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Water Rights, Water Quality & Water Solutions in the West

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WATER TRANSFERS IN THE WEST

by Carlee Brown, Western Governors' Association

INTRODUCTION

NEW REPORT FEATURES SURVEY & ANALYSIS OF TRANSFER PRACTICES

Scarcity is the defining characteristic of water in the western United States. Freshwater is naturally limited to precipitation, runoff, and aquifer storage. Climate variability and extreme weather events — especially drought — increase uncertainty across timescales, from days to decades. Yet demands for water continue to grow, along with the population and economy of the West. As cities, industry, energy developers, and other users seek new secure water supplies, they increasingly turn to voluntary water transfers.

A water transfer is a voluntary agreement that results in a temporary or permanent change in the type, time, or place of use of water and/or a water right. Additionally, the Western Governors' Association (WGA) and the Western States Water Council (WSWC) include in their definition of water transfers that water transfers can be local or distant; they can be a sale, lease, or donation; and they can move water among agricultural, municipal, industrial, energy, and environmental uses. Water transfers are occurring throughout the West, and they will become increasingly important as new demands stress limited supplies. Indeed, the US Bureau of Reclamation (Reclamation) pointed to transfers as one of the most cost effective tools for meeting water demand in its recent Colorado River Basin Study.

Due to the importance of transfers in meeting water demands in the western states, WGA and WSWC recently teamed up to assess the status and trends in voluntary, intrastate water transfers and promote leading practices for transfers in the West. The resulting report, titled *Water Transfers in the West*, was released by WGA in December of 2012 (*see*: www.westgov.org/water). The report suggests ways to make water transfers more efficient and equitable, while not making value judgments about whether transfers are good or bad or attempting to create a one-size-fits-all blueprint for transfers. Instead, it examines water transfer practices across the western states, highlights successful models and practices, and analyzes case studies. It also identifies ways to minimize any adverse impacts associated with transfers, primarily to the environment and the rural communities that depend on water used to irrigate crops and support the local agricultural economy.

The report is intended to help further a longstanding WGA policy that specifically recognizes the potential benefits of water transfers but also expressed concerns about the impacts of shifting water uses on rural communities. WGA Policy 11-7 states: "Western Governors believe states should identify and promote innovative ways to allow water transfers from agricultural to other uses (including urban, energy and environmental) while avoiding or mitigating damages to agricultural economies and communities."

Western states play a primary and fundamental role in the management and allocation of water, including in the administration of water transfers. While water transfers are happening across the West as a result of voluntary agreements among water users, the leadership of the states and Governors is essential to carefully balance the benefits and drawbacks of these arrangements, to ensure sound administration of transfers, and to promote positive outcomes through water sharing.

Water Transfers

Lessons & Tools

Transfer Tenets

Changing Trend

State Roles

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260 North Polk Street,
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Editors: David Light
David Moon

Phone: 541/ 343-8504
Cellular: 541/ 517-5608
Fax: 541/ 683-8279
email:
thewaterreport@yahoo.com
website:
www.TheWaterReport.com

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WGA and WSWC undertook a year-long project on water transfers, including a survey of western state administrators, reviewing the existing literature, and conducting three stakeholder workshops. Recognizing that each state's individual circumstances will determine how it should address transfers, WGA and WSWC's goal is to share lessons and tools and to identify specific steps that states can consider to improve water transfer outcomes.

BACKGROUND

WATER TRANSFERS IN THE WEST

Water rights transfers are hardly new — the landmark legal cases that guide today's transfer policies were decided in the mid-19th century. As noted by Lawrence J. MacDonnell in "*Transferring Water Uses in the West*" (Oklahoma Law Review, Vol. 43:119. Pages 119-130. 1990), a series of California cases decided between 1857 and 1867 established three basic tenets of water law that eventually made their way to other western states.

Basic established water transfer tenets include:

- A change in the place of use is permissible under the same water right (*Maeris v. Bicknell*)
- An appropriative water right can be regarded as a property right — changes such as the point of diversion may be made as long as they do not cause "injurious consequences" to other water right holders (*Kidd v. Laird*)
- A water right is maintained through continued physical appropriation of water and application to a beneficial use; the change in place or type of use does not cause a change in the right or its priority, so long as there is no injury to other water users (*Davis v. Gale*)

Water transfers as we know them today were not common in the 19th century West, however. Indeed, up through the 1960s, many states had restrictive laws concerning water transfers. In some states, rights were linked to the land where the water was originally used. *Id.* As the economics and demographics of western states changed, those laws were removed from the books and new statutes explicitly authorizing transfers came into place.

It was in the 1980s that transfers became a common instrument of water resource management. Academic articles examining the various western water markets emerged, and regional policy makers like WGA examined ways to improve water use efficiency through transfers (see WGA's 1986 report *Tuning the System*). State laws changed, too; as water transfers gained ground, states started to develop institutions and provide protections for third parties who could be affected by transfers, beyond basic public interest and injury considerations.

