



The Water Report™

Water Rights, Water Quality & Water Solutions in the West

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& Water Use**

& More!



TRIBAL CLAIMS TO THE COLORADO RIVER



by Ryan Smith, Brownstein Hyatt Farber Schreck (Washington, DC)

INTRODUCTION

In 2012, after more than two decades of settlement discussions between the Navajo Nation and Arizona water users, the settlement parties nearly reached a settlement of the Tribe's claims to the Little Colorado River, a tributary of the Colorado River. Ultimately, however, the Navajo Nation rejected the settlement in part because it failed to resolve the Tribe's claims to the mainstem Colorado River and did not include funding for the Western Navajo Project (WNP), which would divert Colorado River water from Lake Powell in the Upper Colorado River Basin and deliver it to the Navajo Nation in Arizona in the Lower Colorado River Basin.

It is unclear whether a settlement will be reached, but it is clear that if and when the Navajo Nation settles/resolves its claims to the Colorado River, it will have to successfully navigate through the body of law known as the "Law of the River" — which controls how the river is operated. Fortunately, it does have a model for doing so. Indeed, in the Navajo New Mexico Water Rights Settlement, the Colorado River basin states agreed, and Congress authorized, an interbasin transfer of Colorado River water, but only after a protracted negotiation. Its lessons will prove valuable should the WNP ever be included in an Arizona-Navajo settlement.

TRIBAL WATER RIGHTS - WINTERS RIGHTS

In the majority of the western United States, the Doctrine of Prior Appropriation applies and provides that water rights, including rights to the Colorado River, are established at the time water is put to beneficial use. Water rights for Indian reservations, however, are based on the *Winters* doctrine, which provides that when the federal government creates an Indian reservation, it also reserves water to fulfill the purposes of the reservation. *Winters v. United States*, 207 U.S. 564, 576-577 (1908). These reserved water rights cannot be lost due to non-use, *Hackford v. Babbit*, 14 F.3d 1457, 1461, n. 3 (10th Cir. 1994).

The priority date of reserved water rights is the date the reservation was created by executive order, treaty, or by Congress. *See Cappaert v. United States*, 426 U.S. 128, 138 (1976); *Arizona v. California*, 373 U.S. 546, 598-600 (1963). Where a preexisting tribal use of the water at issue exists before the creation of the reservation, the priority date is time immemorial. *See United States v. Adair*, 723 F.2d 1394, 1414 (9th Cir. 1983), *cert denied*, 467 U.S. 1252 (1984). Because most western Indian reservations were created in the 1800s and early 1900s, tribes generally have water rights senior to non-Indian water users.

TRIBAL WATER RIGHTS TO THE COLORADO RIVER

Colorado
River:
Tribal ClaimsCompact
ProvisionsMexico
ObligationsStates'
SharesNon Tribal
Allocation

As noted, the Colorado River is managed pursuant to a number of compacts, federal laws, case law, contracts, and regulatory guidelines referred to as the "Law of the River." One of the central controlling documents of the Law of the River is the 1922 Colorado River Compact (Compact), which divided the Colorado River Basin into an Upper Basin and a Lower Basin, with the dividing point at Lee Ferry. Compact, Art. II(f) and (g). The Compact apportioned from the Colorado River System in perpetuity to the Upper Basin and to the Lower Basin, respectively, the exclusive beneficial use of 7.5 million acre-feet of water per year (AFY). Compact, Art. III(a). In addition, Article III(b) of the Compact gives the Lower Basin the right to increase its beneficial consumptive use of water from the Colorado River System by one million AFY.

The Compact also provides that the states of the Upper Division (Colorado, New Mexico, Utah and Wyoming) shall not cause the flow of the river at Lee Ferry to be depleted below 75 million acre-feet for any ten-year period. This requirement effectively places a burden on the Upper Division states to deliver 7.5 million AFY to the Lower Division states (Arizona, California and Nevada). With respect to the United States' treaty obligations to deliver Colorado River to Mexico, the Compact provides that the Upper and Lower Basins each are required to contribute one-half of any treaty obligation if a surplus does not exist on the system. Compact, Art. III(c).

The Compact was initially not ratified by all seven states, in part, because no agreement was reached as to each state's share of the water. *Arizona v. California*, 373 U.S. 546, 557 (1963). In 1928, Congress enacted the Boulder Canyon Project Act (43 U.S.C. § 617), which approved the Compact and outlined how the Lower Basin's water should be allocated among the Lower Division states. Congress apportioned water of the Colorado River mainstem as follows: 2.8 million acre-feet and half of the surplus to Arizona, 4.4 million acre-feet and half of the surplus to California and 300,000 acre-feet to Nevada. In 1963, the US Supreme Court confirmed this apportionment. *Arizona v. California*, 373 U.S. 546.

Importantly, the Compact does not allocate water to specific states or to tribes. In fact, with respect to tribes, the Compact states: "[n]othing in this Compact shall be construed as affecting the obligations of the United States of America to Indian tribes." (1922 Compact, Article VII, 1948 Compact, Article XIX(a)). This same language is included in the Upper Colorado River Basin of 1948 ("1948 Compact"), which apportioned the Upper Basin's 7.5 million acre-feet among Colorado (51.75 percent), New Mexico (11.25 percent); Utah (23 percent), and Wyoming (14 percent), and for the portion of Arizona located in the Upper Basin 50,000 acre-feet annually. 1948 Compact, Article XIX. In addition, the 1922 Compact also provides: "[p]resent perfected rights to the beneficial use of waters of the Colorado River System are unimpaired by this compact," which means that the 1922 Compact does not affect a tribe's present perfected rights to the Colorado River that predate the Compact. *See* Article VIII. The 1948 Compact affirmed this section, stating: "[i]t is recognized that the Colorado River Compact is in full force and effect and all of the provisions hereof are subject thereto." Article I(b).

Arizona v. California

One of the seminal cases dealing with Indian water rights is *Arizona v. California*, in which the United States Supreme Court addressed a long-standing dispute between the States of Arizona and California regarding the accounting of Colorado River tributaries in the State of Arizona. California argued that Arizona's use of the Gila River, a Colorado River tributary, counted against Arizona's 2.8 million acre-feet Colorado River apportionment. The Supreme Court disagreed, holding that: (1) Arizona had the right to appropriate and use tributary flow before it reached the Colorado River; and (2) the tributary water did not count against Arizona's 2.8 million acre-feet apportionment. *Id.* at 568-574.

Importantly, the Supreme Court also quantified the federally reserved water rights of five Colorado River Tribes along the lower Colorado River, and discussed the priority date of tribal claims on the Colorado River. (Ultimately, it quantified the rights of additional tribes in later Court decrees.) With respect to the tribal claims, the Court stated:

[T]he United States did reserve the water rights for the Indians effective as of the time the Indian Reservations were created. This means, as the Master held, that these water rights, having vested before the [Boulder Canyon Project] Act became effective on June 25, 1929, are 'present perfected rights' and as such are entitled to priority under the Act.

Arizona v. California, 373 U.S. at 600.

The Water Report

(ISSN 1946-116X)

is published monthly by
Envirotech Publications, Inc.
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Eugene, OR 97402

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Subscription Rates:

\$299 per year

Multiple subscription rates
available.

Postmaster: Please send
address corrections to
The Water Report,
260 North Polk Street,
Eugene, OR 97402

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Colorado River: Tribal Claims

Tribal Rights

Navajo Nation Lawsuit

This means that since most tribes were established prior to 1929, most have senior water rights on the Colorado River. Indeed, the Navajo Nation has taken the position that since its reservation was created by Treaty in 1868 (15 Stat. 667) and extended westward to the Colorado River by Executive Order of January 8, 1900, the water rights of the “Navajo Nation to the waters of the Colorado River System should be treated as prior perfected rights and not affected by operation of the compacts.” See Stanley Pollack, *Natural Resources Development on Indian Lands*, Rocky Mountain Mineral Law Foundation, 2 (Mar. 3-4, 2011). The Court also concluded that “the only feasible and fair way by which reserved water for the reservations can be measured is irrigable acreage.” *Arizona v. California*, 373 U.S. at 601. It further held that Indian water rights are charged against each state’s apportioned share. *Id.*

Unresolved Claims to the Colorado River

There are a number of outstanding claims to the Colorado River, but arguably the most significant claim to the system is the Navajo Nation’s. In March 2003, the Navajo Nation filed suit against the US in the US District Court in Arizona, asserting breach of trust and National Environmental Policy Act (NEPA) claims concerning the Department of the Interior’s management of the tribe’s water needs for its reservation on the Colorado River above Lake Mead in the Lower Colorado River Basin. The complaint alleges that Interior has breached its trust obligation to the Nation by failing to consider the tribe’s water rights and unmet water needs in taking or failing to take a number of actions, including but not limited to the: (1) 2001 Colorado River Interim Surplus Guidelines; (2) regulations for interstate banking on the Colorado River; and (3) allocation of water to the Central Arizona Project.

Colorado River Basin



Colorado River: Tribal Claims

Guidelines Impact

Navajo Nation's Drinking Water

Interbasin Transfer Proposal

In the litigation, the Nation seeks an order “[e]njoining all [Department of the Interior] actions which propose to allocate unallocated water from [the] Colorado River so long as the Secretary of the Interior fails to determine the quantity and extent of the Navajo Nation’s rights to and interests in the waters of the Colorado River required to meet the needs of the Navajo Nation.” The Nation also seeks other relief that would threaten the Secretary’s continuing ability to manage the Colorado River system. Although it is unclear whether and how the litigation will proceed, if successful it has the potential to upset a number of guidelines that dictate how the river is operated. Pursuant to a stipulation of the parties, the Court entered a stay of the proceedings, which expires on May 15, 2013, in order to continue the settlement discussions.

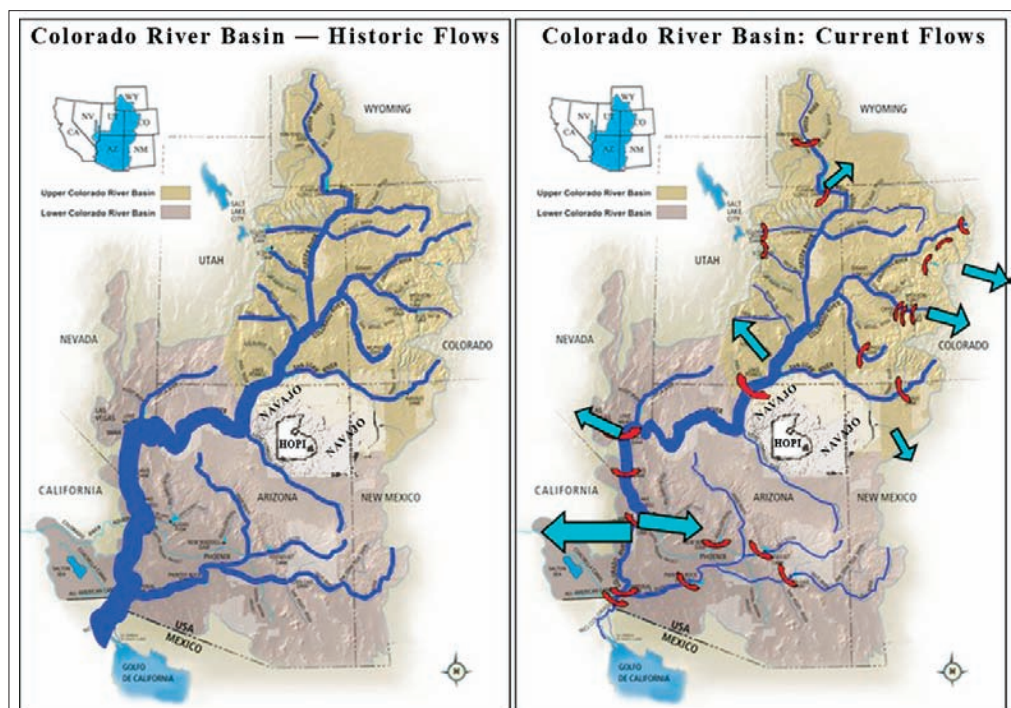
Given the potential impact of the case, the District Court for the District of Arizona permitted the following parties to intervene: the State of Arizona; the Salt River Project Agricultural Improvement and Power District; Salt River Valley Water Users Association; Central Arizona Water Conservation District & Power Authority; Metropolitan Water District of Southern California; Coachella Valley Water District; Imperial Irrigation District; the State of Nevada; Colorado River Commission; and Southern Nevada Water Authority.

As noted above, one of the main goals of the litigation is to have the Secretary of the Interior determine the “quantity and extent” of the Navajo Nation’s Colorado River rights. One of the motivating factors of the lawsuit is the Navajo Nation’s need to secure a reliable source of drinking water on the Navajo Reservation. Indeed, a 2006 appraisal level study performed by the Bureau of Reclamation (Reclamation), entitled the *North Central Arizona Water Supply Study (Study)*, estimated that the total unmet demands in 2050 for the Navajo Nation in the Western Navajo Pipeline (WNP) study area were at 8,263 AFY. *Study*, at 80. The Study also found that the lack of a reliable water supply contributes to a high incidence of disease and infection from waterborne contaminants, stating that “[m]any of the water haulers rely on non-potable water sources for their water supply and/or unsanitary tanks for the transport and storage of water. These sources and tanks are susceptible to microbial contamination.” *Id.*, *supra* note 8, at 13-14.

LAW OF THE RIVER ISSUES

Western Navajo Pipeline

In an attempt to resolve the Navajo Nation’s claims to the Colorado River, the Nation proposed settling its claims to the Colorado River in consideration for, among other things, funding for the WNP, which would (at least under one iteration) deliver approximately 15,000 acre-feet of Colorado River water per year from Lake Powell in the Upper Colorado River Basin to the Navajo and Hopi Reservations in the Lower Basin — 10,906 acre-feet per year to the Navajo Reservation and 4,048 acre-feet per year to the Hopi Reservation. (This would meet the tribes’ projected 2050 demands.) *Id.* at 27. The cost of the project is \$515 million in January 2009 dollars. *Id.* Where possible, the WNP would tie in to existing Navajo Tribal Utility Authority infrastructure. Many tribal members who currently haul water, however, would still have to continue to do so, but from a more reliable, safer, and, in many cases, closer source.



