Pacific Northwest Cooperators' Roundtable for the USGS Cooperative Water Program

September 2-3, 2009 **Tacoma, WA**

Co-sponsored by the

Overview: In cooperation with the US Geological Survey (USGS), the Interstate Council on Water Policy (ICWP) organized this Cooperative Water Program (CWP) Roundtable for stakeholders in Idaho, Oregon and Washington with advisory support from the Washington State Water Resources Association, The River Network, the Oregon Water Resources Congress, the Northwest Indian Fisheries Commission and the Idaho Water Users Association. This roundtable was the ninth in a series of regional stakeholder meetings designed to provide information about the USGS water data and science programs and create an opportunity for stakeholders to help strengthen those programs.

The program included presentations by USGS staff about the purpose, history and capabilities of the CWP and some of the challenges facing it. Cooperator representatives presented excellent descriptions of the scientific contribution that the CWP data collection and interpretive investigations have made in the fulfillment of water resource planning and management responsibilities in the region. The Northwest Hydraulic Consultants, Hach Company, Sutron Corporation, and YSI/SonTek contributed to the discussion among Cooperators and USGS professionals and provided financial support to help us assure that the registration would be affordable for everyone who wanted to participate.

The program, meeting book and PowerPoint presentation files are available from the ICWP website (using the links included in this summary).

Welcome and Program Overview: Peter Evans, Director of the ICWP, welcomed the 65 participants, drew their attention to the contents of the meeting book, described the program, and emphasized the value of the break-out sessions at the end of the meeting. He also described the growing number of organizations and states that have endorsed recent letters to the Secretary of the Interior and to Members of Congress urging full implementation of the National Streamflow Information Program (NSIP) and restoration of the CWP capacity to match Cooperators' investment dollar-for-dollar.

Overview of the CWP from the National Perspective: Ward Staubitz is the National Coordinator of the Cooperative Water Program (CWP). His presentation described the scope and purpose of the oldest and largest USGS program for water data collection and interpretive studies. The CWP developed over the past 114 years around a 50:50 cost share relationship between USGS and the water resource agencies in state, tribal and local government, representing a shared commitment to monitor the highest priority sites. Over the past 25 years, the number of cooperating agencies has more than doubled, with about 1,504 participating in 2007 and a combined budget of about $225M from the following sources:

- federal funds for the CWP ($64.3M); and
- state, tribal and local agency funds ($161M).

Nationwide, the CWP continues to build water databases, integrating data from over 15,000 sites throughout the country, and making them accessible through the National Water Information System (NWIS) and its internet site (which responds to 25-30 million requests for data every month). These data support many interpretive studies and models used by other public agencies and private companies, as well as the USGS (about 700 studies are currently underway), for flood frequency analysis, reservoir design and operations, watershed modeling, aquifer characterization, conjunctive use of surface and ground water, limiting the intrusion of saltwater in aquifers, restoring habitat, protecting water quality and other vital purposes.

The CWP has served an important role in establishing national protocols and standards for data quality and consistency and in helping USGS scientists maintain a fresh appreciation for the changing needs and priorities of water resource management at all levels of government and in the business community.

Overview of the NSIP from the National Perspective: Mike Norris is the National Coordinator of the National Streamflow Information Program (NSIP). His presentation showed the progress that USGS streamgaging programs have made, indicating that about 90% of the active streamgaging stations are now providing real-time data. Mike also discussed the shifting priorities and variation in some of the Cooperators' budgets during the 1990s that caused sufficient concern over the nationwide loss of long-record gages that Congress asked the USGS to design a NSIP in 1998. Based upon an assessment by the USGS, the NSIP was designed to stabilize a base network of streamgages at critical points with a reliable commitment of federal funds to assure sufficient data will be available for the following national purposes:

- meet legal and treaty obligations on interstate and international waters (to monitor legal requirements for deliveries of water at state and national borders);
- flow forecasting (sites needed for validation and improvement of forecasts where the National Weather Service and other federal agencies carry out flood or water supply forecasts);
- measure river basin outflows (for calculating regional water balances for principal watersheds);
- monitor sentinel watersheds (for determining long-term trends in streamflow across the nation, including the effects of climate change); and
- measure flow for water quality purposes (for characterizing the quality of surface waters)