States took on even larger roles in the 1990s by beginning programs to promote and facilitate transfers. When California began its Drought Water Bank in 1991 in response to a multi-year shortage, it was the largest set of regional water trades to occur in the US. *See* Howitt, Richard E. "*Empirical Analysis of Water Market Institutions: The 1991 California Water Market*." Resource and Energy Economics 16, 357-371 (1994). Today, all of the states represented by the WGA and the WSWC report some level of water transfer activity over the last five years, ranging from two transfers in South Dakota to well over 1,200 in Oregon. (South Dakota, Survey Response (Aug. 8, 2011); Oregon, Survey Response (Sept. 20, 2011): (on file with authors).

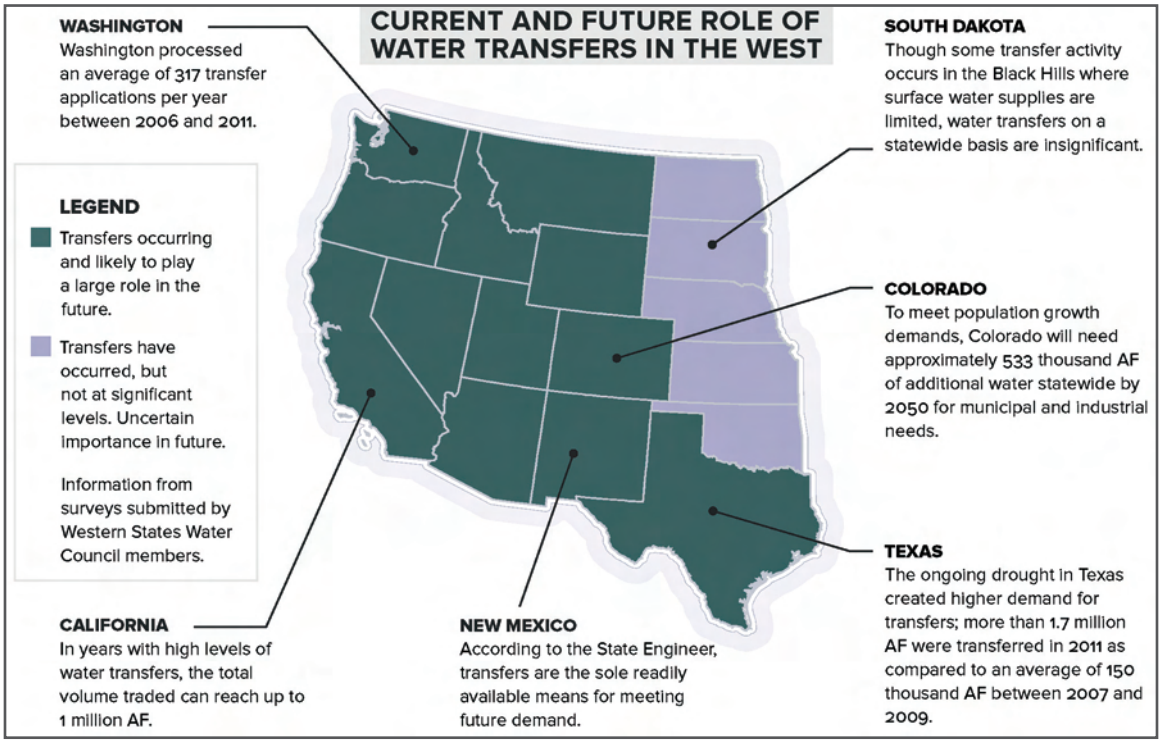
WATER TRANSFERS BENEFITS

Water transfers are just one means to meet demand in the growing West, and most states plan to use transfers in conjunction with measures like building or improving reservoir storage and/or encouraging conservation. Building new storage can be costly and many of the best dam sites have already been developed. Conservation is useful, but some believe that much of the "low-hanging fruit" in urban water conservation — low-flow toilets and urban irrigation efficiency, for instance — has already been picked. Voluntary transfers can be a way to use market mechanisms to redirect existing water supplies towards the emerging needs in the West.

Ever since Adam Smith's metaphor of the "invisible hand," markets have been viewed as a tool to achieve an optimal allocation of a scarce resource. For private goods and services, markets generally set prices at the intersection of supply and demand. Public goods are typically harder to value and allocate using this supply and demand framework. Water is a complex mixed good, with both public and private attributes, and it provides myriad services to its users.

Recently, however, markets have been used to address public policy challenges, such as air quality emissions trading, open space protections, and oil leasing on federal lands. Voluntary water transfers offer an array of potential benefits.

