report that relate to implementing activities to date are included for reference.

Water Policy and Growth

2006 Report Recommendations

To foster sustainable growth policies, states should identify water requirements needed for future growth, and develop integrated growth and water supply impact scenarios that can be presented to local decision makers.

States should facilitate collaborative watershed-focused planning that balances desirable growth and protection of the natural environment that depends on surface and ground water quantity and quality.

In reviewing applications for new water uses, transfers and changes in use, including instream flows, states should consider local, tribal and watershed plans and decisions regarding growth management.

States and local governments should consider the impacts of continued growth that relies on transfers from agriculture and rural areas, and identify feasible alternatives to those transfers.

Implementation Activities

On October 10-12, 2007, the Western Governors' Association (WGA) and Western States Water Council (WSWC), in cooperation with a number of federal, state and local agencies, sponsored a conference in Salt Lake City entitled, "Water Policies and Planning in the West: Ensuring a Sustainable Future." Over 200 individuals participated in plenary sessions, panel presentations and small group discussions designed to further delineate recommendations and specific action items consistent with the WGA/WSWC Water Report. Featured speakers included Utah Governor Jon Huntsman; Vice Admiral Conrad Lautenbacher, Administrator of the National Oceanic and Atmospheric Administration; Stephen L. Johnson, Administrator, Environmental Protection Agency; and Bureau of Reclamation Commissioner Bob Johnson; and Tom Christensen, Deputy Chief, Natural Resources Conservation Service.

Three areas were addressed by the conference: Water Policy and Growth; Water Planning and State Needs and Strategies (to meet future demands); and

Climate Change (and water resources adaptation strategies).

Lastly, under the leadership of the WSWC Legal Committee, staff prepared a report examining legal and institutional issues associated with water and growth, entitled "Water Laws and Policies for a Sustainable Future: A Western States' Perspective" (hereafter the Water Laws and Policies Report).

Related Findings and Next Steps

October 2007 Water Conference

The conference in October of 2007 featured breakout groups that dealt with each of the three conference topics in turn. The first group of breakouts dealt with water and growth. The following is the listing of their findings and "next steps."

Findings

The following are a few of the key findings presented at the conference. A complete summary of the proceedings is contained in a report available at the WSWC offices.

1. Growth in water use isn't necessarily proportionate to population growth and economic development, but may also be influenced by related trends, such as increasing water use to meet growing energy demands.
2. Achieving a new equilibrium between water supplies and demands will require defining and adjudicating existing water rights and providing incentives to move water to higher and better uses, such as voluntary economic inducements and facilitated market and non-market transfers.

Next Steps

Integration of Growth and Water Planning

1. Data needs to be scaled to the watershed level.
2. State water rights administration and local growth planning need to be integrated.
3. Competition between multiple jurisdictions over a single water source must be resolved at the state level.
4. In the future, we must be willing to pay more for water and conserve.

Watershed Planning and Growth

5. Stakeholders/beneficiaries should be included in watershed planning.
6. States should provide technical/financial support for watershed groups.
7. States may wish to consider empowering local watershed groups with more authority.
8. Watershed plans should incorporate other plans, such as tribal plans, Clean Water Act (CWA) Section 208 plans, etc.
9. Watershed plans should represent a statement of the public interest.

Growth and the Public Interest

10. Water planning and land use planning should be better integrated.
11. State water officials should be aware of planning for growth, and local land use and growth decisions should be informed by water availability and related issues.
12. Public interest definitions are generally broad,

"Decisions about where and how to grow are rarely influenced by water policy or the availability of water. Nevertheless, where a state undertakes to develop and implement a comprehensive growth-management strategy, water resources policy should be a component of that strategy. Indeed, many believe the future of growth management efforts will revolve around natural resource constraints. State efforts should not attempt to preempt local prerogatives, but rather endeavor to inform, guide, and assist local efforts." (WGA Water Report, pg. 5)

inhibiting their utility in water rights administration relative to consideration of growth implications.

13. State water managers can be instructed through legislation to consider local growth decisions and plans, rather than relying on a public interest review.

Ag to Urban Transfers

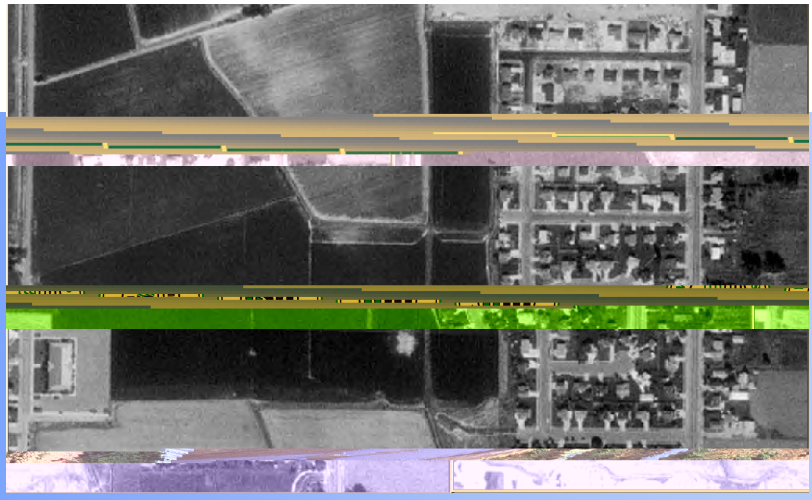
14. Maintaining agricultural production is essential to U.S. food security.
15. Maintaining family farming should be considered as in the public interest.
16. Ecosystem services provided by agricultural lands should be recognized.
17. Water markets should operate within well defined public policy parameters.
18. Public policy should seek to first avoid and then mitigate agricultural land losses.
19. States need to find innovative ways to allow transfers without damaging agricultural economies and environmental values or infringing on private property rights.
20. More surface and ground water storage should be developed, and new technologies employed to promote the beneficial use of impaired waters.

Water Laws and Policies Report

The following findings and next steps are taken from the Water Laws and Policies Report.

Findings

1. Because a disconnect often exists between land use planning agencies and water planning agencies, some states have enacted legislation to manage the consequences of growth, particularly as they relate to water resource allocation.
2. In addition to planning, urban growth boundaries (UGBs)—boundaries that separate urbanizable land from rural land—can integrate water and growth.
3. Although some states have enabling statutes that delineate the purposes and conditions under which development moratoria may be employed, moratoria are an imperfect and indirect means of integrating water and growth management because they typically expire once the qualifying conditions cease to exist or the statutorily prescribed period lapses.
4. Some states, like Arizona, require developers to prove that proposed subdivisions will have an adequate supply of water before construction can begin.
5. While UGBs, growth moratoria and adequate water supply assurances can create a direct link between specific developments and water, they will be more useful if they are used within a comprehensive growth management framework.
6. Impact fees imposed on developers can be an



effective way to coordinate water and growth because developers must internalize or pass on the cost of acquiring new water supplies instead of having municipalities, utilities, or counties absorb the costs.

7. Conservation easements voluntarily donated by landowners restrict development rights on their land to a government agency or non-profit organization to provide public or ecological benefits. Likewise, purchase of development rights (PDR) programs allow landowners to sell development rights to their property to a government agency.

8. While conservation easements and purchase of development rights can encourage the conservation of open space and agricultural lands, they only link water and growth to the extent they foreclose new development and its attendant water demand.

9. While water plans do not normally integrate water and growth because they are usually very general and deal almost exclusively with water use and only rarely with land use, some states authorize or require regional or local water plans, which may be more effective for integrating water and land use planning if they are binding upon local governments.

10. Exempt domestic wells may complicate growth management, particularly if they are used to circumvent measures that would otherwise limit development in a given area.

Next Steps

In order to better integrate water and land use planning, states should examine their related laws and institutions to evaluate the merits of implementing the following steps, recognizing that states should not overtake local planning; rather, growth planning should come from the bottom-up, but take place within the planning framework established by the state.

1. Provide encouragement and education regarding the need for greater coordination and collaboration between water and land use planning agencies.

2. Establish state policies that facilitate the flow of information from water resources agencies to planning agencies, and perhaps a state clearinghouse on data and information related to water - to bridge the information gap and enable local governments to create more accurate, meaningful water resources elements in their comprehensive plans.

3. Clarify the law relative to a utility's duty to serve customers within its service area.

4. Enact legislation to enable localities to impose impact fees on developers so as to pass on the costs of acquiring new water supplies.