UPPER BASIN/LOWER BASIN ISSUES

Colorado
River:
Tribal ClaimsCompact
ConflictTransbasin
DiversionsSettlement
RejectedSan Juan
River BasinInterbasin
IssuesInterbasin
Transfer
Authorized

The WNP presents certain Law of the River issues, specifically pertaining to the 1922 Compact. The plain language of the Compact prohibits the transfer of water from the Upper Basin to the Lower Basin. Article III(a) of the Compact apportions each basin the “**exclusive** beneficial consumptive use of 7.5 million acre-feet of water per annum.” (Emphasis added). The Compact also provides that “[a]ll...rights to beneficial use of waters of the Colorado River System shall be satisfied **solely** from the water apportioned to that basin in which they are situated.” Article VIII (emphasis added).

As a result, some have argued that the transbasin diversions contemplated by the WNP from the Upper Basin (Lake Powell) to the Lower Basin (Tuba City, Cameron, Flagstaff, etc.) can arguably only occur if legislation expressly authorizes the transfer notwithstanding the Compact’s prohibition. Any congressional approval of the settlement, therefore, would need to explicitly authorize the transfer. The Navajo Nation would argue, however, that it is not bound by the 1922 Compact for the reasons discussed above and, therefore, not restricted by any prohibition of interbasin transfers. That said, as a practical matter, any legislation impacting the Law of the River will require the involvement of all Colorado River Basin states, and their respective members of Congress, which presents its own set of challenges.

Ultimately, because of the significant costs of the WNP, the settlement parties were forced to remove the WNP from their settlement discussions and instead pursue only a settlement of the Tribe’s claims to the Little Colorado River. In February 2012, Senators Kyl and McCain introduced the *Navajo-Hopi Little Colorado River Water Rights Settlement Act of 2012*, which authorized: (1) the parties’ settlement of the tribe’s claims to the Little Colorado River; and (2) funding for a number of tribal groundwater projects. The Navajo Nation, however, rejected the settlement and the legislation because, in part, they did not settle their mainstem Colorado River claims or include funding for the WNP. As of the date of this article, the settlement discussions are ongoing.

NAVAJO NEW MEXICO WATER RIGHT SETTLEMENT

Although the WNP has stalled, another Navajo project with an interbasin diversion is moving forward under the authority of the New Mexico Rural Water Projects Act (Act)(Sec. 10301, Pub.L. 111-11.). The Act, which became law in 2009, among other things, authorizes: (1) the Navajo New Mexico Water Rights Settlement approving the water rights settlement agreement between the Navajo Nation and New Mexico concerning the Nation’s claims in the San Juan River Basin; and (2) the construction of the Navajo-Gallup Water Supply Project, which would supply the infrastructure to deliver water from the San Juan River in the Upper Colorado River Basin to communities in the Lower Basin in Arizona and New Mexico.

Initially, Arizona water users objected to the interbasin transfer because — just as with the WNP — they argued such as transfer violated the Law of the River. Specifically, Arizona argued that the bill violated provisions in the 1922 Compact related to the use of Colorado River water that allocated water “exclusively” to the Upper Basin to be used in the Lower Basin. Proponents of the Navajo Gallup Project argued that it was not bound by the 1922 Compact, referring to the language in the compacts discussed above that states: “[n]othing in this Compact shall be construed as affecting the obligations of the United States of America to Indian tribes.”

After a protracted negotiation among the stakeholders and their respective members of Congress, the parties agreed on a solution that would allow Navajo-Gallup Project to deliver water from the Upper Basin to the Lower Basin. The resolution came in the form of legislative language that specifically authorized the interbasin transfer.

Specifically, the legislation provides:

. . . notwithstanding any other provision of law —

(1) water may be diverted by the Project from the San Juan River in the State of New Mexico for use within New Mexico in the lower basin, as that term is used in the Colorado River Compact;

(2) any water diverted under paragraph (1) shall be a part of, and charged against, the consumptive use apportionment made to the State of New Mexico by Article III(a) of the Compact and to the upper basin by Article III(a) of the Colorado River Compact; and

(3) any water so diverted by the Project into the lower basin within the State of New Mexico shall not be credited as water reaching Lee Ferry pursuant to Articles III(c) and III(d) of the Colorado River Compact.

Colorado River: Tribal Claims

Limiting Language: No Precedent

Because of the concern the state parties had regarding future interbasin transfers, the legislation includes language explaining: (1) that the legislation did not establish a precedent; and (2) the rationale for allowing the transfer, specifically citing the unique circumstances of the Navajo Nation and its settlement. Subsections 10603(h) and (i) provide:

(h) NO PRECEDENT - Nothing in this Act shall be construed as authorizing or establishing a precedent for any type of transfer of Colorado River System water between the Upper Basin and Lower Basin. Nor shall anything in this Act be construed as expanding the Secretary's authority in the Upper Basin.

(i) UNIQUE SITUATION.—Diversions by the Project consistent with this section address critical tribal and non-Indian water supply needs under unique circumstances, which include, among other things—

- (1) the intent to benefit an American Indian tribe;
- (2) the Navajo Nation's location in both the Upper and Lower Basin;
- (3) the intent to address critical Indian water needs in the State of Arizona and Indian and non-Indian water needs in the State of New Mexico;
- (4) the location of the Navajo Nation's capital city of Window Rock in the State of Arizona in close proximity to the border of the State of New Mexico and the pipeline route for the Project;
- (5) the lack of other reasonable options available for developing a firm, sustainable supply of municipal water for the Navajo Nation at Window Rock in the State of Arizona; and
- (6) the limited volume of water to be diverted by the Project to supply municipal uses in the Window Rock area in the State of Arizona.

Finally, the legislation made it clear that there was consensus among the Colorado River Basin States, providing "Congress notes the consensus of the Governors' Representatives on Colorado River Operations of the States that are signatory to the Colorado River Compact regarding the diversions authorized for the Project under this section."

Law of the River Conflicts

Ultimately, the language reflected a compromise that recognized the need for the Navajo Nation to secure a reliable source of drinking water for its members, while at the same time preserving the non-Indian parties' strict interpretation of the Law of the River. It also demonstrated that any Indian water settlement that is perceived to be in conflict with the Law of the River will draw the close attention of every basin state and will likely require a creative solution.

CONCLUSION

Congressional Approval

So what does this mean for future settlements that impact the Colorado River, such as the Arizona-Navajo settlement? It has two major implications. First, any interbasin transfers such as would be made possible by the proposed WNP will likely require congressional authorization. Second, because Indian water settlements must be approved by Congress, it means, as a practical matter, that each Colorado River Basin state will have to approve of the transfer. Indeed, it is unlikely that the congressional delegation of any Colorado River Basin state would allow legislation to move through Congress if its water users oppose the legislation.

Ultimately, whether the WNP ultimately is built will depend more on whether there is sufficient federal funding for the pipeline, as opposed to the "Law of the River" issues. Given the current fiscal climate and the relatively high price tag of the WNP, it seems unlikely that Congress will authorize and fund the project anytime in the near future. Unfortunately, in the meantime, the Navajo Nation will be forced to continue to struggle to meet the drinking water needs of its members.

FOR ADDITIONAL INFORMATION:

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Funding Problems

Ryan Smith is Of Counsel with Brownstein Hyatt Farber Schreck in Washington, DC, where his practice focuses on water law, natural resources litigation, endangered species law, Indian water settlements, and government relations. Mr. Smith previously served as a senior legislative advisor to US Senate Minority Whip, Jon Kyl (R-AZ), on tribal and natural resources issues, including water. Prior to joining Senator Kyl's staff, Ryan was Deputy Counsel for the Arizona Department of Water Resources. There, he represented the State of Arizona in connection with Indian water settlements, Colorado River issues, and surface and groundwater management. Mr. Smith received his undergraduate and law degrees from Arizona State University.

Stormwater Center

WASHINGTON STORMWATER CENTER

PROJECTS UPDATE

by Lisa Rozmyn, Washington Stormwater Center (Puyallup, Washington)

Assistance Approach

Throughout the US, polluted stormwater runoff continues to be a major problem affecting our nation's rivers, lakes, streams and marine waters. Washington State has taken a unique, assistance-oriented approach to help further reduce the adverse environmental impacts associated with stormwater runoff. By providing technical assistance to businesses, municipalities, and citizens, the Washington Stormwater Center is working to protect and improve Washington's waters.

In 2009 several Puget Sound business representatives and organizations joined together to encourage the state legislature to develop an organization that would provide independent, non-regulatory assistance to stormwater permittees. There are hundreds of businesses and municipalities charged with complying with complex sets of permit requirements, and their need for assistance was evident.

Legislation

The charge to create the Washington Stormwater Center came with the passage of House Bill 2222 in the 2009 legislative session. The bill, since codified in RCW 90.48.545, provides for the Washington Department of Ecology (Ecology) to establish "a storm water technical resource center in partnership with a university, nonprofit organization, or other public or private entity to provide tools for storm water management." *See also Stark, TWR #99*

December 9, 2010 marked the official establishment of the Washington Stormwater Center (WSC). Created as a university center of Washington State University, located on the Puyallup campus, the Center is a joint venture with the University of Washington, Tacoma Center for Urban Waters.

The following is an overview and update of the current projects being undertaken by WSC. More detailed information, as well as documents, videos, and educational materials, can be found at: www.wastormwatercenter.org

THE WASHINGTON STORMWATER CENTER

WSC Focus Areas

WSC is divided into four areas of stormwater management focus: Business Resource Program; Municipal Resource Program; Emerging Stormwater Treatment Technologies; and Low Impact Development Research. Although separate, the four programs work together to provide the efficient and effective stormwater assistance statewide, and to carry out WSC's mission:

To protect Washington's waters through improvements in stormwater management, serving as the central resource in Washington for integrated NPDES education, permit technical assistance, stormwater management and new technology research, development, and evaluation.

Below is an update of what's happening in each program.

Business Resource Program

Launched in April, 2012, WSC's Business Resource Program strives to provide businesses of all sizes and types with valuable, real world stormwater management solutions. With help from an advisory committee made up of representatives from business and state and local government, WSC crafted a work plan based on real world needs of business struggling with stormwater management requirements. Business Resource Program work includes:

- On-site assistance to National Pollutant Discharge Elimination Program (NPDES) stormwater permittees
- Webinars and web tutorials on pertinent stormwater topics
- Videos on innovative stormwater treatment Best Management Practices (BMPs)
- Educational materials and programs for businesses
- Compliance assistance resources for Industrial, Boatyard, Construction, and Sand and Gravel General stormwater permittees.

Business Solutions

Stormwater Center

Municipal Assistance

Technology Approvals

Municipal Resource Program

The Municipal Resource Program assists municipalities throughout Washington with the elements of the Phase I and Phase II Municipal Stormwater NPDES permits. The following listed projects are all underway and many will be completed by June 2013.

Municipal Resource Program projects include:

- Illicit Discharge Detection and Elimination (IDDE) Manual — a guide for municipalities on a range of approaches for a successful IDDE Program
- Vacuum Truck Decant Facility Map — this project is in collaboration with King County and will help municipalities make their operation and maintenance programs more efficient by showing where they can decant their waste water from catch basin cleaning
- Eastern Washington LID Manual — a guide for Eastern Washington cities, counties, and citizens focusing on the climate, soils, and appropriate uses and installations of LID in their communities
- Stormwater Encyclopedia — building on the work of the Puget Sound Institute's *The Encyclopedia of Puget Sound*, this project brings together resources, ideas, and educational information from around the state, to assist business and municipalities and prevent overlap and recreating of efforts
- Statewide assessment of priority NPDES permittee needs and challenges for the upcoming permit terms, in order to identify and begin preparation of the next set of useful stormwater tools and resources for municipalities.

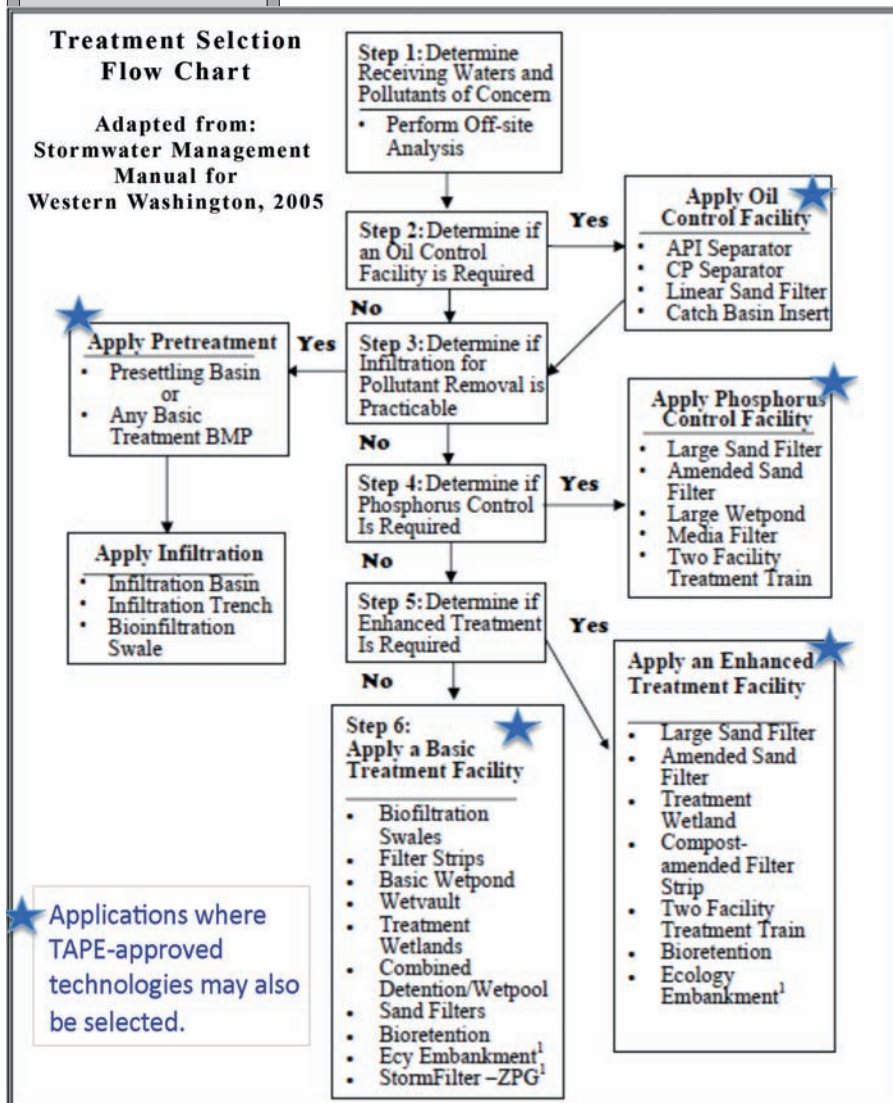
Emerging Stormwater Treatment Technologies Program (TAPE)

The Technology Assessment Protocol – Ecology (TAPE) program is the Washington State Department of Ecology's (Ecology) process for evaluating and approving emerging stormwater treatment technologies. New stormwater treatment technologies and systems that are not in the current Ecology Stormwater Manual

must be certified through the TAPE program before they can be used for treatment of stormwater in development and redevelopment projects in Washington State. Most technologies that apply to the TAPE program are manufactured devices that are developed and sold by private vendors. However, other emerging treatment devices and approaches can also go through the TAPE program — for example, the Washington State Department of Transportation's Media Filter Drain. Treatment technologies certified via TAPE meet state-required pollutant control for one or more of the following categories: Basic and Pretreatment (total suspended solids); Enhanced (dissolved copper and zinc); Phosphorus; and Oil.