Water Transfers



Transfer Benefits

Benefits of water transfers include:

- Voluntary: The seller and buyer enter into a transfer agreement only when it is in each party's interest, and any conflicts are resolved through direct negotiation.
- Decentralized: Resource decisions are made by the resource users themselves, so that local conditions and unique needs are accommodated.
- Flexible: Water transfer markets provide flexibility to accommodate new and emerging uses over time, rather than locking water into a single use in perpetuity. They can be a mechanism for "real-time" adaptive management.
- Incentivize conservation: Prices established by transfers may provide an incentive for farmers to shift to lower water-using crops, invest in improved irrigation technology, and implement other water-saving practices.
- Allocate water to new uses: Transfers allocate water to meet emerging water demands through a voluntary market framework rather than regulations and mandates.
- Drive investment: Prices for voluntary transfers will rise with increased demand for water. Higher market prices will support investment in water conservation, improved water resource management, and new infrastructure required to implement water transfers.

ADDRESSING WATER TRANSFER ISSUES

Unintended Impacts

While water transfers offer a mechanism for reallocating water to its highest valued use, changes in water use patterns can have unintended consequences. The use of water is often not exclusive or exhaustive, and government intervention may be necessary to minimize externalized costs and avoid or mitigate injury to other parties. States should consider how best to address these impacts in order to improve the outcomes of transfers.

Return Flows

Water transfer impacts to closely consider include:

- Impacts on other users: Other water users may depend on "return flows" from a particular water diversion. "Return flows" are the portion of water that is not consumed during water use, and that is returned to the waterway or basin. When water is transferred, those return flows could be affected. Other water users' rights are legally protected from "injury" caused by a transfer; but third parties may not be protected and quantifying those impacts can be difficult and time consuming.

Ownership

- Complex institutions: While water rights can be owned exclusively by individuals, many rights are owned by organizations such as canal companies or irrigation districts. In such circumstances, transfers impact other shareholders and involve more than individual decision-making.

Water Transfers

Instream Impact

Economic Disruption

Speculation

Property Rights

Public Policy

Prior Appropriation

State Laws

Transfer Regulations

No-Injury Rule

Third Party Impact

Water transfer impacts to consider (continued from previous page):

- Environment: Transfers can be used to enhance the river environment, as demonstrated by water trusts across the West that restore instream flows with water rights transfers and donations. However, transfers can also degrade the environment. For example, redirecting water to new uses can dry up streams or wetlands that depend on current irrigation practices (return flows), or allow invasive species to take hold in formerly irrigated farmland.
- Rural Economies and Local economies: Many rural areas in the West depend on irrigated agriculture. For these places, agricultural water use is the backbone of the local economy and an important part of the cultural heritage. The impacts of a transfer to the local economy and community must be considered.
- Speculation: Transfer activity sometimes involves private investment in acquiring and developing water rights. As in any economic endeavor, private investors anticipate earning a future return commensurate with investment risk. But state water law and administrative practices are generally designed to limit speculation, assure that private investment promotes efficient solutions to water resource problems, and avoid negative outcomes such as speculative price increases.

STATES' WATER TRANSFERS ROLE

Western states have a critical role in water transfers, as well as the management and allocation of water generally. Like any other market transaction, a water transfer requires clearly defined property rights governing who owns or controls the water, any use conditions or protections, and terms under which it can be leased or sold to other parties. Because of the complexities of water as both a public and private good, the state plays a critical role in defining and enforcing property rights in water in order to ensure markets serve society.

Beyond that, states face important public policy decisions with respect to water transfers, as described in the report. Questions and concerns relate to the role of water transfers in meeting future water supply needs, balancing the demand for new water supplies with the preservation of the environment, agricultural economies and rural communities, and assessing the proper role for private sector investment in developing limited water resources. WGA and WSWC's report, *Water Transfers in the West*, describes tools states may consider to improve water transfer outcomes, and frames key policy questions for states to consider.

Legal Framework

Given the prevalence of water markets, all western states have developed a robust legal framework for integrating transfers into the Prior Appropriation Doctrine. (The Prior Appropriation Doctrine is the primary doctrine used by western states for allocating water rights and includes recognition of seniority — "first in time, first in right" — as well as beneficial use and continued use of the water right. A detailed appendix of state water laws and policies regarding transfers is available in *Water Transfers in the West*.) In general, states require those wishing to change the place of diversion, place of use, or purpose of an existing right to obtain approval from the appropriate state authority (e.g., state engineer, state agency, or water court). This basic regulation ensures that transfers do not affect other rights. However, states have broadened their review of transfers to consider a range of impacts, including environmental and economic impacts. They have also developed procedures to streamline reviews, particularly for short-term transfers.

Basic state water transfer regulations may address:

- Injury to existing water rights: Although conditions for approval vary considerably across the West, the principles used by states to protect vested water rights from new appropriations also ensure that changes of existing water rights do not injure other vested water rights. This so-called "no-injury" rule is perhaps the most important component of the process most western states use to review and approve water right change applications.
- Third-party impacts: The no-injury rule is focused on impacts to other water right holders and does not consider impacts to third parties that don't hold water rights — such as environmental organizations or recreational users. The no-injury rule may also not account for the ways in which transfers may unintentionally impact third parties in communities with agriculturally-based economies. Nevertheless, many states have enacted provisions within their transfer approval processes that include public interest reviews, instream flow protections, area-of-origin protections, and other measures that consider impacts to environmental, agricultural, and other values.
- Temporary transfers: Some states utilize a more streamlined or expedited review process to approve temporary, short-term transfers. Expedited reviews are considered appropriate in these cases because the shorter duration of such transactions minimizes the risk for potential impacts (*see* for example Cal State W. Res. Control Bd, supra note 27 at 6-1).