5. Identify and implement the most effective means to consider growth management plans or other land-use regulations and decisions during the water appropriations process.

(a) Public interest reviews could provide an administrative opportunity to evaluate growth management plans before new water appropriations or transfers are approved.

(b) Because it is not always clear whether public interest review allows water administrators to consider growth management plans, a more direct way to ensure consideration may be to enact legislation specifically requiring state water agencies to consider local growth in the review process for appropriations and transfers.

6. The WSWC should conduct further review and assessment of the issues associated with exempt domestic and livestock wells, given the extent of serious regulatory and administrative challenges that can potentially affect the sustainability of water supplies, surface flows, and water quality.

7. Permit and monitor exempt domestic and livestock wells as part of water right regulatory schemes.

8. Require local governments to create and adopt local comprehensive plans that include a water resources element.

9. Develop an integrated planning system that pulls together agencies that exercise authority over water resources and land use planning in order to streamline the system of regulation of land use and water use.

Water to Meet Future Demands

2006 Report Recommendations

Federal and state agencies should increase support and funding for state and federal basic water data gathering activities that can serve as the basis for sound decision making. Gaps in data should be identified. Remote sensing capabilities, including Landsat thermal data, and developing technologies, such as the use of Doppler radar to measure streamflows, are important tools that need to be retained and fostered. Further, state and federal agencies must find ways to reduce costs related to gathering and disseminating real-time water data/information, including the acceptance of more in-kind contributions from cooperators. Moreover, new and stable sources of funding are needed. User-pay opportunities or voluntary non-governmental organization contributions should be explored, while recognizing the general benefits provided by basic data gathering efforts, which make it an appropriate governmental activity.

Use the research programs at western state universities to focus research on practical applications of promising new technologies, and identify areas where the increased use of technology (e.g. remote sensing, Supervisory Control and Data Acquisition, new water and wastewater treatment technologies, energy and water efficiency) should be promoted to enable more efficient and cost effective operations.

The WGA and WSWC strongly support enactment of the National Integrated Drought Information System Act of 2006 (H.R. 5136 and S. 2751) to make permanent a National Integrated Drought Information System (NIDIS), as well as broader national drought preparedness legislation. State and federal agencies should consider steps to pursue creation of a broader integrated water resources information system, which would serve as a basis for water-related planning, preparedness and response activities.

The WSWC should explore the relative merits and obstacles related to various programs and technologies and legal and institutional means to augment existing water supplies, including water conservation and water use efficiency, demand management (including pricing structures), water and water rights transfers, water banking, water reuse, revolving fallowing of agricultural lands, watershed protection and management, surface and ground water storage alternatives, desalination, and weather modification. Based on the findings, the WSWC should initiate discussions on an interstate level to optimize appropriate opportunities to ensure that adequate supplies of suitable quality are available to sustain the growth and prosperity of western states.

The WSWC should hold a workshop in collaboration with relevant federal agencies and other stakeholders to evaluate federal and state watershed programs and strategies, and examine in particular the commitment of resources to the watershed approach and the level of coordination among federal agencies and between federal and state agencies, Tribes, conservation districts, municipalities, NGOs, etc.

"In establishing and implementing water planning, a new paradigm has emerged which moves away from a top down approach to identifying problems, projecting needs and suggesting projects and programs towards a bottom up approach that relies on local stakeholders, often on a watershed level, coming together to define and bring to state and federal governments their perceived needs and most likely solutions to their water supply problems." (WGA Water Report, pg. 7)

Implementation Activities

On November 15-17, 2006, the Western Governors' Association, Western States Water Council and California Department of Water Resources, with cooperating federal agencies, sponsored a symposium entitled "Water in the West: Evolving Technologies and Emerging Issues" in Irvine, California. Over 50 senior scientists, water managers and state and federal officials came together to discuss current state-of-the-art practices with respect to water recycling and reuse, artificial ground water recharge, weather modification and desalination, as well as future water management within the context of climate change, increasing climate variability and growing populations.

Following federal agency presentations, a series of expert panels addressed various technological and water supply questions, beginning with climate variability. A key point was that looking backward, it is apparent that we are in a different era than anything seen in the recent past, and looking forward, in many ways water supply management is only going to become even more challenging.

A workshop on water information management systems was held in September of 2007 in Seattle, Washington. Over 40 water resources and information technology specialists participated, representing twelve states, four federal agencies and three universities.

The WSWC met with representatives of state water research institutes in July, 2007 in Montana, in November of 2007 in Arizona and with a group of western institutes' directors in February 2008. In each case, in addition to enabling an overview of ongoing research of interest, the prospects for improving communication and dialogue with water managers regarding research priorities were addressed.

Part of the Water Laws and Policies Report identifies legal and institutional issues associated with augmenting water supplies for the future.

Following enactment of the National Integrated Drought Information System (NIDIS) authorization bill in November 2006, WGA and WSWC have advocated appropriations to NOAA for NIDIS. Additionally, WGA and WSWC representatives have participated on the NIDIS Implementation Team to assist NOAA in developing the NIDIS implementation plan and helping coordinate NIDIS activities. Notably, the WSWC Chair will serve on the NIDIS Executive Council, which will oversee NIDIS implementation, including ensuring coordination and collaboration between federal and state agencies. Further, regarding the proposed National Drought Policy Act, meetings have taken place with the sponsors of the bill, and the provisions of this Act have been included in a bill in the 110th Congress.

Separately, in early 2007, the WSWC developed and circulated a questionnaire to identify anticipated water demands and existing supplies, as well as existing consumptive and non-consumptive uses in each state. State responses to these questions were augmented with federal assessments and studies, but it became apparent most states lack water use and water supply information.

A primary topic of the October 2007 water conference was planning at the local or watershed level. Representatives from various levels of government

"The need for additional supplies to meet growing and changing water supply demands for both offstream and instream demands has been identified by virtually every western state as a priority. After several years of consecutive drought, it should not be surprising that in the arid West water supply continues to be of vital concern." (WGA Water Report, pg. 7)

participated, as well as private stakeholders. In November of 2008, a symposium will take place to discuss how to augment vital water information to better enable comprehensive and adaptive water planning to address increasing challenges.

The Corps of Engineers, through the watershed study, developed a draft report on watershed management tools, and a pilot study exploring watershed planning strategies.

Over the past two years, the WSWC has worked with the federal Advisory Committee on Water Information (ACWI) and through WSWC members to promote cooperative efforts to strengthen basic federal water data collection efforts, explore ways to contain rising federal costs and ensure adequate federal funding. The WSWC has worked with numerous NGOs with an interest in USGS streamgaging networks - and taken the lead regarding NASA's Landsat thermal infrared (TIR) imaging capability and USDA's NRCS snow surveys and water supply forecasts - to communicate the importance of these basic water data collection programs and seek adequate federal funding. WSWC members and representatives have had numerous meetings with key Administration officials, Congressmen and staff. Despite the current tight federal fiscal situation, some additional money has been appropriated for each of these programs.

Related Findings and Next Steps

2006 Fall Symposium on Evolving Technologies and Emerging Issues

General

Findings

1. As traditional surface and ground water supplies become stressed, alternative evolving technologies such as desalination, water recycling and reuse, and weather modification offer opportunities for augmentation and increased efficiency.
2. The federal commitment to water supply infrastructure spending continues to shrink, but there will still be an important role in research, development, technical assistance, and financial incentives such as tax exempt bonds, tax credit bonds, etc.

Next Steps

3. Alternatives to traditional water resources and supplies should be considered and included as appropriate in local, watershed, regional, state, interstate, river basin and national integrated water resource plans and planning.
4. Regulatory and permitting constraints should be evaluated to assure they are applied in a manner consistent with their authorized purposes.

Desalination

Findings

1. The primary constraints for desalination are construction and operational costs, especially energy costs, pre-treatment costs, and disposal of the brines produced.
2. Desalination costs for seawater have dropped from about $2,500 per acre-foot to the $800 to $1,400 range, with costs to treat brackish water at $50 to $500 per acre-foot.
3. As the cost of more traditional water supplies rise and desalination costs continue to fall due to technological advances, future opportunities for desalination will expand, particularly in coastal and rural areas with brackish water resources.
4. There are regulatory and other barriers to co-locating desalination and coastal energy plants so as to take advantage of production synergies.