Of the 7,663 active gages operated by USGS in 2008 within the CWP and NSIP, approximately 3,339 (43%) meet one or more of those five national needs. However, federal funds appropriated for the NSIP in 2008 were sufficient to provide full support for only 503 stations and partial support for another 508 stations, as illustrated on page 71 of the meeting book; this means that more than 2,330 of the 3,339 NSIP gages (i.e., 70%) are supported with a combination of funds from Cooperators, the USGS/CWP and other federal agencies. Approximately 312 of those 7,663 active streamgages were at risk of discontinuation, adding to the set of more than 965 discontinued since 2001 (shown on page 70 in the meeting book).

New issues, public interest and new technologies have increased the demand for streamflow information. Unfortunately, the capability of our combined streamgage network to meet the five national goals has declined in recent years as a result of an increasing instability in the network due to the way the streamgaging programs are funded.

Full implementation of the NSIP is estimated to cost $117M; this would provide for the reactivation of about 970 discontinued streamgages, installation of about 435 new streamgages, "flood hardening" the existing streamgages to assure their continuity through at least a 100-yr flood event and providing real-time data transmission at all NSIP streamgages. Future operation and maintenance of the full NSIP network of about 4,780 streamgages is estimated to cost approximately $108M/year. For the current fiscal year (FY-2009), the Congress appropriated $22.4M for the NSIP (i.e., about 1/5 of the actual cost).

OVERVIEW OF THE MONITORING NETWORKS IN THE REGION

Overview of the USGS Cooperative Water Program Monitoring Networks: Bob Kimbrough provided a comprehensive overview of the basic data programs supported by the USGS in the three states of Washington, Oregon and Idaho; Bob is the Data Chief in the USGS Washington Water Science Center. USGS employs a Water Data Chief in each state WSC and each operates a state-wide hydrologic data network. Overall, they support 740 surface water, ground water and water quality monitoring locations, but the vast majority (<90%) of their investment is in surface water quantity and quality.

The watersheds of the Pacific Northwest are highly managed, with approximately 130 major dams, most of which produce hydroelectric power. The streamgaging program was initially developed to support the planning for federal irrigation projects. The surface water monitoring stations are concentrated in coastal watersheds and in portions of the Cascade Range where precipitation is greatest; approximately 80% or their data collection is supported with real-time telemetry.

The three Water Science Centers monitor 180 water quality stations, overall, and 412 ground water level monitors. Bob presented a map indicating that most of the ground water monitoring is in southern Idaho and that, tragically, 75% of those stations may be discontinued due to funding shortfalls. The USGS operates about 400 ground water quality stations, all of which are in Idaho, and about 40 precipitation gages (most of which are located along the western face of the Cascade Range.

There are six principal issues that drive USGS/CWP monitoring in the Pacific Northwest, but the allocation and accounting for supplies supporting irrigation, hydroelectric generation and municipal/industrial uses are the dominant issues; ecosystem conservation is growing fast and flood and drought are always important.

Bob also illustrated the diversity of Cooperators and other federal agencies sharing the cost of the hydrologic data program, in which the USGS contributes about 1/3 (including funds for both the CWP & NSIP), other federal agencies contribute about 1/3 and CWP Cooperators contribute 1/3. The Cooperators include 5 state agencies, 16 tribal agencies, 23 utilities, 23 cities, 15 watersheds and districts and 15 counties.

In response to questions, Bob clarified that the very limited groundwater coverage under the CWP is supplemented by four USGS/NAQWA study units, by the monitoring efforts of several counties in Washington State and by a state program in Oregon (although all are underfunded and at risk in the current budget situation).

Overview of the Idaho Water Monitoring Networks: Hal Anderson (Planning & Technical Services Administrator for the Idaho Department of Water Resources) described the Idaho monitoring program, beginning with an overview of the needs that it is authorized to support. They have their own streamgages (in addition to the gages they support as a CWP cost-share Cooperator), and monitor the diversions and return flows for irrigation canals. Most of the supplemental data they collected is to meet specific water allocation and regulatory purposes. These purposes include: water rights determinations, delivery and administration; conjunctive administration of surface and ground water supplies; planning and design for water management projects; and evaluation of minimum stream flow needs.