Water Transfers

"Gentlemen's Agreements"

Evolving Laws

Temporary Changes

Public Interest Protection

Water Banks

Reallocation of Water

"New" Supplies

• Informal agreements: In some cases, parties may enter into informal "gentlemen's agreements" to voluntarily share water or forgo the exercise of a valid right to the use of water. These agreements are generally not regulated by the states. They are typically non-binding and subject to challenge by other water rights holders. N.M. Stat. Ann. § 72-3-2. *See also* New Mexico, Survey Response, 8-9 (Nov. 18, 2011) describing informal agreements in New Mexico. However, in some states they can represent significant opportunities to share water for a variety of purposes. For instance, in Utah, gentlemen's agreements are commonly used to provide water for instream purposes. *See* Utah, Survey Response, (Sept. 1, 2011); Survey Responses are on file with authors.

State Transfer Efforts and Programs

As transfers have become more prevalent, state institutions have evolved to deal with them. Today, western states have established regulatory and statutory authorities to accommodate changing demands on water resources. Although these efforts vary considerably across the West, states have generally focused on accelerating the review process for transfer applications, providing incentives for stretching available supplies, and modifying forfeiture and abandonment laws to allow for conservation and instream uses. A number of western states have also enacted provisions to facilitate the temporary or short-term movement of water from one use or location to another. (*See generally* Adam Schempp, *Water in the 21st Century: Policies and Programs that Stretch Supplies in a Prior Appropriation World* (2009); Lawrence MacDonnell and Teresa Rice*, Moving Agricultural Water to Cities: The Search for Smarter Approaches*, 14 Hastings W.-N.W. J. Env. L. & Pol'y, 105, 112-113 (2008); Ricky S. Torrey, *Intrastate Water Transfers in the West: Approaches Problems and Related Issues*, WSWC, 15–51 (1995); MacDonnell, Lawrence J., *Public Water–Private Water: Antispeculation, Water Reallocation, and High Plans A&M, LLC v. Southeastern Colorado Water Conservancy District*. U. Denver Water Law Review 1 (2006) at 137; and Craig Bell and Jeff Taylor, *Water Laws and Policies for a Sustainable Future: A Western States Perspective*, 109 -116; 173–217 (2008) (on file with author)).

At the same time, states are working to provide adequate protections for environmental values and third parties impacted by transfers. In addition to ensuring that transfers do not impair other water rights, many states now consider potentially harmful impacts to environmental and economic values as part of the processes they use to review and approve transfers. MacDonnell and Rice, *supra* note 7, at 111. These considerations often fall under a "public interest" or "public welfare" review and are intended to protect public values and address public concerns involving the direct and indirect effects of transfers. *Id.*

In addition to regulatory and statutory conditions, states have also developed various programs, policies, and institutions to process or encourage transfers. These efforts not only include the state entities charged with regulating transfers, but also encompass state-sponsored water banks and other programs that facilitate the transfer of water by reducing transaction costs and matching willing sellers and buyers. *Id.* at 137-145.

State Views on Water Transfers

As part of this project, WSWC conducted a survey of its member states on the subject of water transfers. Many western states anticipate that water transfers will play a significant role in the allocation of water to existing and future demands. As part of the WSWC survey, western states water administrators were asked: How does the reallocation of water through voluntary, market transfers fit into your state's plans for meeting future water demands? Twelve of the seventeen states indicated that water transfers are occurring and will likely play a significant role in meeting new water demands. The remaining five states acknowledged that transfers are occurring to some degree but replied that they did not have a centralized planning process, had not formally adopted transfers as part of the water supply plan, or had no data to estimate the role of transfers. Several states reported efforts to strengthen tools for water transfers or to build "water banks" to facilitate trading among water users in a specific geographic area.

A review of trends in western water suggests that water transfers will be a critical tool for water allocation in the future. Given that water is fully allocated in many basins and/or during certain times of year, many states see no alternative to water transfers as a source of "new" water supplies. This trend is reinforced by water supply uncertainty — due to climate variability and drought — which may drive water users to secure protection through water transfer agreements and stimulate the development of institutions like water banks to smooth out the effects of variable supplies. *See* O'Donnell, Michael, and Bonnie Colby, *Water Banks: A Tool for Enhancing Water Supply Reliability*, The University of Arizona, Depart. of Agricultural and Resource Economics, January 2010. In addition, transfers can be responsive to changing needs over time — as priorities evolve, transfers can provide flexibility to shift water among uses in a way that permanent infrastructure development may not.

