The Oregon Water Conference 2011: Evaluating and Managing Water Resources in a Climate of Uncertainty

Oregon State University – CH2M Hill Alumni Center – Corvallis, Oregon

OR Section, American Water Resources Association and OR Section, American Institute of Hydrology

Water Management Session
Michael E. Campana, Chair
Wednesday, May 25
8:00 AM – 4:15 PM

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A River Won: Facilitating Cooperative Negotiation of Transboundary Water Resource Management in the Columbia River Basin through Documentary Film

Julie Elkins Watson

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ABSTRACT

The Columbia River Treaty has been in effect for over 45 years, but its future is uncertain. Starting in 2014, Canada and the United States will have the opportunity to announce ten years' notice for termination of the current arrangement. As this artificial deadline approaches, stakeholders are working to determine future scenarios for the shared management of the Columbia. The success of these scenarios is contingent upon a comprehensive understanding of the "basket of benefits" in the Columbia Basin. Accordingly, the stakeholders in a basin must have meaningful dialogue that goes beyond positions to identify the underlying values and interests in the basin. For facilitators, this requires the development of a process for constructive engagement that facilitates mutual understanding and respect. Media, such as documentary films, are one channel for expressing values, interests, and positions that can potentially influence recipients' understanding of the issue. I plan to test the effectiveness of documentary media as a facilitation tool in the Columbia River Basin (CRB) to examine whether it facilitates understanding, promotes constructive dialogue, and sparks brainstorming of new scenarios for the basin. I will create a documentary film that integrates facilitative techniques, encouraging the viewer to elaborate and learn from the different values. I will give surveys before and after the documentary viewing (at the next CRB Symposium in autumn 2011) and analyze the data to determine whether the film influenced the cooperation variables. This study can shed light on the potential of integrating dynamic media into water resource facilitation, which in turn can help facilitators and water resource professionals fine-tune facilitation techniques.

Keywords: Columbia River; Shared management; Stakeholder values; Basket of benefits; Holistic; Transboundary water management; Cooperative negotiation, Facilitation; Documentary; Media; Film

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Water Conflict Management and Transformation in the Pacific Northwest and the World

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ABSTRACT

With the advance of climate change and growth of human populations and economies, the amount of freshwater in the world remains roughly the same as it has been throughout history. The amount economically available for human use is only 0.007% of the total, or about 13,500 km3, which is about 2300 m3 per a person—a 37% drop since 1970. This increasing scarcity is made more complex because almost half the earth's land surface lies within international watersheds—the land that contributes to the world's 263 transboundary waterways. Both water quantity and water quality have been neglected to the point of catastrophe. More than a billion people lack access to safe water supplies. Almost three billion do not have access to adequate sanitation. Five to ten million people die each year from water-related diseases or inadequate sanitation. Twenty percent of the world's irrigated lands are salt laden, affecting crop production. The pressures on water resources development leads to intense political pressure often referred to as water stress, or water poverty. Furthermore, water ignores political boundaries, evades institutional classification, and eludes legal generalizations. Water demands are increasing, groundwater levels are dropping, surface water supplies are increasingly contaminated, and delivery and treatment infrastructure is aging. Collectively, these issues provide compelling arguments for considering the security implications of water resources management.

If the challenges are both subtler and more local in nature then so too are the potential solutions. Throughout this presentation, we will note that shared water does lead to tensions, threats, and even to some localized violence—and we will offer strategies for preventing and mitigating these tensions—but not to war. Moreover, these tense "flashpoints" generally induce the parties to enter negotiations, often resulting in dialogue and, occasionally, to building creative and resilient working arrangements. We note also that shared water provides compelling inducements to dialogue and cooperation, even while hostilities rage over other issues.

We will: (1) Provide a brief overview of the nature of conflict and experiences of cooperation over transboundary resources; (2) Provide a conceptual basis for understanding cooperation and the costs of noncooperation over water; (3) Indicate the possible triggers for conflict over water sharing and the implications on the livelihoods of ordinary communities; (4) Offer evidence on the potential costs of noncooperation or even conflict over water resources; (5) Analyze different examples of cases where basin stakeholders have successfully managed the competition for water resources; (6) Propose general principles and conclusions on conflict and cooperation.