Hal described the increasing cost of data collection, showing that the state funding for collecting monitoring data has increased about 6% over the past 10 years, while the cost of USGS data collection has increased about 18%. Limited federal funding for the USGS programs has also caused their cost share to increase from 50% to about 53% which, in turn, causes the Department to spend more of its data collection budget in support of the CWP (was a little less than 50% of their data collection budget in 1999 and is about 57% of its total data collection budget). In the face of mandated personnel budget reductions, the state has decided it must shift its' funding from the CWP to support existing staff, which requires that they collect more of the data themselves.

Hal also described the paradox that insufficient funding from both the state and federal governments presents in Idaho, where the available water supplies in several watersheds are fully appropriated, while recreational and ecological flows become increasingly complicated, and where interstate allocations are watched more closely than ever. The record of reliable, long-term measurements becomes much more valuable but the recession and other competing budget priorities (e.g., schools, roads and prisons in their state) compel the reduction and discontinuation of collection efforts.

Overview of the Oregon Water Monitoring Networks: Aaron Borisenko (Watershed Assessment Manager for the Oregon Department of Environmental Quality) described Oregon's water quality monitoring program, which is impressive for its cost-efficiency and for the extent to which it is "underfunded;" he estimated the full implementation of their programs would cost about $1.2M and that they are currently operating at about 50%. Their programs are designed to characterize known concerns (in terms of the current status and trends) and to detect emerging concerns so that state and local agencies, the legislature and others can protect their designated uses. He described a recent incident in which toxic conditions produced by an algal boom may have been responsible for the death of several pets (dogs) as an example of the potential for serious harm that water quality events can cause. The DEQ needs the USGS data, in conjunction with their own sampling data, to monitor pollutant loading, calculate waste loading, evaluate the effectiveness of water quality programs and compliance with water quality regulations and permit requirements. Their QA/QC measures have been carefully designed, although budget constraints limit their implementation, too.

Aaron described their ambient water quality monitoring program, in which the state is monitoring about 150 sites six times annually to detect trends at both the local and larger watershed scales. The initial assessment is showing an increasing number of sites with degrading quality. He also described their schedule for complying with a court order for the development of almost 1,200 TMDLs by 2010 and indicated the state expects much more value will come from this effort in future years, as the gaps in the supporting data are closed; they plan to develop a broader geographic approach, rather than attending to one parameter after another. He also described their toxics monitoring program, which is focused on persistent, bioaccumulative toxins and emerging contaminants in the Willamette Basin (it will be extended into other parts of the state in future years –if and when the budget allows). They also operate a ground water quality monitoring program, primarily concerned with nutrients and pesticides in agricultural areas.

In closing, Aaron anticipated further budget restrictions and emphasized the value of coordinated monitoring and shared data; he suggested that development of a water quality monitoring council would be useful.

Overview of the Washington State Water Monitoring Networks: Rob Duff (Environmental Assessment Program Manager, Washington Department of Ecology) described the streamgaging and ground water monitoring programs in Washington, indicating that their water quality programs are very similar to the Oregon programs that Aaron described. The state streamgaging program really got its start in 1996 with legislative recognition that streamflow data for many of the smaller rivers and tributaries was needed to manage water supplies and protect water quality. In 2002, the state legislature sustained the funding for their program as part of the Watershed Planning Act, which also organized local planning councils to set instream flow levels and to establish water banking and TMDLs. Those local units had considerable influence in the initial location and operation of the state's streamgages, which will be adjusted over time to assure the most useful sites are covered (and in response to budget limitations).

Today, the state operates 194 of its own streamgages (100 of which are reporting real-time data) in conjunction with the 253 USGS gages to provide well-distributed monitoring across the state. In addition to the flexibility to meet specific local needs at lower cost (i.e., by operating partial record sites that focus on base flow and low flow measurements), the state program also enables the Department to retain

internal expertise that pays significant dividends in the data assessment and in the modeling they conduct to supplement measured ("reference gage") flow measurements at less cost for the benefit of the local planning councils. A high priority is assigned to the state gages where there is an instream flow or other active management challenges.