Water Transfers

Impact Mitigation

States' Frameworks

Transaction Costs

Programmatic Approach

States' Support

Conserved Water

Lost Tax Base

Federal Coordination

State Tools, Programs, & Policies to Mitigate Adverse Impacts

States can employ a variety of tools and policies in order to facilitate smart, innovative water transfers and water sharing practices. *Water Transfers in the West* identifies a range of options that are available to states interested in promoting market-based transfer agreements to assist in allocating water among multiple uses. It also identifies tools that states can use to mitigate the adverse impacts of water transfers on rural communities, agricultural economies, and environmental values. Many of these practices are already being employed by Western states.

Efficient administration of transfers

In the West, states manage the system for allocating and administering rights to the use of water. States will play a critical role in establishing a framework that provides clarity, security, and transparency for market participants and affected parties. Most importantly, a clear and enforceable system of property rights promotes fluid and functional markets. *See* Griffin, Ronald C., *Water Resource Economics: The Analysis of Scarcity, Policies, and Projects*, The MIT Press, 2006.

High transaction costs — including engineering assessments, mitigation requirements and legal representation — are an impediment to water transfers. They are of particular concern to small or temporary water transfers, where the costs of the transfer process may exceed the value of the water itself, or the time it takes to complete a transfer may limit its ability to meet a short-term need. States can seek to minimize the transaction costs to complete voluntary water transfers.

In *Water Transfers in the West*, WGA and WSWC identified several ways states can streamline the water transfer process while still allowing for the fundamental and essential review to protect other water rights and water users. These options include: providing clear and transparent guidelines on water transfers; providing an accelerated transfer review option; and setting administrative fees.

States can also consider programmatic approaches to water transfers, which can help to streamline the transfer process in critical areas — for example in a specific river basin, aquifer, or water district. Rather than "reinventing the wheel" for each proposed transfer, a programmatic approach provides a process with an established institution, mechanism, and set of standards. Under a programmatic approach, administrators may be able to use common assumptions about the amount of water available to transfer, impacts to other water users, and mitigation requirements in order to expedite common transfers.

Tools

States can provide an array of tools to empower transfer participants and address public policy concerns, including third party impacts. For example, states can provide funding assistance through a variety of programs, including but not limited to grants, low interest loans, principal forgiveness, and other options to promote the development of innovative and beneficial water transfers.

Additionally, states can provide support for locally designed water transfer solutions. Locally-driven and developed water transfer solutions can provide stakeholders, who are often most affected by transfers projects, a sense of control or ownership in the final outcome. States can help foster these locally-driven water transfer projects by providing forums for potential buyers and sellers to come together. This can be as simple as a "bulletin board" where interested participants can post information, to more formal institutions that could include state clearinghouses and/or water banks.

Policy Options

WGA and WSWC identified several options for Governors and state water managers to consider as they address the challenging policy posed by transfers. For example, states can implement measures that promote conservation and efficiency by allowing current water right holders to transfer conserved consumptively used water — or water gained through improved efficiencies. Transferring this conserved water may be complex under state water law, but many states have statutes and programs to remove disincentives and promote the conservation and transfer of water. *See Western Water in the 21st Century: Policies and Programs that Stretch Supplies in a Prior Appropriation World*. Environmental Law Institute, Washington, DC, 2009. States can also adopt measures that protect rural communities, such as implementing measures to compensate for the lost tax base after a large transfer.

States can consider ways to promote the use or development of infrastructure to support mutually beneficial water transfers. Transfers are often recommended as an alternative to new water supply infrastructure, particularly large storage projects. However, transfers often require infrastructure of their own to move water to the new use or to treat water to address water quality concerns. This may include looking to public-private partnerships and private sector investment as a means of providing needed capital for water transfer projects.

States may also take steps to coordinate with the federal government. A number of federal agencies have water-related responsibilities in the West, including the Environmental Protection Agency, the Army Corps of Engineers, and Reclamation. Reclamation is particularly significant, providing water to one-fifth of irrigated farmland in the West and operating projects in the 17 contiguous western states. *See* "*The*

Water Transfers

Grassroots Approach

Bureau of Reclamation: A Very Brief History" at www.usbr.gov/history/borhist.html. In many cases, Reclamation controls water rights and infrastructure that could be employed in beneficial water transfers.

Engaging the public and educating stakeholders

Water transfers are of interest not just to willing sellers and buyers, or even to proximal water users in the local community, but to citizens throughout the West. States can consider developing public outreach programs to educate citizens on the benefits and challenges of water transfers and what states are doing to improve the water transfer process. States may hold basin-wide public hearings to engage the local community in a comprehensive examination of the economy-wide impacts of transfers.

Importantly, the report notes that transfer projects have flourished where solutions are driven from the grassroots, ground up. First and foremost, potential participants must get to know one another. There may be legitimate concerns about proprietary information or financial negotiations, but in general, transparency and good communications within the local community are critical. Further, locally-driven and developed solutions can provide local stakeholders, who are often most affected by transfers projects, a sense of control or ownership in the final outcome.