In May 2008 the TAPE program was closed due to budget and staffing constraints. WSC worked with Ecology to revise the application process and restart the TAPE program in January 2011. WSC continues to partner with Ecology to implement the TAPE program. WSC coordinates and reviews applications, sampling plans, and technical reports that are submitted to Ecology. WSC also manages reviews by a board of national stormwater experts, compiles comments, and makes recommendations to Ecology on whether a device should be approved.

Since the TAPE program re-opened in 2011, three treatment technologies have been fully approved. Currently, 16 other treatment technologies are active in the TAPE program in various stages of application, testing, or review.



Stormwater Center

LID Requirements

LID Training Plan

Research Program

Annual Review

Low Impact Development Program

The Low Impact Development (LID) Program continues to be a major focus for WSC, and Washington State University as a whole. The updated Municipal NPDES Stormwater Permits, effective in June 2013, introduce new sections for both Phase I and Phase II jurisdictions generally requiring that LID, or Green Stormwater Infrastructure (GSI), be considered first, and used where feasible, for stormwater management at most new development and redevelopment projects. In addition, municipal codes, land use code, and construction permitting language and inspection approaches must all be changed to incorporate new LID permit requirements. Many local jurisdictions are scrambling to make headway toward these new compliance goals.

To assist in this new process, WSC is working with Ecology and others to prepare a state wide LID training plan aimed at helping affected jurisdictions meet these goals. Surveys were conducted in the autumn of 2012 to target the training on what is needed most by cities and counties. The information gathered by the surveys is being used to prepare and prioritize elements of the training plan, which will be completed in June 2013.

Additional to the training, WSC is working on the following LID-related projects:

- LID Cost Analysis — an examination of the cost implications of the new Low Impact Development (LID) stormwater requirements
- LID Operation and Maintenance Manual — this manual is greatly needed, especially in light of the new NPDES requirements
- LID workshops — these popular and informative workshops will be held in the spring, 2013
- On-line LID Certification Program

Low Impact Development – Research Update

Washington State University Puyallup's LID Research Program is one of the largest installations in the nation focusing on the rapidly expanding field of LID and GSI, and offers the unique capability to conduct long-term research on full-scale, replicated bioretention and permeable pavement facilities — including: mesocosms (described below); rain gardens; permeable concrete; and porous asphalt.

The LID program has several objectives, including:

- Demonstration and education for conveying LID stormwater management principles
- Long-term research examining both flow control and water quality treatment capabilities of permeable pavements and bioretention systems
- Evaluation and optimization of the flow control and water quality treatment characteristics of LID management practices
- Evaluation of the ability of LID practices to directly reduce or eliminate the impacts of stormwater pollutants on aquatic organisms
- Dissemination of research data and design experience to stormwater designers and managers through various venues including the web, technical journals and manuals, annual reviews, and workshops.

The first LID annual review was held in August of 2012. This two-day event signaled the end of the first year of sampling and data collection for the research program. In addition to presenting preliminary findings from that first year, LID experts from around Washington, as well as Australia, presented their research.



Collecting Highway Runoff



Soil Columns at WSC Filter Highway Runoff to Assess Rain Garden Efficacy

Stormwater Center

LID Review

Highlights from this well-attended LID review included:

- Bioretention media column study research results
- Function of bioretention facilities in Australia — 10 years after initial installation
- Nutrient removal performance of bioretention
- Urban runoff ecotoxicology research

In the fall of 2012, the LID program began its second year of sampling and data collection. This year's focus is on a full-scale porous asphalt parking lot and the mesocosm installation.



Stormwater created and/or harvested on-site is applied to test soils in the round white mesocosms which infiltrate the soil and channel to the white collection boxes below.

Twenty pilot-scale mesocosms at the research center test the pollutant removal capability of bioretention soil mixes. The mesocosms are plastic tanks approximately two meters in diameter and 1.25 meters tall. Five different bioretention soil mixtures (four replications each) are planted with the same plant palette — slough sedge (*Carex obnata*), red osier dogwood (*Cornus sericea*), and red switch grass (*Panicum virgatum*).

For the porous asphalt parking lot study, some of the specific assessments include:

- How well are typical road and parking pollutants filtered at various levels under the pavement?
- What is the long-term pollutant accumulation in soils beneath permeable pavement?
- How do infiltration rates compare between maintained and un-maintained sections?
- What is the stormwater volume reduction on soils with poor infiltration rates?



Staged permeable pavement installation showing different sub-surface aggregate levels.

Stormwater Center

Soil & Plant Filters

Lisa Rozmyn is the Business Resource Program Manager for the Washington Stormwater Center. Lisa works with businesses throughout Washington State to assist them with stormwater permitting compliance, education and technical assistance. Through webinars, workshops, videos and facility visits, Lisa helps businesses to properly manage, control and reduce surface water pollution. Lisa earned a B.S. in Environmental Science from the Evergreen State College. Prior to joining the Center, Lisa was with the Washington State Department of Ecology for 17 years working in a variety of hazardous waste, pollution prevention and water quality capacities.

Both the permeable pavement installations and the mesocosm facilities test runoff from their surrounding areas during “natural” storms. In addition, they have the capability of accepting stormwater that has been “dosed” with known quantities of pollutants. This allows the research team to evaluate pollutant removal at each of these facilities. This work will begin in the near future.

As part of the Washington Stormwater Center’s LID research now underway at the Washington State University (WSU) Puyallup Research and Extension site, a science team, led by Jenifer McIntyre, is exploring the use of LID soils and plants to filter stormwater runoff. The team is a joint collaboration between WSU, the US Department of Fish and Wildlife, the National Oceanic and Atmospheric Administration and the US Environmental Protection Agency. Dr. McIntyre is a postdoctoral research associate at WSU Puyallup. When finished, results of this study will be disseminated to the scientific community and the public through a series of reports, peer-reviewed papers, the Washington Stormwater Center website, and LID annual reviews held at WSU Puyallup. The results will give valuable data on the effectiveness of the most widely used LID technique (bioretention) to improve water quality and protect receiving waters.

CONCLUSION

Although still a fledgling organization, the Washington Stormwater Center is positioned to make great strides toward helping protect Washington State water resources and more generally providing the stormwater management community with reliable information on the “state of the art.” Our team of experts has a collective knowledge base that allows for flexible and varied projects aimed at cleaner water, improved habitat, and economic health.

FOR ADDITIONAL INFORMATION:

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Washington Stormwater Center website: www.wastormwatercenter.org

Recent Washington Stormwater Center News Story:

In a report by Oregon Public Broadcasting on October 17, 2012, the work at the Washington Stormwater Center was highlighted in an interview with Dr. McIntyre.

The article and associated video story can be found at:

<http://earthfix.opb.org/water/article/drained-how-we-got-into-such-a-mess-with-stormwater/>



Monitoring a stormwater outfall in Puget Sound

Small MS4s

NPDES
Stormwater
Program"Phase II"
PermitsExpanded
ProgramExpanded
DirectivesMonitoring
RequirementsUpcoming
GuidanceDaunting
Details

CALIFORNIA SMALL MS4 REGULATION

STATE ADOPTS NEW STORMWATER REGULATIONS - EXPANDS PROGRAM

by Wendy Manley, Wendel, Rosen, Black & Dean LLP (Oakland, California)

Editors' Introduction: In 1990, the US Environmental Protection Agency (EPA) promulgated rules establishing the National Pollutant Discharge Elimination System (NPDES) stormwater program. This program included a phased-in approach for regulating Municipal Separate Storm Sewer Systems (MS4s) — i.e., publicly-owned conveyances (i.e., ditches, curbs, catch basins, underground pipes, etc.) that are designed or used for collecting or conveying stormwater and that discharges to surface waters. MS4s may be operated by municipalities, counties, drainage districts, colleges, military bases, or prisons, to name a few examples. The Phase I program for MS4s requires operators of "medium" and "large" MS4s (generally, those that serve populations of 100,000 or greater) to implement a stormwater management program as a means to control polluted discharges to surface waters. The Stormwater Phase II Rule extends coverage of the NPDES stormwater program to certain "small" MS4s in urban areas.

In all but four States (Idaho, Massachusetts, New Hampshire, and New Mexico) implementation of the stormwater program is carried out by EPA-authorized State agencies. Each iteration of program rules has resulted in increased regulatory stringency (see Bryden, *TWR* #98 & Hardebeck, et al., *TWR* #108).

California's New Permits for Small MS4s

On February 5, 2013, California's State Water Resources Control Board (SWRCB) adopted a new stormwater permit regulating small entities that own or operate their own storm drain system. *The Waste Discharge Requirements for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems* (MGP) regulates traditional municipal systems and "non-traditional" entities like: prisons; fairgrounds; ports; university campuses; parks; and hospitals. The new MGP is only the second generation "Phase II" permit in California regulating Municipal Separate Storm Sewer Systems (MS4s) serving populations of under 100,000. The first was adopted in 2003. Larger MS4s in California have been subject to regulation under "Phase I" since 1992.

Over 200 entities will be subject to this permit for the first time, which will double the total permittee count. Two-thirds of these new permittees are non-traditional MS4s. While many non-traditional MS4s were dropped from the old MGP designation list (mostly school districts who were never directed to apply for coverage), the proportion of non-traditional permittees will increase from 8% to nearly 40% of all MGP permittees.

The new MGP differs from the existing MGP in a number of ways, most notably for its far more prescriptive nature and detail. Under the old MGP, permittees were required to describe their program in a "Storm Water Management Plan" (SWMP) in accordance with directives that filled barely five pages of the permit. Now, the baseline substantive requirements extend to nearly 60 pages for traditional MS4s and over 30 pages for non-traditional MS4s. When revisions made during the adoption hearing and proposed on the change sheet are incorporated, the final MGP will be posted on the SWRCB's Phase II webpage: www.waterboards.ca.gov/water_issues/programs/stormwater/municipal.shtml.

In addition to the standard six minimum control measures, there are explicit requirements for: program management; program effectiveness and improvement; and monitoring. The particular monitoring requirements depend on whether discharge is to an Area of Special Biological Significance, waters where a Total Maximum Daily Load (TMDL) applies, or water quality impaired "303(d) listed" waters. For the first time, TMDLs are incorporated into the permit, and Regional Boards are on a schedule to review TMDL-specific requirements for urban runoff with an eye toward clarifying waste load allocations. Finally, with the details in the permit itself, the SWMP is no longer the program centerpiece and its requirement has been eliminated. Program management will be described in a less formal "guidance document" — a template for which agency staff have promised in the upcoming months.

The amount of detail in the MGP is daunting.

A few examples include:

- public education programs must include specific messages to specific audiences
 - construction contract language must be revised to expressly require compliance with the Construction General Permit
 - catch basins must be prioritized for cleaning based on five specified criteria
 - a "database or equivalent tabular format" with eight specified categories of information shall be used to record maintenance of treatment facilities.
- Clearly, carefully maintained record keeping systems will be necessary

Small MS4s**Flexibility
Loss****Watershed
Management
Zones****Immediate
Violation Issue**

For permittees, a more detailed, prescriptive permit provides greater certainty of what exactly is required, albeit with a loss of flexibility to tailor a program to local considerations. This could be a challenge to non-traditional entities with unique situations not contemplated by permit writers. For California's Regional Water Boards, the more prescriptive approach eases some of the administrative burden of permit enrollment. The agency will no longer review and approve individual SWMPs, as it did under the old MGP following the 2003 Ninth Circuit decision in *EDC v. EPA*, 344 F.3d 832 (2003). By July 1, 2013, all regulated MS4s must submit a Notice of Intent (NOI), fee, guidance document and map, and permit coverage will commence immediately. There will be no further enrollment delays such as occurred for the many non-traditional MS4s who were never directed to apply, or whose applications never received agency approval.

Looking to the future, the MGP Post Construction requirements include both Low Impact Development (LID) design standards and hydromodification measures. As Regional Water Boards establish Watershed Management Zones, local watershed-based criteria for runoff retention and hydromodification will be applicable, either upon Regional Board direction, or in the next permit.

CONCLUSION

The new MGP brings to a close a lengthy process in which State Water Board staff conferred with stakeholders on numerous occasions over several years as it drafted, redrafted and revised the permit. During the adoption hearing, many speakers from both the environmental and regulated communities expressed their appreciation.

Prospective permittees left the hearing, however, with gnawing concerns about the standard Receiving Water Limitation language, which places permittees in immediate violation of the permit upon exceedance of a water quality standard. As became clear following the Ninth Circuit Court of Appeal's decision in *NRDC v. County of Los Angeles*, (2011) 673 F.3d 880, the iterative process required by California stormwater permits provides permittees no opportunity to address an exceedance before facing enforcement (the US Supreme Court reversed the Ninth Circuit on other grounds and remanded the case January 8, 2013. *L.A. Flood Control Dist. v. NRDC*, (2013) 568 U.S. ____). In this respect, California permits stand apart from permits of other states. The State Water Board assured permittees it would be considering the issue.

FOR ADDITIONAL INFORMATION:

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Wendy Manley is an environmental attorney at the Oakland, California law firm Wendel, Rosen, Black & Dean LLP, where her practice focuses on environmental permitting, compliance counseling and litigation for both public and private parties. Her experience with water quality issues encompasses matters under the federal Clean Water Act, as well as state statutes, with particular emphasis on stormwater regulation, permitting, compliance and enforcement. She has handled issues involving National Pollutant Discharge Elimination System permits, state Waste Discharge Requirements, citizen suits, wetlands delineation, endangered species, federal and state environmental review, contamination remediation and cost recovery and California's Proposition 65. Wendy has a science background that includes laboratory and field research, having received a Masters in Marine Biology from the University of Oregon in addition to a B.S. in Biology. She is a graduate of the Northwestern School of Law at Lewis and Clark College in Portland, Oregon, where she received a Certificate in Environmental and Natural Resources Law.