Next Steps

5. Federal water management agencies should encourage further research and development of desalination treatment technologies.
6. The Administration and the Congress should continue to support spending for desalination research and development, including cost sharing where there is a significant national or regional benefit.
7. Federal agencies should continue to investigate the availability and use of brackish waters to meet future water needs, particularly those of rural communities without other readily available sources of supply, and to identify ways to mitigate adverse impacts of brine disposal.

Ground Water Recharge

Findings

1. Artificial or enhanced ground water recharge has been used extensively in the Southwest for decades, and more recently in other parts of the

West, and many western states now have the legal and institutional capabilities to manage recharge and conjunctive use.

2. Aquifer storage and recovery (ASR) projects may offer significant benefits, which should be evaluated on a case-by-case basis, including potential economic and environmental advantages over traditional surface water storage.

3. Ground water recharge can be accomplished through active or passive means, such as injection wells or water spreading basins, and each has unique costs and benefits.

4. In general, geohydrologic data and water quality data on ground water are less prevalent than surface water data and more expensive to obtain.

5. Finding water available for recharge is a primary constraint, but potential sources include native surface waters, seasonal and stormwater runoff, imported surface water, treated effluent (and even other ground water sources).

6. Water quality constraints are another major concern as ground water may be of superior quality than recharged surface waters; differences in chemical properties may have the potential for negative interactions.

Next Steps

7. Adaptive management and other appropriate conditions should be part of state permitting and regulations for ground water recharge and ASR projects given the considerable uncertainty associated with ASR in some cases.

8. Ground water recharge and ASR should be considered a cost effective mitigation measure for potential anticipated changes (meteorological and hydrologic), due to climate variabilities that may have a greater impact on surface water reservoir storage.

9. State and federal water management agencies should evaluate the potential for integrating artificial groundwater storage and recovery opportunities with existing and future project operations, new construction and rehabilitation and betterment work.

10. Federal science agencies and academic institutions should promote further research and seek further technological ASR advances (with the recent National Research Council's Managed Underground Water Report as one example).

Water Recycling and Reuse

Findings

1. Water recycling reduces the need for increased surface water diversions and imports from out of the area, and also reduces stress on ground water aquifers.

2. Successful water recycling projects and programs require aggressive public and political outreach and education.

3. Water recycling and treatment by means of natural and artificial wetlands can be effective and provide benefits for wildlife, including endangered species.

4. Economies of scale offer opportunities that tran-

scend limited jurisdictional boundaries and partnership and special service area agreements provide a means to bridge boundaries and maximize benefits.

5. State water quality, drinking water, public health and water rights laws and regulations all affect the feasibility of potential reuse opportunities.
6. Some states/local agencies provide financial incentives for water recycling and reuse.
7. There are no federal standards for treatment for reuse and state standards, rules and regulations vary.
8. Given life-cycle costs, development and reuse of recycled water may compare favorably with the cost of new supplies.

Next Steps

9. Water recycling and appropriate reuse should be cooperatively promoted at all levels of government as a means of stretching limited local water supplies, enhancing environmental benefits, and otherwise maximizing efficient use.
10. State water law should define rights and acceptable uses of effluent to promote recycling, while adequately meeting interstate obligations and protecting junior water rights dependent on return flows.
11. States should evaluate their current capacity and fill the need as appropriate for institutional mechanisms to encourage water recycling and reuse, as well as public education to develop acceptance.
12. State and local regulatory entities should cooperate in permitting reuse projects and treatment requirements should be suited to the proposed use.
13. The WSWC should look into the differences between individual state reuse standards and consider whether or not federal treatment standards would be beneficial.
14. The Bureau of Reclamation, EPA, and USGS should continue to support research into the benefits of water reuse, as well as define and scope the effects of emerging contaminants on drinking water.

Weather Modification

Findings

1. Weather modification activities have been undertaken since the 1950s, and many programs have been operating for over 30 years, with 69 permitted programs operating in eleven states as of 2004.
2. State permitting of weather modification activities is designed to provide the public and operators reasonable protection from adverse consequences, with rules establishing criteria for licenses and permits, public notice of seeding operations, consideration of public comments, requirements for liability insurance, and operational safeguards.
3. The seven Colorado River Basin states have adopted an initiative governing jointly-funded weather modification activities, where past studies suggest the potential of significant increases in

precipitation (10% or more) in properly designed and conducted programs, and runoff at an estimated cost of $5-$40 per acre-foot.

4. Under certain circumstances, interstate issues may limit operations that cross state borders.

5. Wyoming has undertaken a controlled 5-year $8.8 million study to rigorously demonstrate and physically and statistically verify weather modification practices.

6. Given the limited number of "suitable" storms or weather events during drought periods, weather modifications activities are best used as a long-term water management tool.

7. Cost-effective opportunities exist to expand the use of weather modification, and the environmental consequences of weather modification operations appear to be benign.

Next Steps

8. The Congress should enact appropriate legislation reestablishing a federal weather modification research program, given potential national benefits.

9. The U.S. Bureau of Reclamation, National Oceanic and Atmospheric Administration, National Aeronautics and Space Administration, Environmental Protection Agency, and other federal agencies should support weather modification-related research and development.

10. States should provide administrative, financial and technical assistance to evaluate opportunities to augment existing water supplies through weather modification.

11. The Western States Water Council, in cooperation with the North American Interstate Weather Modification Council, should consider the need for adopting or strengthening interstate or regional agreements to reasonably allow and facilitate permitted activities, and the merits of developing suggested "best management practices" for state regulation of operations.

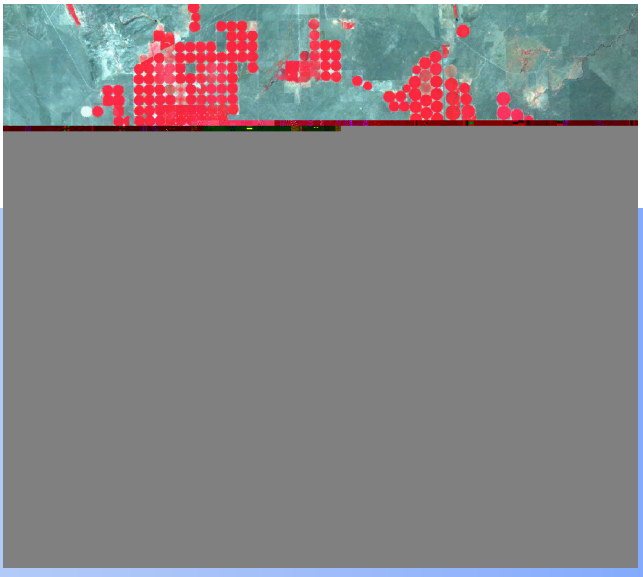
October 2007 Water Conference

The second major topic at the conference in October of 2007 was local or watershed level water planning. The following is a summary of findings and next steps from the respective breakout groups.

Findings

The following are a few of the key findings presented at the conference. A complete summary of the proceedings is contained in a report available at the WSWC offices.

1. Decision makers at all levels need more reliable, basic water resources information, better visualization and analytical tools, and improved models that are dependable and scaled to fit the watershed or "problemshed," requiring greater communication with academic, government and private



research and development organizations.

2. Successfully redefining our water needs and water policies (and planning for the future) will require engaging the public through expanded and sustained "grassroots" participation processes – to develop acceptable options – followed by transparent decision making.

Next Steps

Data, Data Gaps and Research

1. States need better water use and water supply data.
2. There is a need for robust ground water monitoring, soil moisture monitoring, snow survey, and streamgaging networks, etc.
3. The value added by adding monitoring sites needs to be quantified.
4. Water resources data with a long period of record need to be maintained through adequate state and federal funding.
5. Alternates to the historic record need to be developed for decision making.
6. More resources need to be directed towards a better understanding of ground water resources and ground water/surface water interactions.
7. Data analysis must be explained in terms useful for lay decision makers.
8. Remote sensing and related analytical applications need to be scaled to smaller watersheds for local decision making.

Local Planning Programs and Strategies

9. Watershed planning needs to be defined in terms of scale and complexity.
10. Essential elements of watershed planning include local leadership, open dialogue, an assessment of needs and resources, etc.
11. Watershed groups need legal authorities and operational support.
12. Watershed planning and policy must address myriad cross-cutting issues.
13. Water rights adjudications need to be resolved to remove obstacles to future planning.
14. Federal entities need to provide resources and become immersed in the process, as opposed to

serving merely as observers.