Rob also presented an overview of the Washington ground water monitoring efforts, which are closely tailored to the State's water rights and water quality protection requirements. A map of their ground water monitoring sites demonstrated that problem-solving orientation; it also illustrated that any emerging concerns in many areas could go undetected for years and, if sufficiently serious, require response based upon very limited baseline data. Rob estimated there are about 300,000 active water supply wells today and that new ones are being developed at a rate of about 7,000 per year. There are seven areas in which significant drawdown is monitored today and it may not be long before a more comprehensive monitoring network will be required. Public awareness is growing and the Department has an internal workgroup developing plans for the next steps for consolidating the data they already collect, establish priorities for extending their monitoring capabilities and developing an assessment of regional trends.

Overview of the Tribal Water Resources Assessment: Fran Wilshusen (Habitat Services Manager for the Northwest Indian Fisheries Commission) and John Konovsky (Environmental Program Manager for the Squaxin Island Tribe) provided an overview of the tribal interests and programs, tying back to the Boldt decision in 1974, in which the federal courts recognized the tribes' legal rights and their role as co-managers of the regional fishery with the State of Washington. The NWIFC is comprised of a representative from each of 20 tribes in the region and its staff coordinates the interests and capabilities of each tribe concerning management and protection of the salmon and shellfish resources. During the evening reception, Commission Chairman Billy Frank provided many colorful and helpful stories about the tribes struggle for recognition and the distinct cultural perspective they bring to the understanding and management of the river and its fisheries.

As a result of the Tribal Summit in 2002, the NWIFC organized a technical workgroup to design an assessment of the water resources and fisheries in collaboration with USGS, including identification of ecological flow needs and future on-reservation needs. The opportunity to collaborate with USGS and the CWP has been beneficial for training, data sharing and interpretive modeling. In the last few years, these efforts have emphasized monitoring and analysis of low flow conditions at 66 tribal sites and set the basis to establish a strategic data collection protocol, an efficient system for data management and a broader assessment of future data needs. The tribes want to continue the protection of their interests in partnership with the state agencies, with the counties and with federal agencies, like USGS and EPA; cooperative funding agreements will be essential in this effort because the Assessment is estimated to cost $2.25M annually for 2010-2012.

John Konovsky began his presentation with a brief overview of the Squaxin Island Tribe in relation with the neighboring tribes and water features. John also helped us understand the tribal perspective of people being "of the water" and the difference this makes in the monitoring and analysis of water resources. Some of the tribes are further along in the development of technical skills, the data they need and the agreements for resolving disputed access and management issues; others are just getting started and learning from their neighbors, from the Department of Ecology, USGS and other agencies. The NWIFC and the CWP have been helpful in this process

John described the watersheds, management challenges and data availability within the Squaxin Island Tribe's fishing area, indicating there was a severe shortage of monitoring stations to begin with. USGS has a streamgage in the northern portion of the Deschutes River and a ground water model. Several of the county agencies have useful data, but the Tribe installed 6 of its own streamgages to begin providing the basis for the scientific understanding that might reduce the controversy over water management in the future. Their portion of the watershed includes about 1000 square miles and 38 named tributaries that

discharge into the Salish Sea (aka, Puget Sound), and they don't have funding to install gages everywhere. Instead, they hope to develop a strategy similar to the one that Aaron Borisenko described of combining a few, strategically located streamgages and monitoring wells with a few models and assessment tools (similar to the use of the high flow module in StreamStat for understanding high flow characteristics on ungaged, unregulated streams) to maintain sufficient understanding of the water relationships in a complex area. At this point, the cost for operating the Squaxin Island Tribe's program is about $125K annually.

John and Fran concluded their presentation with emphasis on the tribes appreciation for the partnership with USGS, the state and others who share interest in these waters and fisheries. In the discussion that followed, the need for regression analysis of low flow frequency (not only for the tribes, but for the community-at-large) was emphasized by Marijke van Heeswijk, a hydrologist in the USGS Washington Water Science Center. Key federal funding sources appear to be the Interior Department (USGS and BIA) and the EPA.

There was also a good opportunity after these presentations to discuss the impact of tight budgets on USGS staffing capabilities at the national and regional levels. Staffing levels have decreased about 30% over the past eight years. Most of the USGS offices report success in sustaining their science mission, because their science staff is working harder and employing newer technologies to keep up with more projects. Some are experiencing a turnover of staff with an infusion of younger employees who bring new college training fresh enthusiasm and lower pay-scales into the programs –offsetting some of the loss of experience and institutional memory caused by the retirement of senior scientists and field staff.