Umatilla Basin

Aquifer Restoration

Depleted Groundwater



UMATILLA BASIN AQUIFER RESTORATION PROJECT



NEW MANAGEMENT MODEL AT THE CROSSROADS

by Martha Pagel, Schwabe, Williamson & Wyatt (Salem, OR)

INTRODUCTION

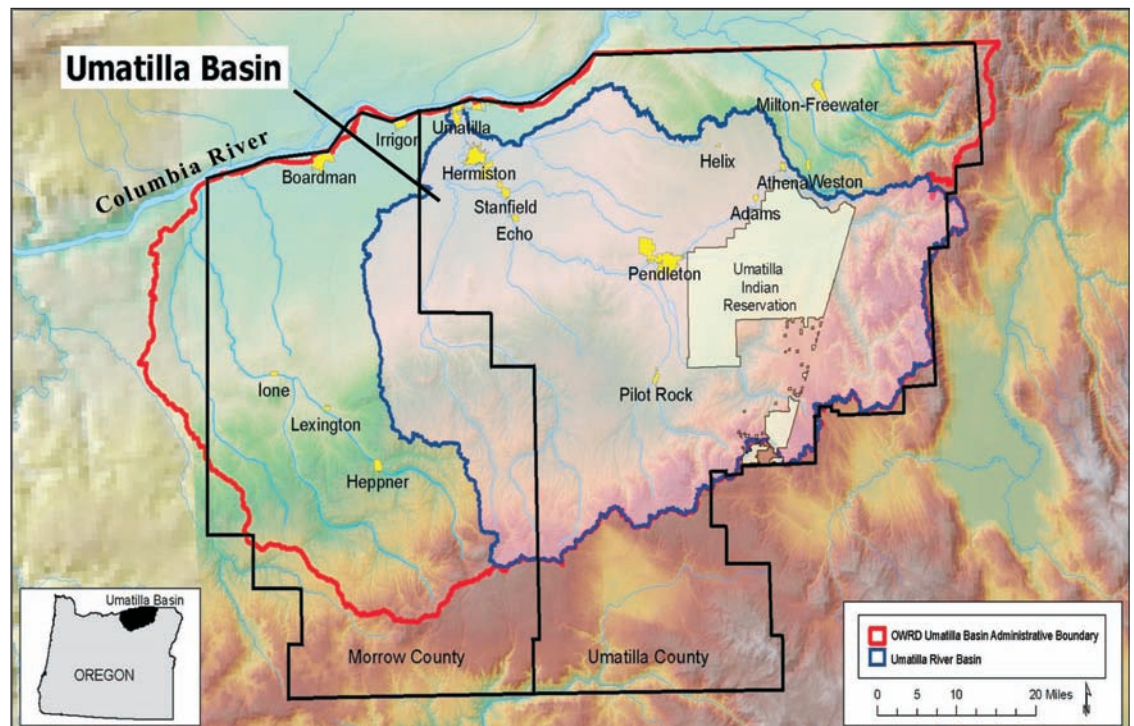
To be or not to be — that is the question facing the Umatilla Basin Water Commission.

The Umatilla Basin Water Commission (Commission) was formed in late 2009 to provide a locally-based governance structure for receiving State of Oregon grant funds and continuing the area's aquifer restoration efforts. Parties to this unique intergovernmental entity included Umatilla and Morrow counties, Westland Irrigation District, and the Confederated Tribes of the Umatilla Reservation (CTUIR). The Commission was the first — and to date only — example of a new entity comprised of local and tribal governments for the development of a joint water project. *See Pagel, New Model for Water Management, The Umatilla Basin Water Commission, TWR #87, May 15, 2011.*

After three years of operation, the Commission is at a critical juncture with respect to its goal of increasing the water supply for meeting economic and environmental needs in eastern Oregon's Umatilla Basin. As it nears completion of initial "Stage 1" operations, the Commission must now decide whether to continue in its current form, reconstitute itself to serve a different role in the basin, or dissolve itself and hand over the Umatilla Basin Restoration Project (Project) and related water management responsibilities to some other entity. The answer is a work in progress.

BACKGROUND

Oregon's Umatilla Basin holds the dubious distinction of being home to four of the State's six officially-designated "critical ground water areas." Parts of the basin have experienced ground water declines of more than 500 feet, and water rights authorizing irrigation of more than 120,000 acres from the depleted ground water sources are curtailed each year under the critical ground water area restrictions. Surface waters in the basin suffer from historically-diminished in-stream flows and increased temperatures that have contributed to a loss of habitat for fish and aquatic resources. At the same time, the Umatilla River and tributaries are the source of water for tribal reserved water right claims held by CTUIR. As a result of these conditions, the basin was targeted as a pilot program for State funding to assist with developing and implementing a long-term, locally-based plan for water supply development.



This article is based on materials presented at the 21st Annual Oregon Water Law Conference held November 8-9, 2012, in Portland, Oregon, by The Seminar Group.

Umatilla Basin

Storage Project

The Coalition

Uncertain Future

Optimizing Recharge

An initial feasibility assessment of options for aquifer restoration was conducted in 2008-2009 under supervision of the Oregon Water Resources Department. See Amali, *Aquifer Recharge and Recovery, Assessing Potential in the Umatilla Basin*, TWR #60, February 15, 2009. As a next step, in 2009, the Oregon Legislative Assembly approved House Bill (HB) 3369 (2009 Or Laws Ch 907), which, in part, authorized a new grant program to fund a “critical ground water storage project” in the Umatilla Basin.

The Commission’s initial priority was to break ground on the aquifer restoration project. From its outset, however, the Commission also foresaw the potential need for a broader role in developing or managing other water projects and transactions to fully address water supply and restoration needs within the basin.

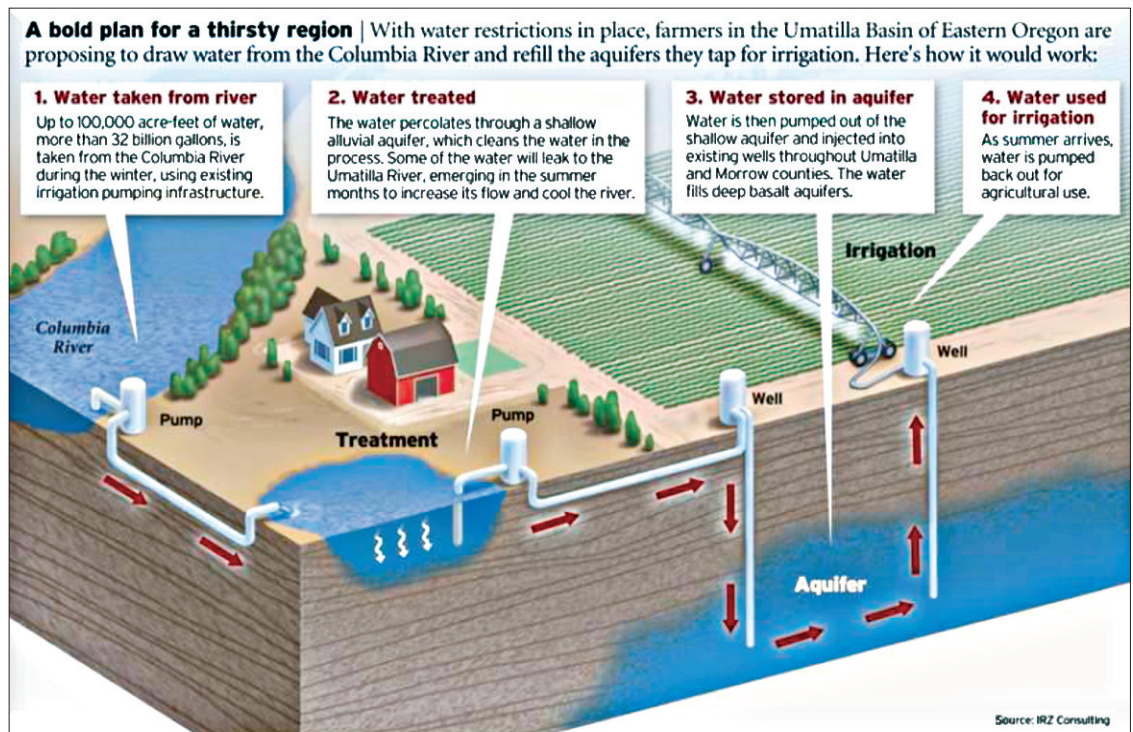
Although the Commission serves as the official, public entity authorized to receive the State grant funds, it works closely with a broader-based group of local stakeholders known as the “Coalition.” The Coalition includes: representatives from public entities such as the affected local governments and irrigation districts; landowners and private irrigators; food processing and agri-business interests; the local business community; CTUIR; and interested citizens. As such, it offers a framework for community input and guidance for the Commission in operating the Project and developing a long-term plan for meeting basin water needs.

A \$2.5 million grant was awarded in 2010, under the program created in HB 3369, to fund start-up work in forming the Commission, implementing initial operations to recharge up to 10,000 acre-feet of water, and developing recommendations for long term Project operations. After three years of operations, the Commission is now unsure of its future.

INTERIM REPORT – WHAT THE COMMISSION LEARNED

In a July, 2012 “Interim Report” to the Oregon Water Resources Department (OWRD), the Commission noted that it has “made great progress over the last two years in the development, operation and monitoring of Stage 1 of the [Project].” However, the Commission also acknowledged that — as more information has become available — it has had to “adapt” in order to “find the best way to optimize the potential of recharge for our water needs and to find ways to satisfy those water needs that cannot be met by the recharge project water alone.” The Interim Report also made clear the Commission does not intend to apply for additional State funding under HB 3369 to continue developing the Project beyond Stage 1.

The Commission’s change of heart, and direction, was necessitated by a combination of factors cited in the Interim Report.