Planning to Meet Our Water Needs

16. Bottom-up planning is expensive and requires adequate funding.
17. Defining planning boundaries can be challenging (political and hydrologic).
18. Research needs and science applications must be better communicated between scientists, researchers and water managers.

Interstate Steams and Western Water Problems

22. The sovereign interests of states and tribes must be recognized.
23. Interstate agreements should provide greater certainty and stability.
24. Federal authorities and mandates should be used with caution.
25. More data and greater communication are needed for sound decision making.

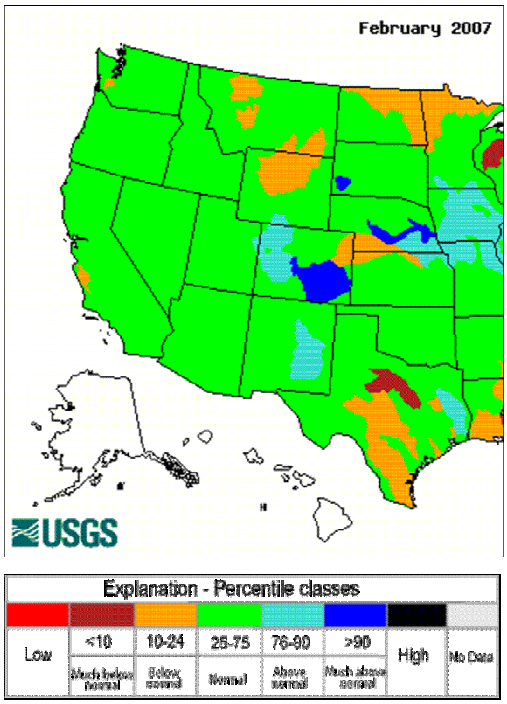
Watershed Study

Next Steps

Basic Water Data Collection

The WGA should urge Congress and the Administration to:

1. Fully fund the US Geological Survey's National Streamflow Information Program (NSIP) to establish, and add 881 streamgages identified to meet Federal water information needs in the western states.
2. Increase funding for the USGS Cooperative Water Program (CWP) to preserve long-term streamgages and restore the 50:50 Federal/State funding split that has been the foundation of this Federal-State partnership for nearly a century.
3. Immediately provide NASA funding to include the emissive thermal infrared (TIR) instrument on Landsat 8 as part of the Landsat Data Continuity Mission (LDCM), as a unique and cost-effective means to measure agricultural and other consumptive water uses.



The United States Geological Survey, in cooperation with states, should:

4. Contain cost increases for the operation of Federal and State streamgaging networks through continued improvements in instrument technology, data analysis techniques, and data delivery

procedures, and reduce salary costs by sharing manpower resources of partner agencies where logistical efficiencies can be gained.

5. Strengthen and apply new methodologies for regional analyses and transfer of hydrologic information to ungaged areas where streamflow information is needed.

6. USGS district offices should meet regularly with state and local cooperators, perhaps in large annual meetings, to discuss projects, plans and strategies for water monitoring and interpretive studies in their region.

7. Working with the Consortium of Universities for the Advancement of Hydrologic Science (CUAHSI), and the WSWC, develop a nationwide database or Hydrologic Information System (HIS) to provide access to the data collected by all state, local, and other Federal agencies, so as to make the nation's water information universally accessible with tools and models that enable the synthesis, visualization and evaluation of hydrologic systems.

8. Support cooperative development of a hydrologic data portal for the entire western United States and use this integrated data network to identify and fill local data gaps, optimizing local and strengthening regional streamgaging networks.

9. Complete the inventory and assessment of the nation's ground water monitoring networks currently being conducted by the Advisory committee on Water Information's Subcommittee on Ground Water and identify information needs.

10. Following the inventory of ground water monitoring networks currently being conducted, undertake a data gap analysis to design optimized ground water monitoring networks that address National, regional, and local scale water issues includes an evaluation of funding requirements for long-term operation of the networks.

The National Aeronautics and Space Administration should:

11. Immediately begin preparing a request for proposals (RFP) and take other steps needed to ensure an emissive thermal infrared (TIR) instrument is included on Landsat 8, and request supplemental and future funding sufficient to minimize any necessary delay in the scheduled launch. This would minimize any gap in the availability of data now used to effectively determine past and present evapotranspiration (ET) and related consumptive water use, as well as monitor future consumption and ET trends, particularly in light of projected climate warming.

The Natural Resources Conservation Service should:

12. Improve monitoring of snow conditions in the West by: (a) expanding instrumentation and refining forecasting leading to a better understanding of current snow conditions; (b) exploring use of remote sensing of snow cover and snow water content; and (c) encouraging and extending NRCS modeling efforts to include both volume and hydrograph projections for reservoirs by incorporating estimated losses between snowpacks, runoff and storage.

The National Oceanic and Atmospheric Administration should:

13. Analyze the existing state and regional evapotranspiration (ET) weather station networks to
    (a) determine the best ways to provide adequate station density throughout the western U.S.,
    (b) establish weather station standards for all ET network providers to adhere to, covering weather station components, location, and quality assurance to ensure accurate and consistent ET values, and
    (c) undertake research to further develop and implement remote sensing ET mapping.
14. Support research to further the understanding and development of crop coefficients. Specific research topics should include hybrid crops, riparian and wetland plants, salt and ground water effects, and non-standard climate condition effects.

The Administration, in order to improve the quality of the precipitation data available in the West, should coordinate the efforts of the relevant federal agencies to:

15. Ensure that extreme storm data is collected, analyzed, and archived and procedures are in place to update storm data sets, methodology, and reports to develop Probable Maximum Precipitation (PMP) estimates.
16. Improve the National Weather Service Cooperative Observer Program network, by supporting modernization.
17. Increase the number of rain gages wherever possible, adding rain gages to other data collection platforms, such as the USGS stream gage networks.
18. Support research aimed at improving radar precipitation estimates and multi-sensor techniques
19. Install additional radars to increase coverage in the West.
20. Set rigorous standards and metrics for vendors to follow so that gage measuring accuracy can more easily be compared.

Drought Preparation by Federal Agencies

Federal agencies with long range water supply planning responsibilities should:

21. Work in cooperation with states to help communities develop drought contingency plans, establish or enhance federal reservoir drought contingency plans, and be visible and engaged in all drought-related forums: nationally, regionally and locally.
22. Support the implementation of the National Integrated Drought Information System (NIDIS) by
    (a) providing drought information, such as reservoir storage levels, linking Federal web sites with the NIDIS site;
    (b) supporting state and local drought planning

within an integrated water resources management framework;

(c) providing information on drought impact assessments in areas where the Corps has expertise, such as navigation, hydropower, ecosystem needs, and recreation;

(d) participating in the NIDIS pilot studies, particularly in studies involving water resources management.

23. Work together with states and regional groups to ensure there is an accurate assessment of the Nation's water availability and demand.

The Corps of Engineers should:

24. Explore perceived inflexibility in providing permits for emergency withdrawals from lakes and streams, and regarding permanent reallocation of storage for municipal and industrial (M&I) water supply and the high cost of allocated water.

25. Align Corps regulatory permit evaluations of municipal water supply requirements with accepted analytical/planning practices.

26. Activate review of Corps drought contingency plans at Corps reservoirs.

27. Identify existing authorized studies that could be converted to integrated water management studies that focus on urban-urbanizing watersheds with complex water delivery problems.

28. Provide more flexibility to Corps division offices for delegating authority to reallocate storage for water supply.

The WGA should urge the Congress to:

29. Modify the applicable authority of the Corps of Engineers so that storage can be more readily reallocated for water supply and not for just municipal and industrial purposes.

30. Instruct the Secretary of the Army to include Integrated Water Resources Planning and Assistance as one of the primary missions of the Corps of Engineers.

Policies and Programs

Findings

1. Existing federal programs and authorities provide adequate opportunities for Reclamation, USGS, NOAA, Corps, EPA and NRCS and other federal agencies to leverage resources to help accomplish several recommendations identified in the WGA/WSWC Water Report. The topics it addressed are likely to continue to be of common interest to the West.

2. Recognizing the effectiveness of collaboration in accomplishing several recommendations in the June 2006 report, the WSWC has initiated efforts to formalize a "Western States Federal Agency Support Team" and to create a liaison position to staff this team made up of representatives of federal agencies.

3. Several organizations have expressed support for a national assessment of water resources needs which should begin at the state and local level and be backed by appropriate support from the federal government.