We also had a useful discussion of the water monitoring councils organized in West Virginia, New Jersey and other states to coordinate and share the cost of CWP streamgages with new Cooperators and sustain the continuity and reliability of existing networks for monitoring water quality and quantity.

Matt Larsen (USGS Associate Director for Water) and Dennis Lynch (Director of the USGS Water Science Center in Oregon) responded to the many references to water quality concerns with an update on plans for the 3rd decade of the National Water Quality Assessment (NAWQA) Program.

INTERPRETIVE STUDIES & STRATEGIC ISSUES PANEL

Adaptive Management of Peak Flows in the Cedar River: Rand Little (Senior Fisheries Biologist with the City of Seattle Public Utilities) opened this panel of presentations with a description of the Cedar River, its management as part of the City of Seattle's water supply and implementation of the Cedar River Watershed Habitat Conservation Plan. The river provides about ½ of the inflow to Lake Washington and the City derives about 2/3 of its water supply from the upper portion of the watershed. Rand described the watershed, the City's water storage facilities and the habitat conservation plan for 83 species, including steelhead, Chinook and coho-salmon. Based on this plan, Seattle has allocated about 22% of the annual flow for reliable municipal supplies and about 44% for baseline environmental flows, leaving about 1/3 of the flow available in the river for adaptive management.

As part of an effort to get agreement on a set of science-based parameters for the management of those flows, the City engaged USGS in the assessment and characterization of the watershed and its key hydrologic, geomorphologic and biologic functions. They are working with a Cedar River Instream Flow Commission to engage a diverse group of stakeholders in the development of a conceptual model of these relationships to guide the scientific assessment and characterization. The results are expected to include numerical models that describe sediment transport dynamics and associated fluvial processes for selected stream reaches and design of a monitoring program to test and refine these models. The monitoring effort is also expected to support continued development and refinement of a conceptual model that attempts to link stream flow with key ecological processes and functions. In pursing these objectives, the investigations hope to promote an adaptive approach to the management of peak flows by recommending inter-annual target ranges" for peak flow magnitudes, durations and frequencies while testing

hypothesized ecological responses to these recommendations in a stream channel that has been alerted by past land and water management practices.

The City wanted to engage USGS in this specific endeavor because of their competence in a wide range of sciences and reputation for integrity, which have proven essential in this complex, multi-dimensional inquiry that requires understanding and support from a large and diverse group of stakeholders. Their credibility as an impartial federal agency has helped establish an environment in which the Instream Flow Committee has a greater willingness to examine controversial issues and a higher tolerance for uncertainty pending the collection of further data. The fact that several USGS staff (Chris Konrad and Chris Magirl were mentioned specifically) have shown so much interest over a long period of time and have developed positive working relations with many of the participating stakeholders was also a key factor.

Yakima River Ground Water Assessment: Ken Slattery (Water Resources Program Manager for the Washington Department of Ecology) described the involvement of USGS in their evaluation of water supply in a basin that has exhibited great potential for development and has experienced controversial resolution of commitments to the Yakama Tribe and reservation; he did not use slides or handouts to support his presentation.

The Yakima Basin is heavily influenced by snow pack and runoff ; among other valued uses, it supports a great deal of hydropower generation and about $1B of agricultural output annually. Irrigation has been supported by the federal investment in five storage and delivery projects operated by the Bureau of Reclamation. Ground water development has increased since WWII due to improvements in pump technology and the availability of inexpensive electrical power. There are about 1000 well permits pending right now, reflecting the potential for further development and depletion.

It was the potential impact of ground water development and the anticipated impact on surface flows that lead the Yakama Nation to file a lawsuit in 1993 challenging the state's proposed issuance of new well permits and the federal government to join the litigation. In 1999, the three parties agreed to a settlement based upon a process that would involve USGS in the development of models for surface and ground water hydrology to reconcile the tribal rights and water rights that BOR held for the operation of their projects with the senior, junior and pending water rights for the rest of the water community. There has been a lot of housing development and other land use improvement investments in the basin relying on water rights that are junior to both the tribal and BOR rights, so the potential for economic disruption is troubling. USGS was an essential participant in the shared process for developing a framework for future decisions that would protect the interest many diverse parties in water rights and infrastructure in the context of strong development pressure.