<div data-bbox="151 178 306 262">Umatilla Basin</div> <div data-bbox="128 336 331 371">Interim Report</div> <div data-bbox="170 546 285 581">Options</div> <div data-bbox="151 963 308 1029">Physical Limitations</div> <div data-bbox="134 1245 324 1312">Water Supply Projects</div> <div data-bbox="128 1593 331 1659">Environmental Benefits</div> <div data-bbox="141 1837 318 1904">Net Benefit Requirement</div>	<p>The Interim Report included:</p> <ol style="list-style-type: none"> 1) A determination that key factual assumptions from the Project's original feasibility study may not reflect actual recharge and discharge characteristics of the target aquifer; 2) A determination that the Project as originally envisioned is not likely to generate the quantity and types of environmental benefits contemplated in the feasibility study and required for funding under HB 3369; 3) A determination that certain provisions of HB 3369 are unclear and unworkable for the Project; and 4) A determination that long-term operations of an aquifer restoration project may need to occur within the framework of a broader water management plan for the Umatilla Sub-basin to achieve the Commission's goals of ground water restoration, streamflow restoration, and increased water supply and certainty for the basin. <p>As a result of these findings, the Commission concluded it will need additional time and information to make final recommendations concerning long-term operations of the Project within the context of a broader water management plan for the basin. More recently, the Commission's thoughts have turned toward the option of dissolving the public entity and re-forming as a private non-profit to provide for broader representation and participation in the process. Another variation would be to limit the Commission's responsibilities to operation of a small-scale aquifer recharge project while working with a new non-profit to refine and implement a broader vision of water management for the basin.</p> <p style="text-align: center;">WHAT WENT WRONG?</p> <p>As described more thoroughly in the Interim Report, the Commission's concerns about its future operations and the need for additional time to explore options stemmed from a combination of new factual information about the physical characteristics and performance of the recharge effort, along with legal and policy uncertainty associated with HB 3369. <i>See HB 3369 Interim Report</i>, filed with the OWRD July 3, 2012.</p> <p>As a result of its start-up operations and continuing feasibility investigation, the Commission has learned there is a limited physical capacity for recharge in the target area — only about 25,000 acre-feet as contrasted with initial estimates of 100,000 acre-feet or more. Additionally: practical and economically feasible access to the recharge water is limited; pumping and distribution costs to move the stored water to irrigation fields will be higher than expected; and Project monitoring requirements are extensive and expensive; and new modeling will be needed to meet HB 3369 demands.</p> <p>In addition to confronting these new facts and physical limitations of the Project, the Commission has grappled with attempting to understand and apply the legal and policy directives in HB 3369. Although the Commission is the first and only recipient of grant or loan funds under the programs created by HB 3369, it was not alone in identifying problems with the 2009 legislation. General concerns were raised soon after enactment of HB 3369 by irrigators and agricultural interests who questioned whether the program would ever be utilized outside the Umatilla Basin. Those concerns were reiterated in an "Oregon Solutions" process jointly convened by the Governor and Umatilla County in 2012 for the purpose of evaluating Columbia and Umatilla River water development options. As an outgrowth of that effort, the Governor's office and OWRD recently formed a "Water Policy Work Group" to review the current program and develop recommendations for changes to HB 3369 or replacement legislation that would provide a more workable framework for funding water supply projects.</p> <p>Specific Concerns with HB 3369:</p> <p>Net Environmental Benefits from "New Stored Water"</p> <p>One of the key limitations of HB 3369 is that in both Section 17, applying only to the Umatilla Basin project, and other sections of the bill for loans and grants elsewhere in the Columbia Basin, the law requires that 25% of the "new stored water" be dedicated to providing "net environmental public benefits or in-stream benefits." These provisions have led to two separate lines of concern among potential project developers: first, whether a 25% reserve for environmental purposes will be economically feasible for most projects, and second — of more immediate concern to the Umatilla effort — whether it makes sense to limit the source of water dedicated for environmental purposes to the "new stored water" created by the Project.</p> <p>For grant projects such as the Commission's aquifer recharge effort, the underlying requirement to provide for a net environmental benefit is certainly understandable — if projects are to receive significant public funding, it seems reasonable that they should provide some level of public benefits. Indeed, by accepting the HB 3369 grant funds, the Commission agreed to provide the full 25% required for net environmental public benefits and it has never wavered from that commitment. The Commission has since learned, however, that the specific wording of HB 3369 that requires dedication of the "new stored water" unduly limits the stakeholders' ability to consider strategies and actions that that may be more beneficial and cost effective for meeting environmental objectives than simply leaving 25% of the recharge water</p>
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<div data-bbox="154 178 308 262">Umatilla Basin</div> <div data-bbox="154 294 308 367">Inflexible Legislation</div> <div data-bbox="154 577 308 651">Flexibility Options</div> <div data-bbox="138 787 324 861">Percentage Requirement</div> <div data-bbox="121 1060 341 1134">Sliding Benefit Scale</div> <div data-bbox="146 1522 316 1596">Language Imprecision</div> <div data-bbox="121 1732 341 1911">Environmental Benefit v. In-Stream Benefit</div>	<p>underground. To be clear, the Commission fully intends that its final water management plan will provide measurable environmental benefits in an amount equal to the 25% requirement.</p> <p>One alternative the Commission has considered for its Stage 1 operations would be to dedicate a quantity of water for environmental benefits that is equal to a specified percentage of the new storage created by the project without requiring that the source of such benefits be the “new stored water” itself. For example, if the aquifer recharge project stored 10,000 acre-feet of water per year, the total amount of water to be made available for net environmental benefit would be 2,500 acre feet per year. Under this approach, the “environmental benefit” amount could be delivered either by leaving that portion of the total recharge water under ground for aquifer restoration purposes (as is currently required under HB 3369) or, <i>alternatively</i>, by providing all or any portion of the 2,500 acre-foot obligation from other sources. Other sources might include purchasing existing surface water rights from the Umatilla River that could be transferred to in-stream flow rights, or purchasing water from existing surface water storage — such as McKay Reservoir — that could be released and protected as in-stream flow in the Umatilla River. The surface water sources could offer a more effective tool for meeting the environmental goal of restoring in-stream flow in the Umatilla River because they can be more easily measured and monitored. Releases from surface storage offer additional flexibility in timing the storage releases to best meet fish habitat needs.</p> <p>The separate concern as to whether 25% is the right amount of “net environmental public benefit” that should be required for all projects is currently under review by the Water Policy Task Force formed by OWRD and the Governor’s office. The Group is also considering whether grants and loans should be treated differently with respect to public benefit requirements.</p> <p>Sliding Scale</p> <p>Another issue of concern to the Commission is the potential that it may be required to dedicate substantially more than 25% of the Project water for net environmental benefits. This concern stems from a lack of clarity between two key subsections of the law: Section 17(3) describes the net environmental benefit requirement for “aquifer recharge” (AR) projects, such as the Stage 1 operations of the Commission’s Project. That subsection states: “Except as provided in subsection (4) of this section” an aquifer recharge project must be designed to provide that no more than 75% of the new stored water may be withdrawn and not less than 25% of the new water is to be dedicated to net environmental benefits or in-stream benefits. Section 17(4) applies to “aquifer storage and recovery” (ASR) projects and creates a sliding scale for the amount of net environmental public benefit required. Specifically, if more than 25% of the funding for an ASR project is from grants of State monies, the project must dedicate a percentage of the new stored water to net environmental benefits that equals or exceeds the percentage of grant funding.</p> <p>OWRD has advised the Commission that it interprets these two sections of HB 3369 to impose the sliding scale on both AR and ASR projects. Because the cost of an AR project is considerably less by comparison to an ASR project, the \$2.5 million in grant funds already received by the UBWC represents substantially more than 25% of the potential Project costs. As a result, if this wording is not limited to only ASR projects, the Commission would be at risk of having to dedicate almost the entire amount of the AR storage project to environmental purposes if it accepts any additional State funding for the Project.</p> <p>Additional “Net” Environmental Public Benefits</p> <p>HB 3369 is also unclear as to whether the requirement to provide a “net” environmental public benefit “and” in-stream benefits in order to qualify for loan funding would be fully satisfied by dedicating 25% of the new stored water. The problem stems from a lack of precision in various sections of HB 3369 that describe the net environmental benefits and in-stream requirements. Section 17, for example, requires at least 25% of the “new stored water” to be dedicated to net environmental public benefits or in-stream purposes, while other sections of the bill seem to require a separate analysis by OWRD as to whether the project will result in “a” net environmental benefit “and” in-stream benefits. The law does not provide further direction as to the amount of ecological improvement that would be necessary to constitute a net environmental benefit, and does not explain the apparent disconnect between Section 17’s direction to provide for net environmental public benefits “or” in-stream benefits. OWRD has stated its own understanding that the requirement of providing a “net” benefit would be automatically satisfied by the act of dedicating 25% of the new stored water for such purposes. But, this outcome is not clearly stated in HB 3369. Similarly, it is not clear whether and how OWRD would make a separate finding relating to “in-stream” benefit that would be distinguished from the more general determination of “net environmental public benefit.”</p> <p>In other words, the law could be construed to require an additional amount of water or other types of mitigation measures to demonstrate both a net environmental benefit <i>and</i> in-stream benefit. The Commission has asked that this concern be addressed by clarifying that an applicant for loan or grant funds may satisfy the net environmental public benefit requirement by providing an amount of water for environmental purposes equal to 25% of the total storage project without the need for further studies or evaluation.</p>
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Umatilla Basin

Funding Dilemmas

Clarification Sought

Legal & Policy Questions

Additional Funding for Continued Feasibility Work

Finally, the Commission has identified a unique need for changes in Section 17 of HB 3369 that would allow the Commission to accept additional State funding for completion of the Stage 1 Project assessment and planning work that has been started under the current grant award. As described in the Commission's Interim Report, for a number of reasons, the Commission is not yet ready to define a final scope and operations plan for the Project. Additional grants or other State funding that the Commission may be able to secure would help continue monitoring and feasibility assessments leading to a final Project plan. However, under the current wording of HB 3369, if the Commission accepts any amount of additional grant or loan funds, the Commission would be committed to build and operate the Project and to dedicate at least 25% of the new stored water for environmental purposes. The amount dedicated to environmental purposes would be substantially higher if the "sliding scale" discussed above is applied.

COMMISSION OPTIONS

These legal and policy questions associated with HB 3369 create more risk than the Commission is willing or able to accept. As a result, the Commission has advised OWRD that it is not planning to seek additional State funding, and may not continue with further Project development unless or until the questions are addressed.

As an alternative, the Commission is considering options to limit the scope of the Project to the small-scale recharge operations that have occurred to date and to work with the broader group of stakeholders involved in the Coalition to form a private non-profit entity that would take on other water development projects or water management functions originally contemplated for the Commission.

WHAT'S AHEAD?

Providing a stable and effective source of funding for new water supply development and improved water management is an important priority for Oregon's future. The Legislative Assembly, the Governor, OWRD and the Oregon Water Resources Commission (OWRD's governing board), the Umatilla Basin Water Commission, and stakeholders throughout the State have all recognized the need to step up Oregon's efforts — particularly in the Columbia Basin — to provide additional storage that can serve both economic development and in-stream restoration purposes.

The pilot effort in the Umatilla Basin has revealed a number of practical, legal and public policy questions associated with the State's current program under HB 3369 that must be addressed to meet this goal. The Umatilla Basin Water Commission must also adapt to new information about the physical characteristics of its recharge project, and the practical limitations of delivering the stored water to potential users in considering the future of the Aquifer Restoration Project. As part of that process, the Commission and Coalition are envisioning new tools that will allow for more effective, cooperative water management within the Basin.

The future picture for the Umatilla Basin may or may not include the Commission, but given the vision, commitment, and investment of local stakeholders, it will surely include some form of innovative place-based effort to meet water supply needs.

FOR ADDITIONAL INFORMATION:

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STORY UPDATE

Abridged February 15 Press Release from Oregon Governor Kitzhaber's Office:

Governor Kitzhaber joined today with members of the Columbia River Umatilla Solutions Taskforce to sign a Declaration of Cooperation on Columbia River-Umatilla Basin water projects. The Declaration outlines specific strategies for storing water for expanded agricultural use, increased economic activity in Eastern Oregon, and improved in-stream conditions for fish.

Taskforce members include irrigators, conservationists, and stakeholders representing local, regional, state, and tribal interests. Governor Kitzhaber formed the group through the Oregon Solutions Network in April 2012, and the group has been working since then to develop consensus recommendations on beneficial water projects in the region.

Their action plan includes developing additional water storage capacity, improving water management, and developing a regional, interstate approach with the State of Washington. The Taskforce has already identified specific projects that increase storage capacity.

For more information: <http://orsolutions.org/osproject/crustaskforce>.

Martha Pagel is a shareholder in the regional law firm of Schwabe, Williamson & Wyatt, where she focuses her practice on water law and natural resources. She also leads the firm's Environment, Energy and Natural Resources Practice Group. She was legal counsel to the Umatilla Basin Water Coalition in drafting the Intergovernmental Agreement to form the Umatilla Basin Water Commission, and she continues to serve as legal counsel to the Commission. From 1992 - 2000, before entering private law practice, she served as Director of the Oregon Water Resources Department and before that as Director of the Oregon Department of State Lands.

DESALINATION ISSUES

Desalination
Issues

Edited/condensed from the Congressional Research Service Report:

Desalination and Membrane Technologies: Federal Research and Adoption Issues (January 8, 2013)

Authored by Nicole Carter, Specialist in Natural Resources Policy, Congressional Research Service

Editor's Note: The following article is an abridged version of the above referenced report. The original 18-page report, produced as an information update for congressional members, is available for download at: www.fas.org/sgp/crs/misc/R40477.pdf

DESALINATION: AN OVERVIEW

Increased Use

In the United States, desalination and membrane technologies are increasingly used to augment municipal water supply, to produce high quality industrial water supplies, and to reclaim contaminated supplies (including from oil and gas development). As of 2005, approximately 2,000 desalination facilities larger than 0.3 million gallons per day (MGD) were operating in the US, with a total capacity of 1,600 MGD which represents more than 2.4% of total US municipal and industrial freshwater use. At issue for Congress is what should be the federal role in supporting desalination and membrane technology research and facilities.

Use
Constraints

Interest in desalination technologies for seawater, brackish water, and contaminated freshwater has increased globally and in the US, as costs have fallen and pressure to develop drought-proof water supplies has grown. Adoption of desalination, however, remains constrained by financial, environmental, regulatory, and social factors. Desalination processes generally treat seawater, brackish water, or impaired waters to produce a stream of freshwater, and a separate, saltier stream of wastewater, often called *waste concentrate* or *brine*. The availability and regulation of disposal options for the waste concentrate can pose issues for desalination's adoption in some locations.

Benefits

Desalination's attractions are that it can create a new source of freshwater from otherwise unusable waters, and that this source may be more dependable and drought-proof than freshwater sources that rely on annual or multi-year precipitation, runoff, and recharge rates. Another significant application of desalination technologies is for treatment of contaminated waters or industrial water or wastewater. Some communities and industries use technologies developed for desalination to produce drinking water that meets federal standards, to treat contaminated water supplies to meet disposal requirements, or to reuse industrial wastewater (e.g., saline waters coproduced from oil and gas development). Many of the technologies developed for desalination also can produce high-quality industrial process water. For many of these applications, there may be few technological substitutes that are equally as effective and reliable as the desalination technologies.

Methods

There are a number of desalination methods. Two processes, thermal (e.g., distillation) and membrane (e.g., reverse osmosis), are the most common, with reverse osmosis dominating in the US. More information on the traditional and emerging desalination technologies appears below.

Costs

Desalination treatment costs have dropped steadily in recent decades, making it more competitive with other water supply augmentation and treatment options. Electricity expenses vary from one-third to one-half of the cost of operating desalination facilities. A rise in electricity prices could reverse the declining trend in desalination costs; similarly, drops in electricity costs (e.g., due to falling costs associated with natural gas-fueled electric generation) improve desalination's competitiveness. Costs and cost uncertainties remain among the most significant challenges to implementing large-scale desalination facilities, especially seawater desalination plants. For instance, a survey of municipal desalination facilities in Texas found the cost for brackish desalination ranged from \$410 to \$847 per acre-foot, and for seawater desalination ranged from \$1,168 to \$1,881 per acre-foot. (Arroyo and Shirazi, *Cost of Water Desalination in Texas*, Texas Water Development Board, Austin, TX, October 2009, see www.twdb.texas.gov/innovativewater/desal/doc/Cost_of_Desalination_in_Texas.pdf). Water produced from proposed seawater desalination facilities in California is estimated to range from \$1,900 to \$3,000 per acre-foot (Cooley and Ajami, *Key Issues for Desalination in California: Cost and Financing*, Pacific Institute, November 2012, see www.pacinst.org/reports/desalination_2013/financing_final_report.pdf).

Energy Needs

Desalinations energy intensity also raises concerns about the greenhouse gas emissions emitted and its usefulness as part of a climate change adaptation strategy. Substantial uncertainty also remains about the environmental impacts of large-scale desalination facilities. Social acceptance and regulatory processes also affect the technologies' adoption and perceived risks. Research and additional full-scale facilities may resolve uncertainties, alleviate concerns, and contribute to cost reductions and options for mitigating environmental impacts.

Desalination Issues

Governments' Roles

To date, the federal government has been involved primarily in research and development, some demonstration projects, and select full-scale facilities (often through congressionally directed spending). The federal government also may support construction of municipal desalination facilities through loans provided to these facilities through the US Environmental Protection Agency's (EPA's) Drinking Water State Revolving Loan Funds. For most municipal desalination facilities, local governments or public water utilities, sometimes with state-level involvement and federal construction loans, have been responsible for planning, testing, building, and operating desalination facilities, similar to their responsibility for treating freshwater drinking water supplies.

Municipal Supply

DESALINATION ADOPTION IN THE UNITED STATES

Desalination and membrane technologies are increasingly investigated and used as an option for meeting municipal and industrial water supply and water treatment demands.

Florida, California, Texas, and Arizona have the greatest installed desalination capacity. Florida dominates the US capacity, with the facility in Tampa being a prime example of large-scale desalination implementation; however, Texas and California are bringing plants online or are in advanced planning stages. Several other efforts also are preliminarily investigating desalination for particular communities, such as Albuquerque. Two-thirds of the US desalination capacity is used for municipal water supply; industry uses about 18% of the total capacity.

Sources

The saline source water that is treated using desalination technologies varies largely on what sources are available near the municipalities and industry with the demand for the water. In the US, only 7% of the existing desalination capacity uses seawater as its source. More than half of US desalinated water is from brackish sources. Another 25% is river water treated for use in industrial facilities, power plants, and some commercial applications. Globally, seawater desalination represents 60% of the installed desalination capacity.