Next Steps

4. Existing federal authorities and proposed initiatives should be utilized through collaborative activities of a Western States Federal Agency Support Team to assist western states as requested to develop their water plans.
5. State water plans should be used by decision makers to help determine national policy and priorities that best align federal agency support to states and as a reference when considering regional watershed issues.
6. Federal agencies with water resource interests should support formalizing a Western States Federal Agency Support Team. Such federal agencies should also provide funding to establish a liaison position to staff the team.
7. The Western States Federal Agency Support Team and WSWC should collaboratively develop strategies to implement selected recommendations of the Water Report, as well as other identified regional challenges.

Water Laws and Policies Report

A substantial part of the Water Laws and Policies Report deals with issues associated with various programs and the technologies to augment water supplies. The following is a summary of major findings and next steps.

Findings

1. Current demand-management strategies include urban use conservation, public education, recycling, water pricing, and privatization of water supplies.
2. States and municipalities are also increasingly utilizing conjunctive use as a management strategy, which encourages the complementary use of surface and ground water supplies and also encourages ground water storage.
3. Ground water storage and recharge projects are subject to federal and state environmental laws and state water laws, and raise issues of beneficial use, forfeiture, and the commingling of separate types of water and water rights, as well as interjurisdictional issues, but they are being used more often due to the difficulty of constructing new storage facilities for surface water.
4. In addition to pursuing opportunities for water storage, many states are actively encouraging water conservation in order to use existing water supplies more efficiently.
5. Providing incentives to conserve water, as opposed to regulation of rights, is the most effective means in the agricultural sector.
6. Municipal conservation has successfully been encouraged through educational programs, funding incentives, and statutory requirements.

7. As new water supplies become scarcer, water reuse is becoming an increasingly practical and cost-effective option for meeting demand.

8. Legal constraints to water reuse include federal and state provisions regulating content and quality of effluent and recycled water, questions about who has rights to effluent, and uncertainties about the reuse of agricultural water rights without injuring other users.

9. Institutional or societal constraints to water reuse include public acceptance of recycled water, health risks associated with reuse, potential environmental effects of water recycling, and the cost of implementing water recycling systems.

10. Water transfers can be effective in securing needed water by reallocating water from lower valued uses to higher valued uses, but constraints imposed by the prior appropriation system and the need for regulation to protect third parties from negative effects resulting from transfers must be considered.

11. Policy tools used to mitigate negative third party impacts include the no injury rule, the historical or consumptive use limitation, public interest reviews, area of origin protection statutes, and statutes or policies that attempt to curtail negative effects on environment and rural communities.

12. Water banks are another method of reallocating water supplies, and many western states or their local water agencies have utilized or are in the process of implementing some type of water bank to facilitate transfers or store unused or excess water.

13. Many states that have created water banks have had to change state law regarding forfeiture and abandonment as it relates to water rights involved in banking.

14. Other forms of transferring water that do so on a temporary basis are rotating fallowing and dry year leasing.

15. Rotating fallowing, which is the practice of temporarily fallowing irrigated fields on a rotating basis, can free up agricultural water for sale or lease without permanently retiring farmland and devastating local communities.

16. A dry year lease contract between a governmental entity or public corporation and another water user for use of their water right during drought years can also be an effective tool.

17. If the technology continues to improve, desalination may play a more essential role in meeting water needs for the future, although a major problem for desalination facilities, apart from considerable costs, is the disposal of the brine concentrate resulting from the process.

18. Weather modification has demonstrated its potential to increase snowpack, and while there are unanswered legal questions regarding enhancing precipitation in one area to the detriment of another and liability for potential losses (due to flooding) or increased costs (snow removal) none of the legal decisions to date have held program or project operators liable.

19. Anticipating this issue, states such as Colorado, Montana, Oklahoma, and Texas have statutory

authorization to form interstate compacts on weather modification.

Next Steps

20. Educate the public about the importance of water conservation and develop focused, targeted measures to promote business and residential water conservation; examples of possible programs include turf removal, leak repair, or landscape irrigation efficiency.

21. Assess the usefulness of specific financial incentives to conserve municipal water, such as rebates, to encourage residential and business conservation.

22. Evaluate the feasibility and potential for water reuse as a possible source of water for landscape irrigation or other non-potable consumptive uses. In addition to health, regulatory, and infrastructural considerations, public attitudes towards reuse should be a key part of the evaluation.

23. States should encourage the use of water banks, rotating fallowing and dry year leasing, as well as other voluntary means to improve agricultural water use efficiency and to provide water for other uses during periods of shortage. Modifications to statutory measures regarding forfeiture and abandonment may be necessary as they apply to participants in these programs.

24. Support additional research to evaluate options in the use of desalination technology effectively to resolve the issue of brine disposal, and to identify ways to avoid or mitigate adverse impacts of seawater desalination on marine life.

25. To avoid potential interstate disputes regarding weather modifications, work with the North American Interstate Weather Modification Council to evaluate the merits of an interstate compact and recommending best management practices relating to state regulation.

Water Infrastructure Needs and Strategies

2006 Report Recommendations

The WGA should support continuing stable federal State Revolving Fund appropriations at a level of $1.35 billion for the Clean Water SRF and $850 million for the Drinking Water SRF, increased annually by a construction inflation index. Further, states need flexibility and fewer restrictions in addressing their priorities.

The WGA should urge Congress to increase appropriations from annual receipts (now over $1 billion) accruing to the Reclamation Fund, for authorized Bureau of Reclamation projects and purposes, to help meet western water supply needs, especially for rural communities, to maintain and replace past projects, and to build new capacity necessary to meet demands related to growth and environmental protection.

The WGA should ask Congress to enact S. 895 ("The Rural Water Supply Act of 2005") to assess rural water supply needs and authorize federal loan guarantees under Title II to better enable non-federal project sponsors to obtain private financing for reimbursable extraordinary operation and maintenance, rehabilitation and replacement costs.

Congress needs to enact new authority for the U.S. Army Corps of Engineers, the Water Resources Development Act (WRDA), which includes many projects important to the West, and carefully consider planning and prioritization changes to encourage achievement of the maximum regional and national benefits.

The WSWC should organize a series of ongoing biennial symposia designed to: (a) bring stakeholders together to try and find ways to meet our growing western water, wastewater, watershed protection and restoration, and public safety-related infrastructure funding needs; (b) find ways to quantify, evaluate and prioritize funding those needs; and (c) highlight the benefits of integrated watershed, river basin, regional and interstate planning and management.

Implementation Activities

Following the recommendations in the Water Report published in 2006, Congress passed the Rural Water Supply Act of 2005 to better enable non-federal project sponsors to obtain private financing to meet rural water supply needs. The WSWC is now working with Reclamation and appropriate Congressional contacts to encourage and facilitate implementation of this Act.

Likewise, consistent with recommendations the Governors' adopted in the Water Report, the 2007 Water Resources Development Act (WRDA) for the U.S. Army Corps of Engineers has been enacted. At the same time, the Corps is examining its flexibility under the law and previous enactments, so as to increase its ability to respond to drought conditions.

In March of 2008, the Western Governors' Association and the Western States Water Council, along with the Association of State and Interstate Water Pollution Control Administrators and the Interstate Council on Water Policy sponsored a workshop on infrastructure needs and promising strategies to meet those needs. The workshop featured speakers from the Environmental Protection Agency as well as Reclamation and Corps of Engineers, and other organizations and stakeholders, including representatives of the private sector.

On March 7, 2008 the WSWC addressed Congress and the Administration on the need for a continuing federal capital investment of $1.35 billion in the Environmental Protection Agency's clean water state revolving fund (SRF) and $850 million for the drinking water SRF (as well as the need to maintain flexibility in the way states are allowed to finance the required match). Moreover, the WSWC has worked to raise awareness among the states, stakeholders and the Congress, with respect to the sources of revenues, current expenditures, and growing unappropriated balance in the Reclamation Fund, which finances many U.S. Bureau of Reclamation projects and programs. By the end of FY2009, it is estimated that the unappropriated balance will reach $9.23 billion. Estimated FY2009 receipts, primarily from federal mineral leasing royalties, are $1.82 billion, compared to requested expenditures of $870 million.

In April of 2008, on behalf of the WGA, the WSWC presented testimony before the Senate Energy Committee's Water and Power Subcommittee on the Bureau of Reclamation's aging infrastructure and related issues.