The proposed 6-yr study took closer to 10 years and $8M to complete, due to a slow start and an expanded scope of work; during that process, a Technical Study Committee served an invaluable role by providing an open, expert forum for reviewing critical assumptions and providing guidance along the course. It provided invaluable insulation against the potential for "political" interference, despite funding delays and many other complications. This study and the scientific credibility of the USGS provided the Department of Ecology sufficient opportunity to plan and make the necessary mitigation investments to secure the yield for many existing water users (through riparian enhancements, irrigation improvements, a water bank and other measures) while tribal and other water rights were protected and major political conflicts were avoided. The intent is to make the datasets and the models available for broader application and to maintain them, if funding can be dedicated for this purpose.

Ground Water Assessments in Idaho: Hal Anderson (Planning & Technical Services Administrator for the Idaho Department of Water Resources) described the challenges that Idaho is facing in the conjunctive management of surface and ground water. Many states have water laws requiring the integration of water rights administration for surface and ground water where those supplies are "hydraulically connected," a matter that is much easier said than done! He described four aspects of assessment his agency needs to

do: regulatory/administrative efforts, resource management analyses, planning studies and research. Unfortunately, many of their efforts are driven by litigation among water users and against the water rights administrator.

A great deal of the Department's attention has focused on the Upper Snake River Basin and uses of the Eastern Snake Plain Aquifer, which has an annual "budget" of about 10MAF. In addition to the traditional irrigation and municipal uses, a strong aquaculture business developed during the past 40 years. In response to a significant drought in 1977, many investments in water use efficiency were made, which reduced surface water diversions as well as the associated supplement to ground water recharge. In order to sustain a growing economy within the context of a fully appropriated water supply (one that is already vulnerable to efficiencies that diminish ground water recharge), Idaho DWR is investing in substantial improvements and calibration of its own ground water models and engaging the expert guidance of a technical advisory committee that includes representatives of many of the community stakeholders and technical support from the Idaho Water Resource Research Institute. These models serve as the principal means of determining whether injury is likely as a result of proposed water rights changes and transfers.

As a result of these management challenges, the state legislature authorized a comprehensive statewide aquifer planning and management program and appropriated $30M for its implementation. The lessons Idaho DWR has learned in the protection and management of water rights in the Upper Snake River Basin and East Snake Plain Aquifer system are likely to be very useful in the statewide program.

Puyallup River TMDL Effectiveness Monitoring: Char Naylor (Water Quality Manager for the Puyallup Tribe) described the confluence of events during the early 1990s that lead to a collaborative effort by the Tribe, Washington State and the federal EPA to need much better water quality models for ammonia and biological oxygen demand (BOD) in the Puyallup River. She did not use an overhead presentation or handouts to support her discussion. The State Department of Ecology did a TMDL study of the Puyallup in 1993 based on concerns that existing wastewater treatment plants were reaching their design capacity and municipal growth in the watershed was quickly creating new demand for treatment services. At about the same time that state study indicated the availability of additional assimilative capacity, the tribe got approval from the EPA for its water quality standards. As a result, there needed to be consensus among these decision makers about the location and extent of any available assimilation capacity and the strong interests within the community would require a high level of confidence in the information supporting the final decisions. During many of the meetings, many of the parties brought attorneys and consulting experts on a monthly basis to all day meetings.

The initial monitoring efforts conducted to validate the State's results raised new questions about assimilative capacity in parts of the lower river and estuary, some of which appeared to have been caused by sampling complications (due to sedimentation). Extension of those monitoring efforts identified new questions related to some of the tributaries, some related to DO and others to temperature and pH standards. The Tribe relied heavily on USGS staff (Jim Ebbert, especially) during these challenging interactions with the State, EPA and the public as a source of reliable expertise in the design of their sampling program, the selection of appropriate equipment and the maintenance of quality assurance measures. The trust responsibility of the federal government to assist tribes also played a role in their reliance on USGS, as did the cost-share provisions of the CWP.