Keywords: Transboundary water, Water conflict and cooperation; Collaborative use agreements, Integrated Water Resources Management (IWRM)

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Development of an Integrated Water Resources Strategy: Assessing the Public's Values, Knowledge, Perception of Risk, and Acceptability of Management Strategies.

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ABSTRACT

Oregon is perceived as a water rich state; however, as the 2001 Klamath Basin crisis demonstrated, Oregon is not immune to water conflict and problems. Due to its seasonal fluctuations in water availability and geographical variation, Oregon can be considered a water scarce state, with the majority of surface water already fully, or in some places, over allocated during summer months. Climate change, population growth, and increased demand for water in Oregon are stressors compromising water quantity and quality for water users, ecosystem services, as well as limiting resources available for fish and wildlife. In 2009, the 75th Legislative Assembly passed HB 3369 authorizing the Oregon Water Resources Department (in conjunction with Oregon Department of Fish and Wildlife, the Department of Environmental Quality, and the Department of Agriculture) to develop a statewide, integrated water resources strategy, signifying the need for an assessment of water use and availability, as well as a projection for future water needs.

In order to develop a statewide, integrated water resource plan, it is important to determine how Oregonians perceive water issues in Oregon. As such, as assessment of Oregonians' risk perception, knowledge, values and adaptability to changing water conditions is imperative to plan for future water needs of people and ecosystems. Further, it is necessary to understand just how climate change will impact the amount, timing and availability of snowpack runoff that supplies the majority of water to the residents and wildlife in Oregon. We will therefore highlight results from two statewide surveys and interviews of Oregon residents, elected officials, and agency personnel in order to describe the socio-political perceptions of Oregonians.

Keywords: Integrated Water Resources Strategies; Public knowledge; Socio-political; Water consumption

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Developing an Agricultural Water Efficiency Strategy to Help Meet Oregon's Water Needs

Teresa Huntsinger

Clean & Healthy Rivers Program, Oregon Environmental Council, Portland, OR

ABSTRACT

In 2010 Oregon Environmental Council (OEC) embarked on a research effort to develop strategic, practical recommendations for advancing agricultural water efficiency in Oregon. While OEC's report on this project will not be published until July 2011, we will share some of our initial findings at the Oregon Water Conference.

As climate change and population growth place increasing pressure on Oregon's already strained water resources, improved agricultural water conservation and efficiency will need to be a critical component of the solution, for the benefit of farmers and fish. Agricultural irrigation makes up at least 80% of Oregon's water withdrawals and about half of all cropland in Oregon is irrigated.

While many people agree that conservation is a laudable goal, and many growers and irrigation districts have made significant progress in improving the efficiency of irrigation and water delivery systems, there has been little consensus about what the state could do to strategically expand more efficient practices. OEC has been reaching out to agricultural stakeholders and irrigation experts to solicit their ideas and investigate existing barriers, with the aim of developing practical solutions that will benefit growers and the environment. Recommendations may include policy changes, incentives, educational programs and pilot projects. These recommendations will inform our participation in the state's Integrated Water Resources Strategy Policy Advisory Group.

Keywords: Conservation; Efficiency; Agriculture; Irrigation

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Building a Legacy: Integrated Water Resources Management in Damascus, Oregon

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[1]City of Damascus, OR; [2]CH2M Hill, Inc., Portland, OR

ABSTRACT

The City of Damascus, Oregon has a current population of nearly 10,000 people and expects to grow to 50,000 residents by 2060. On the eastern edge of the Portland metropolitan area, the City is located in the Clackamas and Willamette basins with an area of almost 12,000 acres. Semi-rural in character, the recently incorporated city will require water, wastewater, and stormwater infrastructure to serve expected growth. The City developed an Integrated Water Resource Management (IWRM) Plan, in cooperation with several regional service providers, to capitalize on a unique opportunity to consider urban water management from a local watershed perspective, while considering water supply, environmental health, drainage and flood control, water reuse, treatment, and disposal as part of a single system.

The IWRM Plan used a structured decision process, community and stakeholder outreach, and a water balance simulation model to develop and evaluate fifteen financial and non-financial criteria for eleven scenarios, including sensitivity analysis of regulatory uncertainty and climate change impacts on recommended solutions. Scenarios included treatment, storage and conveyance infrastructure for potable use, indirect non-potable reuse, and discharge at local basin, city-wide, and regional scales to find an efficient and resilient system solution. Rainwater capture, environmental flow requirements, groundwater availability, and use of existing ecosystem services to provide stormwater and wastewater treatment and disposal were also considered in the analysis.