International Interest

While interest in obtaining municipal water from desalination is rising in the US, desalination is expanding most rapidly in other world regions, often in places where other supply augmentation options are limited by geopolitical as well as natural conditions, such as arid conditions with access to seawater. The Middle East, Algeria, Spain, and Australia are leading in the installation of new desalination capacity, with Saudi Arabia and the United Arab Emirates leading in annual production of desalinated water.

Example: San Diego's Desalination Experiences and Lessons

In 1998, just north of San Diego in Carlsbad, California, a private joint venture, Poseidon, initiated its effort to build a 50 MGD seawater desalination facility to sell water to San Diego's water system. In November 2009, Poseidon received all of the permits for the Carlsbad project. In November 2012, the San Diego County Water Authority approved the purchase of the desalinated water for thirty years. The project costs in 2012 were estimated at close to \$1 billion, which represents a significant increase from estimates a decade earlier at \$270 million; the cost for delivered desalinated water from the plant is estimated at \$1,600 per acre-foot. The plant is expected to complete construction and begin water deliveries in 2016. The extended negotiation and approval process illustrated some of the tensions and concerns that arise during private-sector engagement in provision of municipal water. While Poseidon owned a prime location site for a desalination facility, the water authority and public were hesitant about the arrangement because of concern over profit-taking by a private entity engaged in the provision of a public service. After more than a decade, this concern and other concerns (e.g., environmental impacts) were overcome and mitigated. The Poseidon Carlsbad experience has yielded lessons about the public's expectations for transparency and protections when the private sector is involved in desalination or other aspects of public services and infrastructure. Desalination stakeholders are anticipated to continue to watch the Poseidon Carlsbad facility and arrangement for lessons and precedents as implementation proceeds.

Private Sector Involvement

ENERGY CONCERNS & RESPONSES

Reducing Energy Intensity To Reduce Cost Uncertainties

The cost of desalination for municipal water remains a barrier to adoption. Like nearly all new freshwater sources, desalinated water comes at substantially higher costs than existing municipal water sources. Much of the cost for seawater desalination is for the energy required for operations; in particular, the competitiveness of reverse osmosis seawater desalination is highly dependent on the price of electricity. Reverse osmosis pushes water through a membrane to separate the freshwater from the salts; this requires considerable energy input. Currently the typical energy intensity for seawater desalination with energy recovery devices is three-to-seven kilowatt-hours of electricity per cubic meter of water (kWh/m³). The typical energy intensity of brackish desalination is less than seawater desalination, at 0.5-3 kWh/m³, because the energy required for desalination is a function of the salinity of the source water.

Uncertainty in whether electricity prices will rise or fall creates significant uncertainty in the cost of desalinated water. If electricity becomes more expensive, less electricity-intensive water supply options (which may include conservation, water purchases, and changes in water pricing) become comparatively more attractive. Recent drops in natural gas prices and little to no growth in electricity demand has increased the cost competitiveness of existing desalination technologies in recent years.

Desalination Energy Use

Electricity Cost Tie-In

Desalination Issues	<p>Cost-effectively reducing desalination's energy requirements could help reduce overall costs. In recent decades, one of the ways that desalination cost reductions were achieved was through reduced energy requirements of reverse osmosis processes. Now the energy used in the reverse osmosis portion of new desalination facilities is close to the theoretical minimum energy required for separation of the salts from the water. Therefore, although there still is some room for energy efficiency improvements in using desalination as a water supply, dramatic improvements are not likely to be achieved through enhancements to standard reverse osmosis membranes. Instead energy efficiency improvements are more likely to come from other components of desalination facilities, such as: the pretreatment of the water before it enters the reverse osmosis process (pretreatment is necessary in order to avoid fouling and harm to the reverse osmosis membranes); enhanced facility and system design; or the use and development of a new generation of technologies (see below).</p>
Energy Reductions	<p>For example, energy efficiency advances in the non-membrane portions of water systems and the use of energy recovery technologies are reducing energy use per unit of freshwater produced at desalination facilities. Pumps are responsible for more than 40% of total energy costs at a desalination facility. Energy efficiency advances in a type of pump that is useful for smaller applications (called a positive displacement pump) have made desalination more cost-effective for some applications and locations and less sensitive to electricity price increases.</p>
Power Plant Co-location	<p>Emissions Concerns and Renewable Energy Opportunities</p> <p>Desalination's electricity consumption has greenhouse gas and other emissions associated with it if the electricity is generated using fossil fuels. The use of desalination as a climate change adaptation strategy is questioned because of its potential fossil fuel intensity relative to other adaptation and water supply options. Electricity price uncertainty and emissions considerations have driven many desalination proponents to investigate renewable energy supplies and co-location with power plants. A major benefit of co-location is using the cooling water from the power plant for desalination; this water has been warmed by the power plant which reduces the energy requirements for desalinating it. Also, the desalination facility may avoid construction costs by sharing intake and discharge facilities.</p>
Renewable Energy	<p>The extent to which desalination technologies can be coupled with intermittent renewable or geothermal electric generation, use off-peak electricity, and operate in areas of limited electric generation or transmission capacity but with renewable energy resources is increasingly receiving attention. Desalinating more water when wind energy is available (which requires facilities that can operate with a variable water inflow) and storing the treated water for when water is demanded can almost be viewed as a means of electricity storage and reduction of peak demand. Efforts to jointly manage water and energy supply and demand and to integrate renewable energy with desalination may bolster support for desalination.</p>
New Supply Issues	<p>HEALTH & ENVIRONMENTAL CONCERNS</p> <p>From a regulatory, oversight, and monitoring standpoint, desalination as a significant source of water supply is new in the US, which means the health and environmental regulations, guidelines, and policies regarding its use are still being developed. Existing federal, state, and local laws and policies often do not address unique issues raised by desalination. This creates uncertainty for those considering adopting desalination and membrane technologies.</p>
Permitting Requirements	<p>Environmental and human health concerns often are raised in the context of obtaining the permits required to site, construct, and operate the facility and dispose of the waste concentrate. A draft environmental scoping study for a facility in Brownsville, Texas, identified up to 26 permits, approvals, and documentation requirements for construction and operation of a seawater desalination facility. According to the Pacific Institute's report, <i>Desalination, With a Grain of Salt</i>, as many as nine federal, 13 state, and additional local agencies may be involved in the review or approval of a desalination plant in California. For example, during the US Army Corps of Engineers (Corps') process for issuing seawater desalination facility permits for placing structures in waterways and dredging and filling in navigable waters, the US Coast Guard would consult with the Corps on whether an intake facility would be a potential navigation hazard and the National Oceanic and Atmospheric Administration would consult on whether intake facilities and discharge of waste concentrate may affect marine resources. Some of the regulatory hurdles are not particularly onerous; others may be particularly challenging depending on the location and size of the facility. In California in 2012, Assembly Bill 2595 was introduced; it would require California's Ocean Protection Council to create a task force to study how to streamline the state permitting process for seawater desalination facilities. No similar legislation for the federal process has been proposed during the 112th Congress.</p>
Environmental Impacts	<p>Some stakeholders view the current permit process as a barrier to adoption of desalination. Other stakeholders argue that rigorous permitting is necessary because of the potential impact of the facilities on public health and the environment. Particular attention is often paid to the impingement and entrainment of aquatic species by intake structures of coastal and estuarine facilities and the disposal of waste concentrate.</p>
Health Concerns	<p>Evolving Drinking Water Guidelines</p> <p>While the quality of desalinated water is typically very high, some health concerns remain regarding its use as a drinking water supply. The source water used in desalination may introduce biological and</p>

Desalination Issues

Boron Issues

chemical contaminants to drinking water supplies that are hazardous to human health, or desalination may remove minerals essential for human health. For example, boron, which is an uncommon concern for traditional water sources, is a significant constituent of seawater and can also be present in brackish groundwater extracted from aquifers comprised of marine deposits. Boron levels after basic reverse osmosis of seawater commonly exceed current World Health Organization health guidelines and EPA health reference level. Boron is known to cause reproductive and developmental toxicity in animals and irritation of the digestive tract, and it accumulates in plants, which may be a concern for agricultural applications. Boron can be removed through treatment optimization, but at greater cost.

In 2008, EPA determined that it would not develop a maximum contaminant level for boron because of its rare occurrence in most groundwater and surface water drinking water sources; EPA has encouraged affected states to issue guidance or regulations as appropriate. Most states have not issued such guidance. Therefore, most US utilities lack clear guidance on boron levels in drinking water suitable for protecting public health. The National Research Council (NRC) recommended development of boron drinking water guidance to support desalination regulatory and operating decisions.

Other Health Concerns

Similarly, the demineralization (particularly the removal of the essential minerals calcium and magnesium) by desalination processes also can raise health concerns. Another health-related concern is the extent to which microorganisms unique to seawater and algal toxins may pass through reverse osmosis membranes and enter the water supply, and how facilities may need to be operated differently when these organisms and algal toxins are present. How to effectively manage desalination facilities in order to avoid public health treats from algal blooms is an emerging area of interest and research.

Some of the coastal facilities contemplated in the US would treat estuarine water. Estuarine water, which is a brackish mixture of seawater and surface water, has the advantage of lower salinity than seawater. The variability in the quality and constituents in estuarine water, as well as the typical surface water contaminants (e.g., infectious microorganisms, elevated nutrient levels, and pesticides), may complicate compliance of desalinated estuarine water with federal drinking water standards.

Waste Concentrate Disposal

Concentrate Disposal Challenges and Alternatives

For inland brackish desalination, significant constraints on adoption of the technologies are the uncertainties and cost of waste concentrate disposal. For coastal desalination projects, the concentrate management options are often greater because of surface water disposal opportunities.

Land application can include spraying concentrate on salt-tolerant plants or infiltration — typically for small volumes of brackish water concentrate. Evaporation ponds use solar radiation to precipitate salt crystals, which are then harvested and typically disposed; in some cases the salts or other constituents may be beneficially reused. Surface water disposal of waste concentrate is permitted on a project-specific basis based on predicted acute and chronic effects on the environment. Inland surface water disposal is particularly challenging because the limited capacity of inland water bodies to be able to tolerate the concentrate's salinity. For injection purposes, EPA generally classifies waste concentrate as an industrial waste, thus requiring that the concentrate be disposed of in deep wells appropriate for industrial waste. Desalination proponents argue that desalination's concentrate is sufficiently different from most industrial waste that it should be reclassified to increase the surface and injection well disposal opportunities. Some states (e.g., Texas) have made efforts to promote the beneficial use of waste concentrate (e.g., use as liquids in enhanced oil and gas recovery) and facilitate its disposal including land application techniques. While states can have such policies and programs in place, federal environmental regulations administered by EPA for the most part define the regulatory context of concentrate disposal.

Desalination Methods

TRADITIONAL & EMERGING DESALINATION TECHNOLOGIES

The two most common processes are thermal distillation and reverse osmosis. The earliest commercial plants used thermal techniques. Improvements in membrane technology have reduced costs, and membrane technology is less energy-intensive than thermal desalination (although more energy-intensive than most other water supply options). Reverse osmosis and other membrane systems account for nearly 96% of the total US desalination capacity and 100% of the municipal desalination capacity.

Traditional

Reverse Osmosis Improvements

Reverse Osmosis: Reverse osmosis forces salty water through a semipermeable membrane that traps salt on one side and lets purified water through. Reverse osmosis plants have fewer problems with corrosion and usually have lower energy requirements than thermal processes. Examples of how research advances in the traditional desalination technologies of reverse osmosis have the potential for improving the competitiveness and use of desalination are: nanocomposite and nanotube membranes and chlorine resistant membranes. Nanocomposite membranes appear to have the potential to reduce energy use within the reverse osmosis process by 20%, and nanotube membranes may yield a 30%-50% energy savings. Membranes are susceptible to fouling by biological growth, which reduces performance and increases energy use. The most widely used biocide is chlorine because it is inexpensive and highly effective. The most common membranes used in reverse osmosis, however, do not hold up well to exposure to oxidizing agents like chlorine. Advancements in chlorine resistant membranes would increase the resiliency of membranes and expand their applications and operational flexibility.

Desalination Issues	<p>Distillation: In distillation, saline water is heated, separating out dissolved minerals, and the purified vapor is condensed. There are three prominent ways to perform distillation: multi-stage flash, multiple effect distillation, and solar distillation. In general, distillation plants require less maintenance and pretreatment before the desalination process than reverse osmosis facilities. While solar distillation is an ancient means for separating freshwater from salt using solar energy, research into improving the technology is increasing. In large part the interest stems from the potential application for the technology to supply freshwater to small remote settlements where saline supplies are the only source and power is scarce or expensive.</p>
Condensed Vapor	<p style="text-align: center;">Innovative & Alternative Desalination Processes</p> <p>Capacitive Deionization: Capacitive deionization desalinates saline waters by absorbing salts out of the water using electrically charged porous electrodes. The technology uses the fact that salts are ionic compounds with opposite charges to separate the salts from the water. The limiting factor for this technology is often the salt absorption capacity of the electrodes. The technology shows promise for energy-efficient desalination using electrodes of optimized pore size.</p>
Porous Electrodes	<p>Electrodialysis: Electrodialysis and capacitive deionization technologies depend on the ability of electrically charged ions in saline water to migrate to positive or negative poles in an electrolytic cell. Two different types of ion-selective membranes are used — one that allows passage of positive ions and one that allows negative ions to pass between the electrodes of the cell. When an electric current is applied to drive the ions, fresh water is left between the membranes. The amount of electricity required for electrodialysis, and therefore its cost, increase with increasing salinity of feed water. Thus, electrodialysis is less economically competitive for desalting seawater compared to less saline, brackish water.</p>
Ion Migration	<p>Forward Osmosis: Forward osmosis is an increasingly used but relatively new membrane-based separation process that uses an osmotic pressure difference between a concentrated “draw” solution and the saline source water; the osmotic pressure drives the water to be treated across a semi-permeable membrane into the draw solution. The level of salt removal can be competitive with reverse osmosis. A main challenge is in the selection of a draw solute; the solute needs to either be desirable in the water supply, or be easily and economically removed. Research is being conducted on whether a combination of ammonia and carbon dioxide gases can be used as the draw solution. The attractiveness of forward osmosis is that its energy costs can be significantly less than for reverse osmosis when combined with industrial or power production processes. A disadvantage of this technology is that it yields a lower quantity of freshwater per unit of water treated and a larger quantity of brine that requires disposal.</p>
Draw Solute Selection	<p>Freezing Processes: Freezing processes involve three basic steps: (1) partial freezing of the feed water in which ice crystals of fresh water form an ice-brine slurry; (2) separating the ice crystals from the brine; and (3) melting the ice. Freezing has some inherent advantages over distillation in that less energy is required and there is a minimum of corrosion and scale formation problems because of the low temperatures involved. Freezing processes have the potential to concentrate waste streams to higher concentration than other processes, and the energy requirements are comparable to reverse osmosis. While the feasibility of freeze desalination has been demonstrated, further research and development remains before the technology will be widely available.</p>
Ice Crystal Separation	<p>Ion Exchange: In ion exchange, resins substitute hydrogen and hydroxide ions for salt ions. For example, cation exchange resins are commonly used in home water softeners to remove calcium and magnesium from “hard” water. A number of municipalities use ion exchange for water softening, and industries requiring extremely pure water commonly use ion exchange resins as a final treatment following reverse osmosis or electrodialysis. The primary cost associated with ion exchange is in regenerating or replacing the resins. The higher the concentration of dissolved salts in the water, the more often the resins need to be renewed. In general, ion exchange is rarely used for salt removal on a large scale.</p>
Ion Substitution	<p style="text-align: center;">CONCLUSION</p> <p>Desalination and membrane technologies are playing a growing role in meeting water supply and water treatment needs for municipalities and industry. The extent to which this role further expands depends in part on the cost-effectiveness of these technologies and their alternatives. Desalination’s energy use, concentrate disposal options, and environmental and health concerns are among the top issues shaping the technology’s adoption. How to focus federal research to produce results that provides public benefits, at what level to support it, and how to provide a regulatory context that protects the environment and public health without unnecessarily disadvantaging these technologies are the three most significant desalination issues before the 113th Congress.</p>
Continuing Cost Issues	<p>FOR ADDITIONAL INFORMATION: NICOLE CARTER, Congressional Research Service, ncarter@crs.loc.gov</p>