Ground Water Assessment in Oregon: Phil Ward (Director of the Oregon Water Resources Dept.) described several recent events that have stimulated development of groundwater in Oregon and the OWRD need to enhance ground water models with help from the USGS. Among the challenges, of course, are recent budget cuts (despite broad support from industry and the water community). One strategy the OWRD recommends for getting maximum value from the CWP interpretive studies is to have your own staff closely involved throughout the study, so that there can be greater translation of the results

into the future thinking and decision making by your agency. Up until a few years ago, they had a budget of about $500K annually to invest in ground water studies and were able to complete assessments for the Deschutes, Willamette and Klamath River basins.

In the Deschutes Basin, they have almost fully appropriated water supplies and a surface flow that is highly sensitive to ground water depletions. The Department has helped organize a mitigation bank to facilitate transfers among users, so that economic development may continue.

In the Willamette Basin, again, the river is highly dependent upon ground water inflow and an especially productive set of aquifers associated with Columbia River basalts (a porous volcanic rock formation) which is exhibiting significant drawdown and requiring more extensive management.

Water administration in the Klamath Basin has been especially sensitive since the Bureau of Reclamation was ordered to curtail delivery of irrigation water from Klamath Lake for 225,000 acres of cultivated land. As a result, there was a rapid development of ground water supply wells, fueled in part with state funding in both OR and CA. CWP studies with USGS indicated that over 70% of the inflow to the Klamath Lakes is from the aquifers, so the Department is no longer approving well permits in that Basin.

In each of those basins, the Department faced very difficult management challenges that would not have been as easily managed without a comprehensive set of ground water investigations and USGS support. In the next few years, they anticipate a strong need to extend these studies into the Umatilla, Walla Walla and other basins.

Water Quality Assessment of the Tualatin River: Charlie Logue (Director of Regulatory Affairs for Clean Water Services in Washington County) described the history of development, regulation and science related to water quality management of the Tualatin River. Clean Water Services was originally organized as the Unified Sewerage Agency (USA) in 1969 as a result of water quality concerns and a moratorium on new sewer connections. They manage releases of water from Hagg Lake and the operation of 4 wastewater treatment plants. After repeated investments in improved wastewater treatment facilities and a persistent struggle to sustain water quality throughout the watershed, they engaged USGS in 1990 to help identify the sources of nutrient loads, to assess the fate and transport of those nutrients and to quantify the processes that were affecting dissolved oxygen (DO).

Clean Water Services has also been a cost-share partner in data collection, but it was these interpretive studies that led to the construction of hydrologic models capable of incorporating temperature, flow and pollutant loading. Among the substantial findings from this work, USGS helped identify the role that sediment was playing as a "sink" for DO and that natural background levels of phosphorus in tributary ground water were higher than the initial 1993 TMDL. With the science that USGS provided, Clean Water Services learned to manage flow releases from the reservoir to maintain acceptable DO levels and limit algae blooms during summer; they also avoided a considerable investment in wastewater reuse project, which could have complicated their efforts to maintain the DO. This science also helped in the establishment of new TMDLs in 2001 consistent with the higher level of phosphorus in the ground water and including a more sophisticated ammonia limit that is structured to mimic the assimilative capacity available on a monthly basis during the summer. Clean Water Services works with many experts in the private sector but has especially appreciated USGS involvement in these particular studies needed to support broader policy decisions, where the agency's status as a federal participant helps avoid the "dueling expert" dilemma and facilitates broader public policy decisions.

Following these panel presentations, we discussed budget pressures that have limited the USGS ability to share the cost of data collection and interpretive studies on the traditional 50:50 basis and the mounting pressure on state and local agency budgets. Both Hal and Phil indicated that the state cost-share is getting harder to secure as their share increases above the 50:50 level and as the pressure from state budget managers (in both the legislative and administrative branches) to support in-house staff and services

(instead of contracting with USGS or private consulting firms) is increasing. County representatives indicated the same pressures are increasing within their agencies, as well.

We also discussed the USGS sensitivity to conducting interpretive studies in competition with experts in the private sector. Several factors identified previously (e.g., their competence in such a wide range of geotechnical sciences and research capabilities, their independence and reputation for impartiality as a federal agency and the cost-share) were repeated, but we also discussed the time frame available for decision making and the distinction between issues that require an advance in the basic science and those that involve application of reasonably well-established analytical skills.