Related Findings and Next Steps

March 2008 Workshop

Findings

1. Infrastructure investments are key to our nation's continued economic prosperity and environmental improvements, vital in assisting state and local entities meet federally mandated standards, and should be considered as part of any economic stimulus package.
2. Repair and replacement project costs to address aging infrastructure needs are surpassing anticipated expenditures for new construction.
3. Appropriate asset management strategies to minimize "life-cycle costs" are increasingly important as infrastructure ages.
4. More collaborative research and better methods are required to identify regional vulnerabilities and quantify related risks, acceptable levels of risk, and projected expenditures to reduce unacceptable risk.
5. Infrastructure planning/financing is fragmented across different levels of government and governmental roles and responsibilities may need to be refined.
6. Regional projects offer economies of scale that can maximize the benefits received from steep capital investments required for water-related services. This approach contrasts with the growth of 'exburbs' and proliferation of single family domestic wells and septic systems that may strain water supplies and the ability of water resources to attenuate related pollution problems.

"Much of our infrastructure is inadequate due to population growth, water quality requirements and safety threats not anticipated at the time of its design and construction. Redesigning, rebuilding and reoperating public infrastructure will be costly and challenging, …"
(WGA Water Report, pg. 13)

7. Better decision support tools are needed, as well as research into more efficient and cost effective construction and asset management techniques, processes and programs.

8. Private sector opportunities exist to create ownership and management partnerships to accelerate high priority projects, access new technology and global expertise, and fast track financing.

9. Greater public participation and transparency in pricing will be needed as consumer costs of service will increase significantly (perhaps doubling) over the next decade.

Next Steps

General

10. A variety of financing opportunities should be examined in choosing the best mix of mechanisms for a specific project.

11. Although not a panacea for all our infrastructure financing challenges, private and public/private financial partnerships can be useful and should be encouraged.

The Congress should:

12. Maintain and increase Clean Water Act and Safe Drinking Water Act State Revolving Fund appropriations, as it represents a comparatively small but vital percentage of overall infrastructure investment.

13. Consider establishing a Water Trust Fund, as well as reserving existing special fund revenues (such as the Reclamation Fund) for dedicated purposes.

14. Remove the state volume caps for private activity bonds used for water and wastewater projects, provide loan guarantees, and otherwise support and encourage necessary alternatives to direct federal investment of limited general funds.

Federal agencies should:

15. Cooperate in the development and implementation of appropriate criteria for prioritizing infrastructure needs, asset management strategies, policies, standards, techniques and technologies.

16. Work with state and local water agencies to identify necessary studies, data and projects and states should actively support funding to assist in implementation.

States should:

17. In cooperation with federal, state, local and private landowners, quantify and prioritize water and wastewater infrastructure investment needs, and include these needs as a component of western state water plans and planning processes.

18. Encourage water conservation, water reuse and recycling, desalting and reclamation of brackish waters, reductions in per capita use/consumption and other appropriate technologies.

19. Encourage adequate and progressive local asset management plans, programs and best management practices through technical and financial assistance.

20. Ensure state agencies work together to assist local water providers in maximizing state and local resources and use a combination of federal, state, local and public monies to fund water projects.

21. Identify communities vulnerable to water supply shortages, untreated wastewater discharges, flooding and other related threats to public health, safety and the environment due to catastrophic and chronic infrastructure failures.

22. Provide institutional mechanisms and otherwise encourage regional water and wastewater projects to maximize economies of scale and minimize environmental impacts from smaller, piecemeal project development.

23. Consolidate and streamline water-related infrastructure investment project permitting, minimizing costs and delays, as well as explore means of expediting high priority actions.

24. With federal technical and financial assistance, identify, restore and preserve high value watersheds and natural features (such as wetlands) that provide ecological service (mitigate flooding, filter and remove pollutants, recharge ground water, etc.) and that may minimize the need for structural alternatives.

The Western Governors' Association, together with the Western States Water Council should:

25. Provide the political leadership to raise awareness of our water infrastructure investment needs and encourage public education and acceptance of increasing costs of service based on foreseeable demands.

26. Update information and compile a report on western state water resources infrastructure financing authorities, funding sources, policies and programs.

27. Communicate and encourage the adoption of "beneficiary pays" principles and best management practices, including "ability to pay" considerations.

Local Government and Utilities should:

28. Adopt transparent planning and rate setting processes that include stakeholder/public education and participation, with rates reflecting life-cycle costs and acceptable risk.

29. Encourage water conservation as a means to maximize opportunities to minimize future infrastructure investment requirements.

30. Identify and prioritize water and wastewater infrastructure needs and quantify acceptable risk.

Academia should:

31. Develop programs to help retain the infrastructure engineering and institutional knowledge threatened by the retirement of "baby boomers."

32. Encourage research and innovation in meeting water and wastewater treatment needs, emerging contaminant problems, and related challenges – while minimizing costs.

Watershed Study

Federal Infrastructure Needs (Asset Management)

Findings

1. The Bureau of Reclamation (Reclamation) is implementing their Management for Excellence Team recommendation to adopt a quantifiable prioritization framework for operation and maintenance that is used Reclamation-wide in its Budget Review Committee process and is flexible enough to accommodate special situations. Likewise, one of the four pillars of the Corps' of Engineers (Corps) Actions for Change initiative is to effectively implement a comprehensive systems approach in employing risk-based concepts for operations and major maintenance. The Corps is actively engaged in the development of an Asset Management Framework that will merge the agency's vision for performance and efficiency along its business line missions with a proactive lifecycle investment strategy. Based on the initial observation that Reclamation and Corps goals are similar, there could be potential common areas of interest in the development of corporate models and processes to prioritize asset management needs.
2. The Environmental Protection Agency, Office of Water (EPA), has indicated an interest in collaborating with Reclamation and the Corps on future asset management initiatives. Through their Sustainable Water Infrastructure Initiative (SI), EPA is working as an advocate and sharing information on best practices, tools, innovative technology, and research. EPA's SI provides an opportunity for leveraging resources to advance asset management technology for federal, state, and local organizations.

Next Steps

3. Reclamation and the Corps should develop Asset Management prioritization models and processes that could then be refined and used by each agency independently.
4. Reclamation and the Corps should identify potential opportunities to leverage EPA's SI program to advance asset management technology for federal, state, and local organizations.
5. An updated analysis of sediment volume and distribution in reservoirs followed by estimates of their remaining life relative to storage of water supply and other purposes should be part of a national assessment of water resources needs.

Resolution of Indian Water Rights

2006 Report Recommendations

Reaffirm the resolution of the Western Governors' Association on settlement of Indian water right claims.

Building on the successes of the past two decades, the WGA should engage Congress in an important discussion of what federal policy should be and how these settlements can be funded.

The WGA should appeal directly to the new Secretary of Interior to begin a meaningful dialog on the Departments' trust and programmatic responsibilities related to Indian water right settlements.

Implementation Activities

At the request of the Council, and pursuant to an invitation to Secretary of Interior Kempthorne, a meeting was held in May of 2007 in Washington, D.C. with key Interior representatives, as well as representatives from other federal agencies and members of the so-called Ad Hoc Group on Indian Water Rights, composed of the Western Governors' Association (WGA), the Native American Rights Fund, the Western Business Roundtable, and the WSWC. A fruitful discussion identified and listed issues which should be further addressed. Central to the discussion was the responsibility of the federal government for funding Indian water rights settlements.

In August of 2007, WSWC and WGA representatives met with representatives of the Interior Indian Water Rights Office, as well as the Counselor to the Secretary, to follow up on the earlier May discussions. The subsequent meeting elaborated and refined the issues that need to be addressed. Assignments were made for follow up action.

The Council and the Native American Rights Fund held a symposium in August 2007 on Indian water settlements. Representatives of the federal government, states, tribes, and other stakeholders participated in the two day event, which focused on opportunities for collaboration in reaching settlements and sharing perspectives on how such settlements can secure necessary support from Congress and the Administration. It was clear that several settlements would likely be introduced in the Congress over the next few years. The importance of resolving difficult issues associated with funding became increasingly apparent at the symposium.

At the August symposium, Majority Staff Counsel for the Senate Energy and Natural Resources Committee, described bills that had been introduced by the Senators from New Mexico to facilitate Congressional approval of settlements in their state, and potentially others in the West. Both relied in different ways on revenues accruing to the Reclamation Fund, which now shows a substantial surplus. This fund, comprised of revenues from oil and gas royalties, sale of public lands, and hydropower revenues, was also seen as a source of funding for other Reclamation purposes.