The IWRM Plan built on the City's core values and an earlier Public Facilities Plan that identified ecosystem services as both a "facility" to be protected and developed, as well as a possible alternative to built infrastructure solutions. The Voyage™ model used for simulation and reporting of results facilitates decision-making and assists to visualize alternatives. The IWRM Plan builds a portfolio for water management that balances risk, cost, and long-term uncertainty to establish a fundamental direction for water management in the next century in Damascus.

Keywords: Watershed planning; Integrated Water Resources Management (IWRM); Reuse; Systems modeling

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Willamette Basin Water Futures: County Partnerships with Scientists' Cutting-Edge Models

Adam Stebbins

Benton County and Benton-Lane-Linn Water Resources Study Group, Corvallis, OR

ABSTRACT

The elected County Commissioner-led Benton-Lane-Linn Water Resources Study Group evolved in early 2009 to help counties, their partners, and area residents understand, pursue projects and offer recommendations to governing bodies concerning the region's water quality and quantity. The Study Group is building on 2009-2010 successes including community engagement to support goals of the Oregon Integrated Water Resources Strategy. Participants of the Benton-Lane-Linn Water Resources Study Group will be working as part of the multi-year Oregon State University "Willamette Water 2100" NSF grant project. The five-year OSU led project is unique in the level of integration among several leading water resources academics from science, engineering, and socioeconomic disciplines.

Elected officials in the Willamette Basin often have to make short term wagers on water issues, against the backdrop of long term uncertainties over the quantity of and quality of water in the face changing land uses, population growth and climate change. The year-round water flow of the Willamette River and heavy winter rains make the impacts from a changing climate seem small in comparison to immediate economic and environmental issues. Meanwhile, scientists across the water resources disciplines are struggling to inform State and Local government and the citizens they serve, regarding the effects that a changing climate will likely have on water resources. Modeling of water supply and quality provides a means to bridge the climate change knowledge gap and risks under different scenarios. The Benton-Lane-Linn County Water Resources Study Group is starting a pilot project that brings Oregon State University scientists, elected officials and water-use decision makers into a "knowledge-to-action network" partnership, to develop tools and project the potential consequences of climate change.

Participating Study Group members in this knowledge to action network will have the ability to create a process and forum aided by science to weigh policy scenarios as the region faces tradeoffs involving water resources. The result is a pilot project where the latest science-based models are formed with policy choices that help inform improvements to local and regional policies for alleviating potential water scarcity.

Keywords: Legal and institutional issues; Water resources; Willamette Basin; Modeling

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A Novel Physically-Based Framework for the Intelligent Control of River Flooding

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[1]Assistant Professor and [2]Graduate Research Assistant, School of Civil and Construction Engineering, Oregon State University, Corvallis, OR

ABSTRACT

River flooding is a recurrent threat and its control and management continues to be a challenge. It has been recognized that effective flooding control requires a real-time strategy that combines optimization with a physically-based simulation model. Current real-time frameworks that combine simulation and optimization have two main drawbacks. The first drawback is that they attain the best operation strategy based on short-time forecasting only (few hours – few days). This may lead to a wrong operation strategy that may result in flooding or to an unnecessary water release from the reservoirs which would be in conflict with non-real time objectives of the system, such as those of maximizing water storage for irrigation and hydropower production. The second drawback is that they do not account for system flow dynamics. These frameworks instead simply perform mass balance analyses in the reservoirs and assume that the water levels in the reservoirs are horizontal. This is a strong limitation given that a flooding event is highly dynamic and may start from anywhere in the river system. It may start from upstream (e.g., large inflows), from downstream (i.e., high water levels at downstream) or laterally from the connecting reaches (e.g., water levels at river junctions are near the reach banks). Accounting for system flow dynamics is also important because the flow conveyance from one reservoir to another is not instantaneous but depends on the capacity of the connecting reaches, the capacity of the associated gates and outlet structures and the dynamic hydraulic gradients. We present a novel simulation-optimization real-time framework that (1) accounts for system flow dynamics, (2) maximizes the benefits of non-real time objectives of the regulated river system at all times, except during a period, determined automatically trough sampling for a long forecasting, in which the objective of the system will switch to minimize flooding and (3) allows controlled flooding only after the capacity of the entire river system has been exceeded. This controlled flooding is based on hierarchy of risk areas to losses associated with flooding. This means that river reaches (or their areas of influence) that are less prone to losses will be assigned higher preferences for locations of flooding. Once the sampling determines that there is no danger for flooding, the proposed framework automatically switches to maximizing the non-real time objectives of the system. This sampling accounts for unsteady boundary conditions and for system flow dynamics, in particular for computing the conveyance capacity of the system. We demonstrate the proof of concept of this new framework using a hypothetical river system.