RESULTS FROM THE DISCUSSION OF OPPORTUNITIES & PRIORITIES

The participants divided into three groups of 20-25 each to explore opportunities for both the USGS and the Cooperators to improve the CWP. The three groups worked independently for about 90 minutes to respond to three questions and prioritize the results. Those questions and the combined results are available on the internet, but **the highest ranking recommendations** were as follows**:**

What actions should the USGS consider doing to improve the CWP?

- USGS should convene regular advisory committees (and less formal meetings) to share science, enhance understanding and relations with Cooperators on a on topical/regional basis, to seek opportunities that are mutually beneficial and get partners more engaged in the planning and management decisions; this would also help USGS maintain awareness of emerging needs;
- Place greater priority in budget requests to restore 50:50 cost-share capability in CWP and full funding for the NSIP;
- Collect more data available from other agencies and make available through the NWIS or a portal;
- Make better use of informal data collection methods (e.g., volunteers, web cams, etc.); and
- Provide more timely access to interim and final results from both data collection and interpretive studies.

What action should the Cooperators consider doing to improve the CWP?

- Remind your congressional and state legislative delegations of the CWP and NSIP benefits and needs so that appropriate support (from federal, state and other sources) can be secured; and
- Help with the formation of state monitoring councils and make sure USGS clearly understands Cooperator needs; invite USGS into Cooperator meetings to help WSC leadership identify and understand issues early.

How can we coordinate monitoring efforts within the region to increase the value of all the data for use in interpretive studies and program decisions?

- The USGS, Cooperators and other stakeholders should collaborate in the organization and support for statewide or watershed monitoring councils that could inventory water monitoring programs and promote a set of useful standards, protocols, meta-data, etc. to reduce discrepancies among the data sets developed by different agencies, etc.;
- A portal should be established, funded and maintained to provide efficient access to water data from a wide variety of sources; and
- If the monitoring councils become focused on specific tasks (or operate at a very technical level), the USGS and Cooperators should organize less formal meetings on a regular basis to bring various agencies and organizations that collect and/or need water data to facilitate the coordination of their needs, plans and investments.

Before the meeting adjourned, **John Tubbs** (Deputy Assistant Secretary for Water & Science in the Department of the Interior) and **Matt Larsen** (USGS Associate Director for Water) shared some of their observations from the presentations and discussions. John expressed a strong appreciation for the quality of the relationship between USGS leadership and the water agencies and users who depend on reliable data and interpretive studies. He described his experience as the administrator of Montana's Water Resources Division, which involved water rights administration, water project operations, flood protection and dam safety, as the basis for his perception that the USGS/Cooperator relationship is an excellent example of a working partnership –to be emulated in other agency programs, even though it suffers obvious funding limitations. John encouraged USGS, the ICWP and the Cooperators to continue these meetings, sensing that the balancing of USGS roles between advancing the basic science (which requires more patience and peer review) with the need to get the information into the hands of Cooperators fast enough to make well-informed and timely decisions requires great understanding.

Matt thanked all the participants for the thoughtful attention they put into their presentations, the very useful discussions and for their support of USGS water programs. He also shared several observations about the likely shifts in water availability due to global climate change in the years ahead. He introduced many of us to the term "increasing episodicity," referring to the predicted changes in episodic climate functions, including storms, floods and droughts, which are likely to become more intense. He related those changes to the series of water management functions that will likely be affected by shifting precipitation patterns, which will deliver less in the form of snow and more in the form of rain, and the migrating boundaries of habitat for a variety of aquatic and riparian species. Matt is optimistic that the recent congressional authorization for the NSIP, expansion of the ground water program and direction to organize an interagency panel on climate change will produce many good opportunities and results. He concluded by sharing his observations from the inauguration day ceremonies last January on The Mall in Washington, DC, when the crowd of about two million people reacted enthusiastically to President Obama's pledge to restore science to its rightful place in our decision making; even as water programs compete with other national priorities for funding, it is reassuring to observe such broad public appreciation for the value that good science brings to the decisions our society needs to make.

The meeting materials, including the presentation slides, are available to anyone who is interested using the internet links provided above or from the three Water Science Center Directors listed below.

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