Since the symposium, discussions have been ongoing regarding prospects for the bills (S. 1171 and S. 1643) introduced by the Senators from New Mexico. Further, members of the Ad Hoc Group on Indian Water Rights have received a request from Interior to develop a white paper on the issues identified at the two meetings with Interior and other federal agencies earlier in the year. Response to this request is awaiting

some resolution on the important issues associated with the New Mexico bills.

In April of 2008, on behalf of the WGA, the WSWC presented testimony before the House Natural Resources Committee's Water and Power Subcommittee on Indian water rights settlements, focusing on current settlement negotiations, settlement funding issues, and the Administration's "criteria and procedures."

Related Findings and Next Steps

WGA Resolution and Meetings with Interior

Findings

1. Advantages to negotiated settlements include: (a) the ability to be flexible and to tailor solutions to the unique circumstances of each situation; (b) the ability to promote conservation and sound water management practices; (c) the ability to establish the basis for cooperative partnerships between Indian and non-Indian communities that provide practical solutions to water supply issues for all parties; and (d) the opportunity to save "millions of dollars through avoidance of prolonged and costly litigation…."
2. Settlements should be encouraged and facilitated by the federal government, both in terms of assisting in the negotiations, as well as in providing appropriate funding for the settlements. However, federal funding continues to be a key barrier to settling Indian land and water claims.
3. Under current budgetary policy, funding of land and water right settlements must be offset by a corresponding reduction in some other discretionary component of the Interior Department's budget, making it difficult for the Administration, the states and the tribes to negotiate settlements knowing that they may not be funded because funding can occur only at the expense of some other tribal or essential Interior Department program.
4. The federal government should continue to support its longstanding policy in favor of Indian land and water settlements with a strong federal fiscal commitment for meaningful federal contributions to these settlements that recognizes the trust obligations of the United States government.

Next Steps

5. Congress should ensure that any land or water settlement, once authorized by the Congress and approved by the President, will be funded and implemented in a timely manner without a corresponding offset to some other tribal or essential Interior Department program.
6. Congress should explore opportunities to provide funding for settlements from reserves accruing to the Reclamation Fund.

"The states and the federal government must work together to jointly design and fund settlement projects that provide the greatest benefit for Indian and non-Indian water users alike in those situations where the interests are inextricably combined by practical reality."
(WGA Water Report, pg. 18)

Climate Change Impacts

2006 Report Recommendations

The federal agencies must continue and expand funding for data collection networks and activities necessary for monitoring, assessing, and predicting future water supplies as addressed earlier herein by the Water Needs and Strategies group recommendation (2A).

The Western Governors should urge Congress and the Administration through the Climate Change Science Program (CCSP) to fund research for improving the predictive capabilities for climate change, and assessment and mitigation of its impacts. Additionally, given the complex climatology in the West, it is important that climate change modeling be conducted at a much finer resolution, e.g. watersheds and subwatersheds. It is also important that the federal government implement research funding recommendations associated with Goals 4 and 5 of the 2003 CCSP Strategic Plan, including the area of increased partnerships with existing user support institutions, such as state climatologists, regional climate centers, agricultural extension services, resource management agencies, and state and local governments.

States should maintain various water-related plans, including state water plans, watershed plans, state drought plans, reservoir management plans, flood plans, etc. These plans should be expanded or enhanced accordingly to include climate change scenarios. Particular emphasis should be placed on climate change within the context of watershed planning. States, similarly, should expand or enhance other state plans that include water-related concerns—such as forest management, energy, and economic development plans—to include the impact of climate-change scenarios.

States should coordinate with and include local governments in their climate change planning efforts. Local governments are an ever increasing player in water issues, for example, through land use policies, as the developer of new water supplies, water transfers, and in implementing water restrictions and water use efficiency programs.

States should evaluate and revise as necessary the legal framework for water management to the extent allowable to ensure sufficient flexibility exists to anticipate and respond to climate change.

The Governors should convene ongoing, broad stakeholder meetings between state water managers, local water supply managers, scientists, federal agencies, universities, and others to make sure water managers understand what the science is saying about climate change and what new tools exist, and, conversely so that scientists understand the data and research needs of water managers and users.

Implementation Activities

The WGA, the WSWC, and the California Department of Water Resources (CDWR) jointly cosponsored a May 2007 workshop on climate change research needs in Irvine, California as part of efforts to respond and adapt to climate change impacts expressed in the policy directives of the Water Report. The workshop brought together state and local water

managers, academic researchers, and representatives from the federal Climate Change Science Program (CCSP) agencies that fund the academic research and discuss how to better facilitate scientist-end user interactions while developing partnerships with the federal agencies. Given that there are many areas where focused research could support planning and adapting to climate change impacts, the workshop was intended to develop a strategy for fostering research useful to western water managers.

In addition, the third major subject addressed during the WGA/WSWC conference in October 2007 was climate change impacts and associated adaptation strategies.

Further, at its March 2008 meetings in Arlington, Virginia, the WSWC cosponsored a joint session with the Association of State and Interstate Water Pollution Control Administrators on climate change issues. The meeting explored the science of climate change, its political effects in the West, as well as an analysis of the "winners and losers" in the agricultural sector, and the potential legal and regulatory implications.

Lastly, the Water Laws and Policies report examined the legal and institutional issues associated with potential climate change impacts.

Related Findings and Next Steps

Irvine Workshop

Participants broke out into small groups to discuss assigned questions dealing with water management-related climate information and policy needs, and with development of relationships with the federal climate science agencies and with academia. Key findings and recommendations are summarized below.

Findings

1. Water managers need to have outputs of climate models available at scales useful for resource management activities – regional and watershed scales – and in a format amenable to incorporation into resource management models.
2. Maintaining continuity in key historical water-related data collection programs, such as the USGS streamgaging program and the emissive thermal infrared instrument on Landsat – and taking steps to improve data quality – are critical to climate change adaptation.
3. There needs to be an information broker/translator function to act as the intermediary between climate scientists and modelers and practitioners, and to facilitate discussion on practitioners' needs as well as involving practitioners in development of the research questions.
4. The U.S. lacks a focused resource that translates the Intergovernmental Panel on Climate Change (IPCC) global assessments into downscaled information that can be used by decision makers.
5. It is necessary to begin laying the groundwork and making investments to support improved water management reliability – whether to respond to natural climate variability, forecasted climate change impacts, or population growth – well in advance of the time when such reliability will be even more critical.
6. For various reasons, the federal Climate Change

"It must be recognized that there is already substantial stress on the water sector today even in the absence of climate change…. Climate change may pose additional stresses and could result in thresholds being reached earlier than currently anticipated." (WGA Water Report, pg. 22)

Science Program (CCSP) has not implemented a strategic communications plan to produce information for decision makers and conduct targeted outreach to stakeholders – the absence of which is a setback for programmatic relationship building.

7. There are a variety of tools that could be employed to build and strengthen relationships between practitioners and academics.

8. Building relationships between water managers and the federal climate science program agencies, which are closely allied with the academic community, is also important, and again, there are a number of tools that could be employed to develop and strengthen these relationships.

Next Steps

9. The federal government or state governments should take the lead in putting together a web site to provide more useful and scaled output from climate models for the water management community.

10. Water managers should take the initiative to clearly communicate their needs for applied science to the climate research community, and must seek opportunities to guide hydroclimate research in directions that will support real-world problem solving.

11. The federal climate science program should perform national and regional assessments, since the IPCC assessment reports cover a global/ international scale, and by their very nature cannot address the level of detail needed for adaptation.

12. NOAA's Regional Integrated Sciences and Assessments (RISAs), or entities like them, should be given sufficient funding support so that they can provide a service that translates IPCC global assessments into downscaled information for decision makers.

13. Funding should be provided to local universities for research and modeling, working in collaboration with water managers, based upon agreed upon standards and data protocols

October 2007 Water Conference

The conference in October of 2007 held in Salt Lake City, Utah also focused on climate change. Consistent with the recommendations in the Water Report, the breakout groups emphasized dealing with the potential impacts of climate change. The major conclusions of the breakout groups follow:

Findings

The following are a few of the key findings presented at the conference. A complete summary of the proceedings is contained in a report available at the WSWC offices.