Keywords: Flooding; Hydraulic routing; Optimization; Real-time control; Reservoirs; River operation; River systems; Genetic algorithms.

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Source Water Protection in a Climate of Change: Perspectives from a Publicly-Owned Utility

Karl Morgenstern and Jared G. Rubin

Eugene Water & Electric Board. Eugene, OR

ABSTRACT

The McKenzie River serves as the sole source of drinking water for nearly 200,000 residents in Eugene, OR. The McKenzie River is also home to a number of threatened and endangered fish species. Whereas the majority of the upper watershed is forested, areas of rural development and agriculture occur along the valley floor. The cities of Springfield and Eugene are located near the river's mouth. There are numerous dams in the system that provides flood control and hydroelectric power for the region. Climate change has the potential to affect the river and the services provided by it to local residents and aquatic life. Models predict that climate change will dramatically affect storm and weather patterns as well as the timing and extent of the seasonal snowmelt. The area is also experiencing significant population growth, a trend that is anticipated to continue over the course of the next few decades. The development pressures accompanying population growth and rural expansion can also have profound impacts on the river. This impact is perhaps most evident when considering changes to the ecologically-critical riparian and floodplain areas. EWEB has taken an active role in assessing the McKenzie's water quality and the health of the riparian zone in face of developmental pressures. EWEB oversees an extensive water quality monitoring program that tracks conventional water quality parameters as well as some of the emerging contaminants of concern often associated with increased development such as flame retardants and pharmaceuticals. EWEB and its partners also conducted an extensive critique of the existing regulations pertaining to floodplains and riparian zones and identified significant gaps that allowed for the continued degradation of these ecologically sensitive resources. Effective riparian and floodplain management are critical for economic stability, ecologic resiliency, and adaptation in response to a climate of change. Recent experiences suggest that increased regulations may not be the most effective means for achieving riparian/floodplain protection due to property rights concerns. In the long run, voluntary incentives such as the promotion of agricultural and ecosystem services may prove to be more effective mechanisms for protecting these resources.

Keywords: Water quality; Climate change: Ecosystem services, Agriculture; Riparian; Floodplain

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Growth Management-oriented Water Conservation and Reuse in Oregon: Operationalizing Integrated Watershed and Water Resources Management

Jamison Cavallaro
Willamette Falls Watershed Association, Clackamas County, OR

ABSTRACT

Oregon's largest metropolitan region, Greater Portland, is home to a diverse array of water utilities though few have sufficiently robust water reuse and conservation goals. In determining the most beneficial way to allocate water-related public goods and natural resource management services, Oregonians are adapting to stronger legal standards among other principles such as sustainable development, public participation, and more. Despite the climate of uncertainties, the region is experimenting with full-cost accounting for water consumption, storm/wastewater assimilation, and ecosystem recovery.

For over 30 years the Portland metropolitan area has experienced different urbanization patterns and regional management regimes while impacting the ecology of multiple watersheds within the Lower Willamette River Estuary (and Columbia River from the Sandy River sub-basin to the Columbia's confluence with the Willamette). Focused on lessons learned from the 2004 Portland metro area Updated Regional Water Supply Plan, water purveyor targets for infrastructure connectivity, demand management, and new supplies are compared to that of other regions.

From a growth management perspective, this paper analyzes Integrated Water Resources Management (IWRM) as both a regulatory process as well as an intermodal water system infrastructure policy. Academic findings indicate that non-potable water reclamation and reuse options, nodal water storage and distribution infrastructure, systems of water pricing and land use permitting/zoning codes/comprehensive plans, and demand management should receive greater attention in the 21st century. This paper also offers criteria to aid in the analytical evaluation of Oregon's transition towards sustainable IWRM. Year by year, the commitment to IWRM (or "getting the right flows to the right places at the right time") can be measured by the following:

1) Increased application of water reclamation and conservation programs;
2) Reduced consumption of potable water by shifting to non-potable water for certain industrial and municipal, agricultural, and community system demands; and
3) Improved ecological in-stream flows and conditions.