WATER BRIEFS

**BAY DELTA DELIVERIES CA
REDUCED PUMPING & ESA ISSUES**

State and federal officials are conferring on measures needed to provide for the water security of California and to protect the threatened delta smelt after pumping levels through the Sacramento-San Joaquin Delta (Delta) were reduced in the short term to protect the fish. In addition, the US Bureau of Reclamation (Reclamation), in coordination with California's Department of Water Resources (DWR), is reinitiating informal consultation with the US Fish and Wildlife Service (Service), in cooperation with the California's Department of Fish and Wildlife, to evaluate a range of potential alternatives to best meet the needs of the fish and water users during this challenging water year. US Department of Interior (Interior) and California officials are also reemphasizing their commitment to move forward with the Bay Delta Conservation Plan (BDCP), which would implement a long-term solution for reducing or avoiding the conflicts that are being seen again this year between water deliveries through the Delta and fishery needs.

Delta smelt are fish native to and found only in the San Francisco Bay and Sacramento-San Joaquin Delta Estuary in California. They were once one of the most common pelagic (living in open water away from the bottom) fish in the upper Sacramento-San Joaquin Estuary. Delta smelt was first listed as threatened under the federal and California ESAs in 1993 as a result of habitat loss, drought, introduced species, and reduction of food items. The species was listed as endangered under the state ESA in 2010. Critical habitat was designated for the species in 1994. Recent estimates of delta smelt included the lowest levels ever recorded — about one-tenth the level it was in 2003. A 2005 population viability analysis calculated a 50% likelihood that the species could become extinct within the next 20 years.

In response to some projections that within a few weeks the current authorized incidental take threshold for adult delta smelt could be exceeded, the Service has directed state and federal water operators to further reduce pumping from facilities located in the South Delta. Over the past two months, delta smelt (listed under both the federal

and California Endangered Species Acts) have been steadily entrained at the water diversion pumping plants operated by Reclamation and California's DWR in the southeastern Delta. About 75 percent of the estimated incidental take of adult delta smelt for the operating season has occurred with nearly two months left before the period of concern for adult delta smelt ends. "The actions the Service are requesting were recommended by the joint federal-state Smelt Working Group and are intended to reduce the incidental take of delta smelt," said US Fish and Wildlife Service Pacific Southwest Regional Director Ren Lohoefer.

On February 8, the Service determined that the combined net Old and Middle River flows in the central Delta should be no more negative than -1,250 cubic feet per second (cfs) on a 14-day running average, with a simultaneous 5-day running average no more negative than -1,563 cfs. This is a decrease from the most recently permitted flow of -2,500 cfs.

These actions come as state and federal agencies are considering a proposal for a new water conveyance facility to move water through the Delta and help restore the health of the ecosystem. The BDCP is designed to help restore fish populations, protect water quality, and improve the reliability of water supplies for all water users who depend on the Delta for deliveries from state and federal projects. Because the conveyance proposed as part of the BDCP would divert water from a location north of the Delta, biologists believe that take of delta smelt from operation of the South Delta facilities could be reduced.

Adult delta smelt migrate into the Delta and spawn during the winter and early spring months. Depending on Delta conditions during their upstream migration, some adults may enter areas of the Delta where they become vulnerable to entrainment at the federal and state pumping plants. At the pumping plants, entrained smelt are sampled periodically. Entrainment of delta smelt often results in mortality and is considered incidental take under the Endangered Species Act.

Authorized incidental take represents the amount of harm to a threatened or endangered species expected to result from the operation

of the state and federal projects while operating in compliance with the biological opinion. If the estimate of incidental take is exceeded, ESA Section 7 consultation will be reinitiated to evaluate the adequacy of the protections in place, the basis for the amount of authorized incidental take, and, where available, improvements in the measures needed to protect the species.

The first delta smelt was counted at the pumps on December 12, 2012, and the Service initiated Action 1 of Reasonable and Prudent Alternative component 1 of the Biological Opinion on December 17, 2012. This action, the seventh determination made this 2012-2013 water year to comply with the biological opinion, was taken based on information about Delta conditions provided by participants of the Delta Conditions Team, and considered in the Smelt Working Group recommendations. All of the Determinations and Working Group Notes are posted on the web site of the Service's Bay-Delta Fish and Wildlife Office at: www.fws.gov/sfbaydelta/cvp-swp/smelt_working_group.cfm.

For info: Pete Lucero, Reclamation, 916/ 978-5101 or plucero@usbr.gov

**GROUNDWATER CLOSURE NM
PROTECTION OF EXISTING RIGHTS**

On February 1, New Mexico State Engineer Scott Verhines, announced that the Jal Underground Water Basin in Jal, New Mexico is closed for an indefinite period of time to the filing of well applications. "Office of the State Engineer staff has completed a study determining there are no unappropriated waters in the Jal Underground Water Basin," said State Engineer Verhines. "The closure of the basin is a measure to sustain valid existing water rights."

The Jal Underground Water Basin closure is covered under Section 72-12-3 NMSA 1978 for new appropriations of underground waters. Any applications submitted for filing to the Office of the State Engineer will be rejected. "A river basin is said to be closing when the amount of water needed to meet both social and environmental needs and the varied demand for water begins to exceed the amount of water available," according to the agency press release.

For info: Lela Hunt, NMSEO, 505/ 383-4092; SEO's website: <http://www.ose.state.nm.us/>

WATER BRIEFS

**NO. PLATTE REGULATION NE
PRIORITY ADMINISTRATION IN EFFECT**

On February 6, Wyoming State Engineer Patrick Tyrrell announced that priority administration is in effect on water rights diverting from the North Platte River and its tributaries upstream of and junior to Pathfinder Reservoir, with a priority of December 6, 1904 (and later); and between Pathfinder Dam and Guernsey Reservoir, with a priority of April 20, 1923 (and later), until such time as the administration is lifted (no later than May 1, 2013). Priority administration is required by Wyoming water law and is initiated by the request for regulation as provided by the Modified North Platte Decree, in order to protect senior Wyoming water rights held by the US Bureau of Reclamation (Reclamation) for storage in their reservoirs.

The North Platte River system has experienced below average winter snowpack and streamflow conditions over the past 16 months. State Engineer Tyrrell indicated the combination of below average snowpack conditions and low carryover storage in the Reclamation reservoir system requires the administration of water rights junior to Pathfinder and Guernsey Reservoirs. Based on the existing water supply, snowpack and forecasted runoff, it is anticipated that water supplies will be below average in 2013.

The February storage and runoff forecasts for the coming season total 705,364 acre-feet, well below the 1,100,000 acre-foot “trigger” value which represents a full North Platte Project ownership supply. If water supply conditions change over the next few months, the State Engineer’s Office will make adjustments to the basin-wide priority administration activity.

Since the initiation of the Modified North Platte Decree in 2001, and later the implementation of the Platte River Recovery Implementation Program (PRRIP), many municipalities located within the North Platte River basin have secured replacement water for use in the event their existing rights cannot meet their community’s demand. “Most of the towns and cities in the basin, and its industries, are in good shape and have planned ahead,” Tyrrell said.

The immediate effects of the priority administration would mainly affect those junior priority water

rights held by some municipalities and industries, and storage reservoirs that may divert or store water. Tyrrell is sending letters to the municipalities and industries that may be affected by these administration activities to inform the entities to review their water rights portfolio and determine if their water demand will exceed their reliable water supply for the upcoming year. Alternatively, water may be obtained through a temporary agreement or contract from available storage, a temporary change of use agreement, a transfer or exchange agreement, or other supplies available under Wyoming law and approved by the Wyoming State Engineer’s Office. Effects on junior irrigation rights are expected to be small in February and March.

The priority administration actions for the affected water users will be carried out pursuant to state law by water commissioners and hydrographers assigned to various portions of the North Platte River basin, working under direction of Brian Pugsley, Division I Superintendent, Water Office.

For info: Brian Pugsley, SEO, 307-532-2248 or Brian.Pugsley@wyo.gov; Matt Hoobler, North Platte River Coordinator, 307-777-7641 or Matt.Hoobler@wyo.gov

**EXTREME EVENTS PLANNER US
WATER UTILITIES INITIATIVE**

Extreme weather events such as hurricanes and continuing drought can have devastating impacts to utilities. It’s important that utilities identify actions they can be taking to better prepare for these events. EPA’s Climate Ready Water Utilities initiative has released a workshop planner to help utilities plan for extreme events. The workshop planner provides all of the materials needed to plan, conduct, and facilitate an adaptation planning workshop on five extreme event scenarios: floods, drought, wildfire, sea level rise, and reduced snowpack.

An extreme event is any event outside of a utility’s normal planning threshold. For example, this could be a drought longer than the drought on record, or a 100-year flooding event. Researchers project that the probability of these storms will increase and could occur every 3-20 years.

For info: Workshop Planner at: <http://water.epa.gov/infrastructure/watersecurity/climate/upload/epa817f13001.pdf>

**LOW IMPACT PERMITS US
GUIDE TO LID PERMITTING**

American Rivers recently released a guide to permitting approaches that encourage or require “low impact development” or “green infrastructure.” The guide combines model permit language with excerpts from comment letters that have helped to drive permit evolution, and is intended to be a resource for community and watershed advocates.

Like many sources of water pollution, stormwater generally falls under the prohibitions and requirements created by the federal Clean Water Act. For over a dozen years, these requirements have found their way into permits for municipal storm sewer systems. American Rivers maintains that these permits have not done enough to stem the flow of stormwater pollutants into our urban waters — protecting and restoring our waters will require a different approach to stormwater permits, one that emphasizes building homes, businesses, and communities in ways that reduce the amount of stormwater running off of parking lots, streets, and rooftops.

This guide is intended to be a resource for community and watershed advocates that provides clear examples of new stormwater permits that encourage or require “low impact development” or “green infrastructure.” These permits represent an emerging new generation of regulatory approaches and reflect the emerging expertise of water advocacy organizations, stormwater professionals, and permitting agencies. The goal is to provide information about new trends in stormwater permitting and examples of permits that demonstrate leadership toward standards that will build green infrastructure and compliance with water quality standards. The guide is organized as a matrix that combines model permit language along with excerpts from comment letters that have helped to drive the evolution to increased low impact development.

For info: www.americanrivers.org/newsroom/resources/permitting-green-infrastructure.html

WATER BRIEFS

AG BAY DELTA GRANTS CA
RECLAMATION & NRCS

On January 18, the US Bureau of Reclamation (Reclamation), in cooperation with the Natural Resources Conservation Service (NRCS), announced the availability of Agricultural Water Conservation Efficiency Grants, a funding opportunity through the Bay Delta Restoration Program. Reclamation is seeking proposals from California Indian tribes, irrigation districts, water districts, and other organizations with water or power delivery authority to partner with Reclamation on district-level water conservation projects that facilitate on-farm conservation or water use efficiency.

In 2011, Reclamation and NRCS formed a water conservation partnership as a pilot project and are continuing the collaborative process through this funding program due to its success. **Funding opportunity announcement (FOA) number R13AF20005** is available at www.grants.gov. The FOA invites eligible applicants to leverage their money and resources by cost sharing with Reclamation on projects that save water, improve water management, create new supplies for agricultural irrigation, improve energy efficiency, and benefit endangered species. Projects should also increase the capability or success rate of on-farm water conservation or water use efficiency projects that can be undertaken by farmers and ranchers through irrigation system improvements and efficiency enhancements.

Up to \$900,000 is available under this FOA. Once projects have been selected, NRCS will provide accelerated technical and financial assistance to farmers and ranchers in the successful applicant's project area, through US Department of Agriculture programs such as the Environmental Quality Incentives Program (EQIP) or the Agricultural Water Enhancement Program (AWEP). Through EQIP and AWEP, NRCS California is making available up to an additional \$5 million for on-farm water conservation efforts.

Since 2011, Reclamation and NRCS have collectively awarded more than \$13 million to nine water districts and their farmers for water conservation and water use efficiency projects. This partnership between Reclamation,

NRCS, water districts, and farmers has improved water conservation and water supply sustainability in the region.

Proposals must be submitted as outlined on www.grants.gov by April 8, 2013, at 12 p.m. It is anticipated that awards will be made in spring 2013.