ALTERNATIVE TRANSFER METHODS

Alternative Methods

One strategy to mitigate third party impacts caused by traditional water transfers is to employ **a**lternative **t**ransfer **m**ethods (ATMs). These can include a suite of tools, such as leases, rotational fallowing, split-season uses, and water banks. The key shared feature of these methods is that they avoid the permanent dry-up of agricultural land, and many of the economic and environmental impacts that can occur when land goes out of irrigated agriculture forever. WGA and WSWC's report highlights alternative transfer methods that states have used or can consider to support voluntary market-based water transfers:

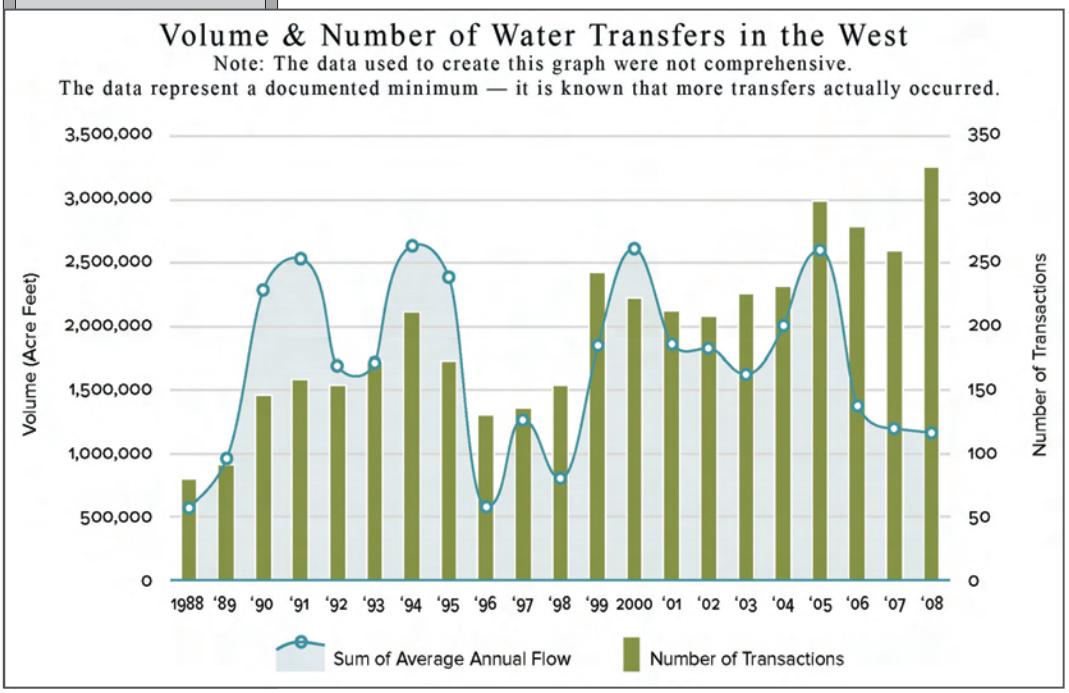
Alternative transfer methods include:

- Rotational Fallowing
- Deficient Irrigation
- Water Banks
- Interruptible Supply Agreements
- Split Season Leases
- Buy/Lease Back
- Piping and Lining Canals and Ditches

"ATM" Requirements

In order to be effective, ATMs must be clear, measurable, and subject to administration. However, given that these types of transfers are relatively new, a consensus may not always exist as to how they should be measured, monitored, or regulated to ensure non-injury to other water right holders.

Further, the relatively recent growth of ATMs means that existing statutes and regulations may not adequately address them or that such transfers have not been fully tested in a state's water right change application process. This can increase the amount of uncertainty associated with ATMs and can serve as a disincentive. Nevertheless, regulators and project sponsors will likely become more comfortable with the procedures associated with ATMs over time as these transfers are more fully vetted through the legal and regulatory process. Colorado, Survey Response, 4–5, 13–15 (Sept. 26, 2011).



States can take action to encourage ATMs. For example, Colorado developed a grant program in 2007 to facilitate the development and implementation of ATMs. Since its inception, the program has awarded $2.8 million to various water providers, ditch companies, and university groups for the funding of projects to study and further ATMs' use.

Water Transfers

CASE STUDIES

In order to better understand the practitioner's perspective on water transfers, WGA and WSWC highlighted regional case studies at their stakeholder workshops. They also invited panelists with first-hand expertise on innovative approaches to water transfers that mitigated the impacts of transfers to rural communities and the environment.

Shared Outcome

In each of these examples, stakeholder involvement and grassroots solutions were key to effective outcomes. Practitioners emphasized that the state provided support through policy and resources, but not top-down prescriptive management. Stakeholders worked together for the best shared outcome from water transfers, using a big-picture vision to work toward healthy rural communities and adequate supplies for urban demand.