Federal and state regulatory frameworks (both requirements like NEPA, ESA, and CWA as well as other watershed and public involvement guidelines like Statewide Goals 1-6 and 11) are explored by the author and local practitioners to generate recommendations for future studies and greater IWRM policy implementation improvements in Oregon

Keywords: Demand management; Non-potable: Water reclamation; Water recycling and reuse; Integrated watershed and water resources management: Watershed and floodplain restoration; Smart growth; TMDL, Salmon and steelhead recovery: Infrastructure optimization

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Exempt Wells in the Courts, Agencies and Legislatures

Jesse J. Richardson, Jr.

Water Systems Council/Virginia Tech, Blacksburg, VA

ABSTRACT

"Exempt wells" are water wells that are exempt from one or more permit or other requirements in seventeen western states. Important policy considerations underlie the exemption, and only Utah does not exempt any water uses. However, some have expressed concerns about exempt water wells and the impact of the exemptions on water planning and growth management.

The proliferation of exempt wells in the West has generated a considerable amount of litigation, as well as administrative actions and legislative activity. This presentation examines and analyzes the most recent litigation and other activity on exempt wells, analyzing the possible impacts in Oregon.

Most prominently, in Bounds v. New Mexico, the Court of Appeals of New Mexico, No. 28,860 (October 29, 2010) opinion overruled a lower court decision that was decided in 2008. The lower court ruled that New Mexico's exempt well statute was unconstitutional on its face. The Court of Appeals decision has been appealed to the New Mexico Supreme Court.

In Washington State, litigation has been filed challenging the Washington Attorney General's opinion that the exempt well provision in that state provides an unlimited exemption for "stock watering". The exemption is being used by large concentrated animal facilities to allegedly pump over a million gallons of water a day. In addition, litigation involving Washington State's growth management statute, but focused on exempt wells, has been argued before the Washington Supreme Court in Kittitas County, et al. v. Eastern Washington Growth Management Hearings Board (Case No. 84187-0). Finally, A moratorium on exempt wells in Upper Kittitas County has generated significant controversy.

In Montana, the Department of Natural Resources rejected an administrative challenge to the exempt well rules, but in a settlement of court action challenging that action agreed to institute rulemaking to change the regulation. Legislative activity is expected this coming session.

This presentation synthesizes the present activity. The author attempts to provide a forecast of the outcomes of this activity.

Keywords: Exempt wells; Constitutional law; Water law

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Assimilative Capacity Modeling in Support of the Georgia Comprehensive State-Wide Water Management Plan

Brian Watson, Jeremy Wyss, Steven Davie, Elizabeth A. Booth

Water Resources Group, Tetra Tech, Atlanta, GA

ABSTRACT

In January 2008, the Georgia Water Council approved the Georgia Comprehensive State-Wide Water Management Plan (GA Water Plan). The purpose of GA Water Plan is to guide the state of Georgia with managing its water resources in a sustainable manner. This means not only allowing growth in Georgia, but also maintaining the ecological and biological health of the State's rivers, lakes and estuaries, as well as protecting state water quality standards. In order to evaluate the State's resources, the Georgia Environmental Protection Division (GAEPD) with the assistance of other state agencies, the University System of Georgia and other research institutions, the U.S. Geological Survey and contractors are conducting water resource assessments to determine Surface Water Availability, Groundwater Availability, and Assimilative Capacity of the surface water resources. The assessments will include the compilation and management of data, computer modeling of both current and future needs, and additional monitoring if needed. Results of the assessments will be provided Regional Planning Councils as a starting point for the development of a recommended Water Development and Conservation Plan. The Assimilative Capacity resource assessment included the development and calibration of a series of linked models including GADosag, EPDRIV-1D, LSPC, and EFDC. Once calibrated these models were used to evaluate a number of scenarios such as impacts due to the projected land use and point source discharges in 2050, non-point source management strategies, U.S. Army Corps of Engineering reservoir operation changes. These models were also used in the development and/or evaluation of nutrient criteria.

As our water resources become more taxed (both quantity and quality), and nutrient criteria development are being developed, the approach taken by Georgia will serve as guide to other agencies in long-term water planning.

Keywords: Modeling; Assimilative capacity; Water planning