For info: Melissa Crandell, Reclamation, 916/ 978-5208 or mcrandell@usbr.gov

TOTAL COLIFORM RULE US
EPA REVISIONS

On February 13, EPA published in the Federal Register the revisions to the 1989 Total Coliform Rule (TCR). The Revised Total Coliform Rule (RTCR), which applies to all public water systems (approximately 154,000 public water systems), offers an opportunity for greater public health protection against waterborne pathogens while at the same time reducing the implementation burden for water systems. The rule is based on EPA's consideration of public comments and recommendations from the total coliform distribution system advisory committee, which consisted of a broad range of stakeholder groups, including States, environmental groups, utilities, and public health and public interest groups. Public water systems (PWSs) and primacy agencies must comply with the revised requirements by April 1, 2016. Until then, PWSs and primacy agencies must continue complying with the 1989 TCR.

The TCR was published in 1989 and became effective in 1990. The rule set both health goals (Maximum Contaminant Level Goals, or MCLGs) and legal limits (Maximum Contaminant Levels, or MCLs) for the presence of total coliform in drinking water.

The RTCR requires public water systems that are vulnerable to microbial contamination to identify and fix problems; and establishes criteria for systems to qualify for and stay on reduced monitoring, which could reduce water system burden and provide incentives for better system operation. The rule also details the type and frequency of testing that water systems must undertake.

For info: Coliform Rule at: www.gpo.gov/fdsys/pkg/FR-2013-02-13/pdf/2012-31205.pdf; additional info on EPA's website: http://water.epa.gov/lawsregs/rulesregs/sdwa/tcr/regulation_revisions.cfm

WATER CYBERSECURITY US
EXECUTIVE ORDER

On February 12, President Obama issued an Executive Order (Order) entitled *Improving Critical Infrastructure Cybersecurity*. "Critical Infrastructure" is defined as "systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters."

As noted in Section 1 of the Order, "[R]epeated cyber intrusions into critical infrastructure demonstrate the need for improved cybersecurity. The cyber threat to critical infrastructure continues to grow and represents one of the most serious national security challenges we must confront. The national and economic security of the United States depends on the reliable functioning of the Nation's critical infrastructure in the face of such threats."

The Secretary of Homeland Security within 150 days of the Order "shall use a risk-based approach to identify critical infrastructure where a cybersecurity incident could reasonably result in catastrophic regional or national effects on public health or safety, economic security, or national security." The Order is designed to further the "policy of the United States Government to increase the volume, timeliness, and quality of cyber threat information shared with U.S. private sector entities so that these entities may better protect and defend themselves against cyber threats. Within 120 days of the date of this order, the Attorney General, the Secretary of Homeland Security...and the Director of National Intelligence shall each issue instructions consistent with their authorities and with the requirements of section 12(c) of this order to ensure the timely production of unclassified reports of cyber threats to the U.S. homeland that identify a specific targeted entity."

For info: Order available at: www.whitehouse.gov/the-press-office/2013/02/12/executive-order-improving-critical-infrastructure-cybersecurity

Resolving Conflicts Between Agriculture and Fish

Law Seminars International Seminar / The Water Report \$100 discount

April 15, 2013 — Yakima, WA

A message from Program Co-Chairs Tom Lindley, Esq. of Perkins Coie LLP & Elaine L. Spencer, Esq. of Graham & Dunn PC:

Only a few weeks remain until the *Resolving Conflicts Between Agriculture and Fish* seminar on April 15th in Yakima, WA. Agriculture and fish too often collide in the regulatory world, and how to protect both in a healthy environment with a healthy economy is one of the great conundrums of our time. We've assembled a faculty of experts on the front line of that effort, from the key regulators to tribal leaders to the lawyers litigating to protect the agriculture industry and to protect fish. We are particularly pleased to have Derek Sandison, Director of the Office of Columbia River; Philip Rigdon, Deputy Director of the Yakama Nation Department of Natural Resources; Urban Eberhart of the Kittitas Reclamation District; and Tom Ring, a hydrogeologist for the Yakama Nation join us to frame the key issues in water and agriculture in one of the most important basins in the nation.

We hope you can join us for the seminar. It's a great opportunity to learn what is on the horizon and to ask the tough questions. And, it is a great opportunity to connect with others seeking to insure a proper balance. We look forward to seeing you on April 15th!

For full agenda information: www.lawseminars.com/detail.php?SeminarCode=13AGWA

Please contact LSI directly to receive your \$100 discount off of tuition (Reg. \$495) at: 206-567-4490
or email registrar@lawseminars.com.

Mention "The Water Report discount"

March 16-20 Portugal

Transboundary Water Management Across Borders & Interfaces: Present & Future Challenges Conference, Aveiro. University of Aveiro. For info: <http://ibtwm.web.ua.pt/congress/>

March 17-19 CA

2013 WaterReuse California Annual Conference, Monterey. Portola Hotel & Spa. Sponsored by WaterReuse Ass'n. For info: www.watereuse.org/conferences/california/13

March 20 OR

BPA's New Role & Visions for the Future Presentation, Portland. Red Star Tavern & Roast House in the Club Room. Presented by OSB Energy, Telecom & Utility Law Section. For info: Sarah Edmonds, 503/813-6840 or sarah.edmonds@pacificorp.com

March 20 AZ

Unexpected Alliance: A Conversation with Salt River Project About Collaborative Efforts to Protect Habitat & Surface Water Flows on the Lower San Pedro River (Brownbag), Tucson. WRRRC, 350 N. Campbell Ave., 12-1:30pm. Presented by Water Resources Research Center. For info: Jane Cripps, WRRRC, 520/621-2526, jcripps@cals.arizona.edu or <http://ag.arizona.edu/azwater/>

March 20-22 FL

Design-Build for Water/Wastewater Conference, Orlando. Hilton Walt Disney World. For info: www.dbia.org/conferences/waterww/2013/default

March 20-22 NV

Lower Colorado River Tour, Las Vegas. Vegas Start. Presented by Water Education Foundation. For info: www.watereducation.org/

March 21 CO

Rio Grande Compact Commission 74th Annual Meeting, Alamosa. Adams State University-McDaniel Hall (Rm.101). For info: Roberta Barela, 719/ 589-6683 or Roberta.barela@state.co.us

March 25-27 MO

Agricultural Hydrology & Water Quality II: 2013 AWRA Spring Specialty Conference, St. Louis. Hilton Ballpark Hotel. Sponsored by American Water Resources Ass'n. For info: www.awra.org/meetings/Spring2013/

March 27-28 NV

Climate Change Science for Effective Resource Management & Public Policy in the Western United States Workshop, Las Vegas. University of Nevada Las Vegas Student Union. For info: Dr. Lynn Fenstermaker, 702/ 862-5412, Lynn.Fenstermaker@dri.edu or <http://epscorspo.nevada.edu/>

April 2-5 ID

The Water Opportunity Show, Indianapolis. Indiana Convention Ctr. For info: <http://s36.a2zinc.net/clients/wqa/wqa13/public/enter.aspx>

April 3-5 CO

Western States Water Council Spring (171st) Council Meeting, Denver. Sheraton Hotel Downtown. For info: www.westgov.org/wswc/meetings.html

April 4-5 CA

Sea to Sierra Water Tour: Seminar on California Water Issues, Emeryville. Amtrak. Presented by Water Education Foundation. For info: www.watereducation.org

April 7-10 TN

Sustainable Water Management Conference, Nashville. Loew's Vanderbilt Hotel. Sponsored by American Water Works Ass'n. For info: www.awwa.org/conferences/

April 8-12 Germany

Industrial GreenTec 2013 Fair, Hannover. For info: Ulli Hammer, uhammer@hfusa.com or www.hfusa.com

April 9-12 TX

Texas Water 2013 Conference, Galveston. Moody Gardens Hotel & Convention Ctr. Sponsored by Texas Section AWWA. For info: <http://www.texas-water.com/home.html>

April 10 OR

2nd Annual UO Climate Change Research Symposium & Climate Change and Indigenous Peoples Lecture, Eugene. UO, Fir Room EMU. Lecture: Many Nations Longhouse. For info: <http://climatechange.uoregon.edu/>

April 10 CO

Water, Oil & Gas 101 Program, Denver. CBA-CLE Classroom, 1900 Grant Street, Ste. 300. Sponsored by Getches-Wilkinson Center. For info: www.colorado.edu/law/research/gwc/events

April 11 CA

Santa Ana River Watershed Conference, Costa Mesa. Westin South Coast Plaza. Presented by Water Education Foundation. For info: www.watereducation.org/doc.asp?id=2626

April 11-12 TX

Texas Water Law Conference, San Antonio. Westin La Cantera. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

April 15 WA

Resolving Conflicts Between Agriculture & Fish Seminar, Yakima. Red Lion Hotel Yakima Ctr. The Water Report Special \$100 Discount. For info: Law Seminars Int'l, 206/ 567-4490, registrar@lawseminars.com or www.lawseminars.com/detail.php?SeminarCode=13AGWA

April 16-17 NC

Well Construction/Operation & Subsurface Modeling Workshop (Potential Impacts of Hydraulic Fracturing on Drinking Water Resources), Research Triangle Park. EPA-RPT Campus Main Bldg. Auditorium. Presented by EPA. For info: Lisa Matthews, EPA, 202/564-6669, lisa@epa.gov or www.epa.gov/hfstudy/techwork13.html

April 16-19 AZ

Seventh International Conference on Irrigation & Drainage: Using 21st Century Technology to Better Manage Irrigation Water Supplies, Phoenix. Presented by USCID. For info: www.uscid.org/13azconf.html#4

April 16-19 Spain

12th International UFZ-Deltares Conference on Groundwater-Soil-Systems & Water Resource Management (AquaConSoil 2013), Barcelona. For info: www.aquaconsoil.org/AquaConSoil2013/Start.html

April 17 OR

The Future of Water Supply & Management in the Pacific NW Seminar, Portland. World Trade Center. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

April 17-19 CA

Central Valley Tour (Field Trip), San Joaquin Valley. Presented by Water Education Foundation. For info: www.watereducation.org

April 18 NC

Wastewater Treatment & Related Modeling Workshop (Potential Impacts of Hydraulic Fracturing on Drinking Water Resources), Research Triangle Park. EPA-RPT Campus Main Bldg. Auditorium. Presented by EPA. For info: Lisa Matthews, EPA, 202/564-6669, lisa@epa.gov or www.epa.gov/hfstudy/techwork13.html

April 19 MA

Stormwater Management in New England Seminar, Boston. Seaport Boston Hotel World Trade Ctr. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com or www.lawseminars.com



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CALENDAR

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April 19 **OR**

Oregon Environmental Cleanup Conference - Superfund & Oregon Cleanup Law, Portland. For info: Holly Duncan, Environmental Law Education Center, 503/ 282-5220 or www.elecenter.com

April 21-26 **FL**

8th Int'l Ass'n of Hydrological Sciences Groundwater Quality Conference, Gainesville. University of Florida. For info: www.conference.ifas.ufl.edu/GQ13/

April 22-23 **CA**

9th Annual National Environmental Policy Act Conference: All Points of View on NEPA, San Francisco. Hotel Nikko. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

April 23 **WA**

9th Washington Hydrogeology Symposium, Tacoma. Hotel Murano. For info: <http://depts.washington.edu/uwconf/hydrogeo/>

April 23-24 **WA**

Ecological Significance of High Flows on Alluvial Rivers Workshop, Omak. Koala Street Grill. Hydrology & Biology for Environmental Flow Requirements. For info: Northwest Environmental Training Center, 425/ 270-3274, www.nwetc.org

April 24 **AZ**

Linking Knowledge & Action for Water Sustainability & Urban Climate Adaptation - Research Update from ASU Decision Center for a Desert City (Brownbag), Tucson. WRRRC, 350 N. Campbell Ave., 12-1:30pm. Presented by Water Resources Research Center. For info: Jane Cripps, WRRRC, 520/ 621-2526, jcripps@cals.arizona.edu or <http://ag.arizona.edu/azwater/>

April 24 **WA**

GoGreen 13 Seattle - 4th Annual Conference, Seattle. The Conference Center. For info: <http://seattle.gogreenconference.net/>

April 24-26 **Spain**

Asset Management for Enhancing Energy Efficiency in Water & Wastewater Systems Conference, Marbella. Sponsored by International Water Ass'n. For info: <http://iceam2013.es/asset/index.php>

April 25-26 **NM**

Law of the Rio Grande Conference (13th Annual), Santa Fe. Hilton Hotel. For info: CLE International, 800/ 873-7130 or www.cle.com/

April 25-26 **HI**

Endangered Species Act Seminar, Honolulu. YMCA, 1040 Richards Street. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

April 28-May 2 **TX**

2013 NGWA Summit: National & International Conference on Groundwater, San Antonio. Hyatt Regency. Sponsored by National Ground Water Ass'n. For info: <http://groundwatersummit.org/>

April 29-May 3 **AL**

Interstate Technology & Regulatory Council 2013 Spring Meeting, Montgomery. Renaissance Montgomery Hotel at the Conference Ctr. For info: <http://www.itrcweb.org/Meetings/Upcoming>

April 30 **WA**

UW Water Symposium, Seattle. University of Washington - Husky Union. Hosted by Center for Urban Waters. For info: www.tacoma.uw.edu/center-urban-waters/2013-university-washington-water-symposium

April 30-May 1 **TX**

Environmental Trade Fair & Conference, Austin. Convention Ctr. Sponsored by Texas Commission on Environmental Quality. For info: www.tceq.texas.gov

May 2-3 **NV**

Tribal Water Law Conference, Las Vegas. Bellagio. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

May 3-5 **WA**

The Paths Ahead for NW Geosciences - 2nd NWGS Symposium, Seattle. University of Washington. Presented by Northwest Geological Society. For info: <http://nwgs.org/symposium/symposium.htm>

May 6-7 **AZ**

17th Annual Water Reuse & Desalination Research Conference, Phoenix. Sheraton Downtown. For info: www.watereuse.org/foundation/research-conference-17

May 6-8 **DC**

Managing Our Nation's Fisheries: Advancing Sustainability Conference, Washington. Mayflower Renaissance. Hosted by the Pacific Fishery Management Council. For info: www.cvent.com/events/managing-our-nation-s-fisheries-3/event-summary-94ddf325198f4501996ccc62aa396aa2.aspx

May 7-10 **LA**

National Mitigation & Ecosystem Banking Conference, New Orleans. Sheraton New Orleans. For info: www.mitigationbankingconference.com/mitigation_call_presenters.htm

May 9-10 **WA**

Clean Water & Stormwater Seminar, Seattle. TENTATIVE. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com or www.lawseminars.com