Colorado: Lower Arkansas Valley Super Ditch

"Buy-and-Dry" Transfers

The Lower Arkansas Valley in southeastern Colorado has long been an agricultural center for the state, producing beef, grains, and specialty crops. But the region's irrigated agriculture has declined as cities on Colorado's Front Range have looked to the Lower Valley as a water source for their growing populations. A succession of "buy-and-dry" transfers from farmers to cities such as Colorado Springs, Pueblo, and Aurora has taken roughly a quarter of the region's irrigated lands out of production since the 1950s. [Editor's Note: "buy-and-dry" refers to a situation where land is purchased and the water rights are transferred off the appurtenant land to another use.]

The Colorado Water Conservation Board estimates that municipal growth, if it follows historical trends, could dry up an additional 28% of the Lower Valley's irrigated land by 2050, leaving less than half of the historically irrigated acreage in production.

The Lower Arkansas Valley Water Conservancy District (District) was created in 2002 to protect the Valley's water resources. The District has pursued this strategy by aggressively fighting additional buy-and-dry transfers to Front Range cities and by promoting ATMs that meet municipal demands while allowing farmers to continue to irrigate.

Water Leasing

The District has pursued a water leasing program for the Valley — an option which allows irrigated lands to remain in production while cities obtain water supplies. For farmers, water leasing creates a "new crop," one with a predictable cash flow that irrigators can use for on-farm improvements, debt reduction, and equipment upgrades. For municipalities, the irrigated fields in the Lower Arkansas Valley are functionally equivalent to a reservoir that the cities can tap (fallow) when needed to meet municipal demands. "This is the best way to extend our farming operations as long as possible," said Dale Mauch, a farmer in the Lower District and a Super Ditch board member. "The Front Range continues to grow. On top of that, we just don't have the moisture we're used to — we're in our 12th year of drought."

Super Ditch Program

The leasing program was formally incorporated as the Lower Arkansas Valley Super Ditch Company (Super Ditch) in 2008. The Super Ditch negotiates on behalf of irrigators to make water available to other water users through leases, interruptible water supply agreements, and water banking. The Super Ditch expects it can lease up to 24,000 **a**cre-**f**eet (AF) in a dry year, 50,000 AF in an average year, and 80,000 AF in a wet or extremely dry year (like 2002 when there was not enough water to farm). The Super Ditch delivers water into Pueblo Reservoir and then the lessees are responsible for transporting the water for their use.

Terms

It will be up to individual farmers to decide whether, and to what extent, they want to participate. If there is more interest in leasing than demand, the amounts are prorated. Irrigators may fallow land in rotation or on some other basis, and are responsible for weed and erosion control on their fallowed land. Leases constitute a legal encumbrance upon the ditch company shares leased by the irrigators, and constitute a continuing obligation of the owner, assignor, or successor to provide certainty of supply to lessees.

Municipal Cooperation

"Fallowing-leasing recognizes the reality that cities are going to need and obtain irrigation water to meet their future needs," said Peter Nichols, general counsel for the Super Ditch. "The advantage is that it invites them to work with, rather than against, farmers and rural communities." In addition to municipal providers, the Super Ditch will also lease water to other irrigators who need additional water.

Though still in development, the Super Ditch has already taken the step forward from concept to reality. The City of Fountain and a smaller community, Security-Widefield, have signed the first two annual leases, which will automatically renew for 39 subsequent years. The providers may, however, convert the annual leases to 40-year term leases within the first five years, in which case the providers will get a right to renew for an additional 40 years.

Water Transfers

Proactive Coalition

Oregon: Deschutes Water Alliance

In the face of a series of new environmental regulations and a rapidly growing population, water users and managers in Central Oregon realized that change was coming. Instead of a slow process of farmers begrudgingly selling off water rights, a proactive coalition of irrigation districts, cities, tribes, private utilities, counties, state and federal agencies, and conservation groups united under the Deschutes Water Alliance (DWA). By using water transfers, reservoir management, and conservation methods, DWA will free up 260,000 AF of water by the year 2025.

The Deschutes River Basin is historically agricultural, and its location in the high desert east of the Cascades means farmers rely heavily upon irrigation. "I had to deal with 100 years of tradition," said Marc Thalacker of the Three Sisters Irrigation District, which has been in operation since 1877. "Drying up the stream was my job — if any water flowed through town, I was in trouble." Thalacker joined with a group of other irrigation district managers, Central Oregon cities, tribal groups, and the non-profit Deschutes River Conservancy to create the Deschutes Water Alliance. DWA's mission is to accommodate demands from agriculture, the environment, and urban users simultaneously.