1. Our past, present and future "waterscape" is obscured by a general lack of basic water data for numerous parameters, both on the supply and demand side, including existing water uses and needs by sector, ground water stocks, surface and ground water interactions, future climate variability and extremes, and changing precipitation pat-

terns, snowpack and streamflows, etc.

2. Meeting our future water needs in the face of climate variability will require employing an integrated water supply approach that maximizes diverse opportunities including a mix of water sources of varying quality, as well as new and innovative use of technological, economic and institutional tools.

3. Undefined and un-definable climate and other variables mean continuing uncertainty and highlight the necessity of taking incremental steps and the need for adaptive management approaches.

Next Steps

National Climate Service

1. There is support for some form of a National Climate Service that would incorporate and coordinate existing climate and water data collection and analysis services and communicate with decision makers and the public through one consistent portal.

2. Global climate models must be scaled to the local watershed level to be useful in forecasting future conditions and making adaptation decisions.

3. WGA should continue discussions with appropriate entities and flesh out the concept.

State and Local Climate Change Adaptation Strategies

4. Climate change scenarios need to be integrated with projections of long-term demands and the need for drought planning, more storage, water banking, water conservation, etc.

5. Stormwater and other waters of impaired quality should be considered as supplemental water supplies.

6. More data is needed to evaluate risks related to climate change and possible changes in operational project rule curves, etc.

7. Forecasting models require more and better data to be robust and useful.

8. Planning for climate changes should be undertaken at all levels, from the federal government to private and public water utilities, with participation from stakeholders.

9. More focus should be on planning, while recognizing the importance of preparing for emergency response.

Congressional Action on Climate Change

10. Federal climate change legislation needs to incorporate provisions related to adaptation strategies, as well as mitigation actions.

Climate Change and Water Supply

11. More water storage should be considered, accompanied by an extensive risk and cost-benefit analysis, together with an analysis of the potential for reducing demand and increasing water use efficiency.

12. Greater water conservation should be encouraged, while recognizing the net impact on recharge, returnflows, wetlands, etc.

13. Regional cooperation between water resources managers/purveyors should be encouraged.

14. There is a continuing need for more dialogue and public education.

Water Laws and Policies Report

As part of the Water Laws and Policies Report, issues associated with potential climate change impacts were examined. The following are major findings and recommendations.

Findings

1. While scientists acknowledge some uncertainty about the magnitude of the impacts, climate change may very well result in (a) earlier snowmelt; (b) reduced runoff; (c) greater evapotranspiration; (d) more intense, though less frequent precipitation events; (e) and a rise in sea level.
2. In addition, higher evapotranspiration rates may also result in greater demand.
3. These prospects, coupled with the West's rapid growth rate, could lead to serious consequences if water resource managers are not adequately prepared.
4. As water resource managers anticipate and plan for the potential impacts of climate change, increasing the flexibility in water administration will be vital.
5. Few states have statutorily added mechanisms to increase administrative flexibility to specifically address water-related impacts of climate change, but many water initiatives and programs can be adapted to provide needed flexibility.

Next Steps

6. States should examine their existing water laws and institutions to determine if they are adequate to provide sufficient flexibility to address potential climate change impacts.
7. States should focus on water initiatives and programs associated with demand management and efforts to "stretch" existing supplies, such as water banking, and water transfers.
8. In addition, states that share river basin or ground water resources should consider jointly addressing potential future supply reductions resulting from climate change.

Watershed Study

Next Steps

1. The WGA should request that Congress appropriate sufficient funds to conduct a portfolio assessment of federal projects to evaluate the performance of such projects given current conditions and to determine the vulnerability of projects to changing conditions, and increasing vulnerability.

2. The related federal agencies should begin a systematic updating of their respective reservoir operating plans and drought contingency plans to assure that operating plans are adaptable to a changing climate.
3. Based on the initial appraisals of project performance and vulnerability, recommendations should be considered on reallocating storage and modifying structures.
4. Better monitoring of snow and water conditions is needed to allow adjustments in reservoir operations in real time; more instrumentation would lead to a better understanding of current snow conditions, and the USDA should explore the fuller use of remote sensing of snow cover and snow water content.
5. Forecasts can be improved on multiple timescales and additional research should be undertaken to incorporate forecasts into reservoir operations. The use of seasonal and interannual forecasts in reservoir operations should also be evaluated.

ASIWPCA/WSWC Joint Meeting on

Climate Change

Next Steps

Governments at all levels should work together to:

1. Integrate long-term planning including climate change, land use, water supply, flood control and water quality plans.
2. Improve monitoring and data collection to identify and respond to changing regional and local trends, and allow for better early warning systems that (a) focus on critical or vulnerable systems; (b) deliver real-time data; (c) improve data access, storage and retrieval; (d) allow for real-time "smart" analysis; and (e) provide feedback and evaluation.
3. Reevaluate assumptions regarding potential for more extreme events, larger floods and longer droughts, because future variability may be outside the range of our past experience.
4. Improve understanding of climate drivers and variability at multiple time scales.
5. Produce better predictive information using probabilistic forecasts.
6. Enhance predictive capacity at the watershed scale.
7. Prepare for ecosystem vulnerabilities by: (a) managing invasive species; (b) protecting instream flows in key habitats; and (c) preparing for extreme events.
8. Anticipate an increased need to address the forecasted effects of climate change in administrative, regulatory, and legal agreements involving water resources.

Coordination and Cooperation in Protecting Aquatic Species under the Endangered Species Act

2006 Report Recommendations

Working with representatives of the federal implementing agencies, and soliciting input from other federal agencies and stakeholders, western state representatives under the auspices of the WSWC should establish a protocol outlining objectives and principles for implementing ESA Section 2(c)(2). Its objective should be to minimize conflicts arising between the use of water for the needs of listed species and other water uses and to foster cooperation and consultation between Federal and State governmental entities to enhance species protection and recovery, while protecting rights to water use.

Identify tools under western state water law that can be used to provide water for threatened and endangered species protection.

Implementation Activities

A WSWC report was prepared under the direction of the Legal Committee describing the "tools" available pursuant to state law for protecting and enhancing instream flows for a variety of instream values, including ESA. This is part of the Water Laws and Policies Report.

The WSWC has invited both the federal ESA implementing agencies, the Fish and Wildlife Service and NOAA Fisheries, to engage with us in an effort to improve collaboration through the establishment of a model protocol. However, as yet, these invitations have not been accepted.

Related Findings and Next Steps

Water Laws and Policies Report

A number of opportunities exist under federal law to protect and enhance flows. The purpose of this part of the Water Laws and Policies Report is to describe state authorities and approaches (tools) to do likewise, and to suggest a sequencing in the use of the various opportunities that favors a first recourse to state tools.

Findings

1. While recognizing the importance of federal laws to protect and enhance streamflows, under the prior appropriation doctrine a variety of state laws and programs (tools) have been developed to preserve instream flows, and these tools can be exercised as part of administrative, judicial, or legislative determinations over water allocation.
2. In one form or another, all western states have laws that allow at least some instream flow protection. Many states statutorily authorize instream appropriations. Some create minimum flow protections or instream flow rights. Yet others provide indirect mechanisms to preserve instream flows. In addition, all states may utilize their administrative authorities to protect instream flows. For example, some states condition the approval of new appropriations applications on meeting minimum flows.
3. The development and application of broad public interest criteria provides an administrative mecha-

"Greater cooperation and coordination between federal and state water and fish and wildlife agencies is necessary to improve the prospects for aquatic species conservation and recovery and to assure the continued economic vitality of the West." (WGA Water Report, pg. 24)

nism to deny new applications. Likewise many state agencies weigh public interest criteria when evaluating proposed transfers.

4. Water may also be obtained for instream flows by acquiring existing rights through water transfers, water leases, and water banks.

5. Other tools for instream preservation include coordinated flow-release conditions and protective state legislation.

6. States should anticipate continued competition relative to instream flows because of the limited nature of the resource, statutory mandates, statutory limitations, administrative policies, and the divergent interests of individuals, governments, and organizations.

Next Steps

1. While recognizing the existence of tools and remedies under federal law, those seeking to protect and enhance instream flows should first consider utilizing existing state tools to address their concerns before resorting to other means, as this approach can not only avoid conflict but provide enhanced protection within the regime of state laws and administration.

2. In instances where specific interests cannot be accommodated under state law, a process of negotiated compromises resulting in formal agreements should be pursued to resolve conflicts.

Notes

Notes

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