Integrated Approach

With booming populations, municipal needs grew dramatically: Deschutes County was the fifth-fastest growing county in the nation in 2006 and 2007. In addition, environmental regulations necessitated a new paradigm of water management. Instead of addressing new demands and the various regulations separately, DWA pursued a more integrated approach to long-term water planning and management. "With Endangered Species Act, Clean Water Act and the State Groundwater Mitigation Program requirements coming at the same time water demands were changing, we knew this was something best addressed in one cohesive strategy — it's not that we are surpassing standards in all areas, but we are now looking at these regulations and water demands as one interwoven issue," said Steve Johnson, manager of the Central Oregon Irrigation District, who oversees more than 40,000 acres of irrigated lands.

Instream Flows

The environmental requirements called for substantial increases in instream flows. With DWA's initial plan, about 75% of the water conserved could eventually be left instream to help endangered fish such as steelhead and salmon. The increases in instream flow will also help meet Oregon's groundwater mitigation requirements, particularly important because of the highly interconnected surface and groundwater in the basin.

Conservation Measures

There is no "new" source of water to meet the environmental, municipal, and agricultural demands in the Deschutes Basin. Roughly half of the 260,000 AF identified will be achieved through conservation measures, while 32% will come from water transfers (both sales and leases) and another 19% through reservoir management. The emphasis on conservation has meant large strides forward in infrastructure, particularly for irrigation districts.

Lining ditches and piping canals led to large gains in water for environmental uses as well as on-farm deliveries of water, with some farmers receiving 25% more water. These efficiency gains in irrigation water deliveries in turn decreased the amount of water that farmers and some districts needed to pump to irrigate, which has led to savings in energy as well as water.

Restored Flow

Through the DWA, the Deschutes Basin has already seen substantive gains in flows on the Deschutes River. More than 200 **c**ubic **f**eet per **s**econd (cfs) had been restored throughout various reaches of the Deschutes River through 2010, and additional permanent and temporary (leased) gains are made nearly every year. There remains a significant need for continued funding for ongoing planning and capacity building for the group, as well as capital for large scale infrastructure projects. Still, the sustained conservation efforts and new strategies — such as water sharing within agriculture and changes in storage management — offer promise for the basin's future.

California: Metropolitan Water District - Palo Verde Irrigation District

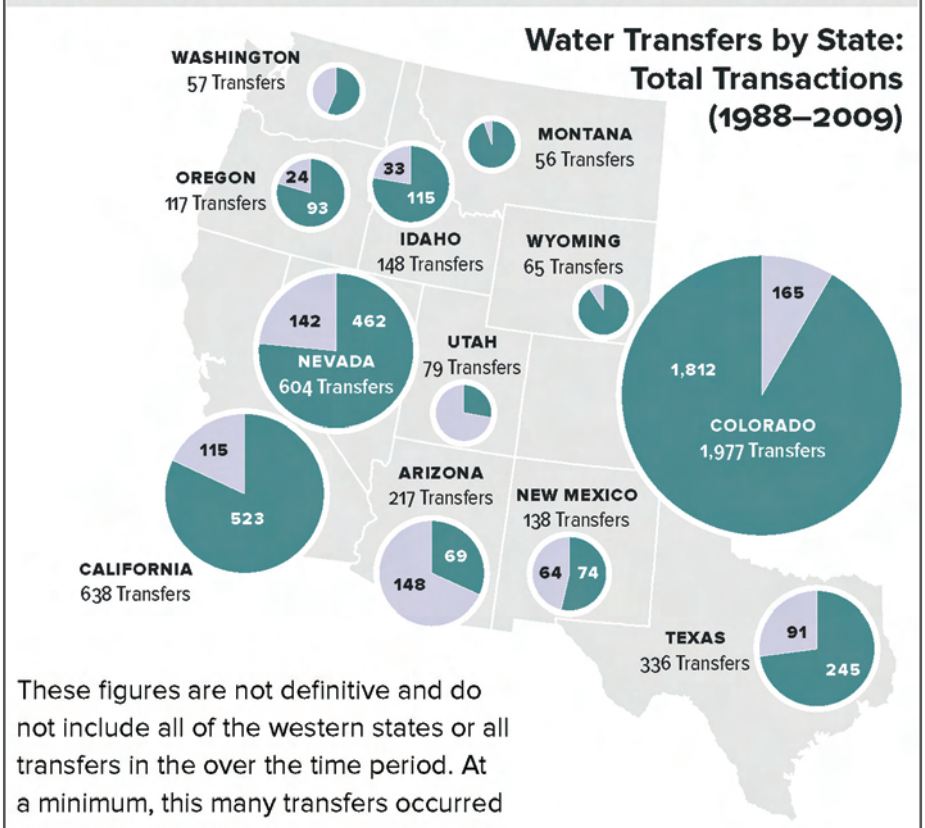
Municipal Transfer (Fallowing)

In Southern California, a large-scale transfer has reallocated water from agricultural to urban use with special attention to the farmers and local economy in the Palo Verde Valley, the water's area of origin. The transfer provides for 35 years of water supply to the Metropolitan Water District (MWD), which services six counties and 19 million people in Southern California. Through conservation in the Palo Verde Valley, between 30,000 and 120,000 AF of water is made available to MWD customers annually.

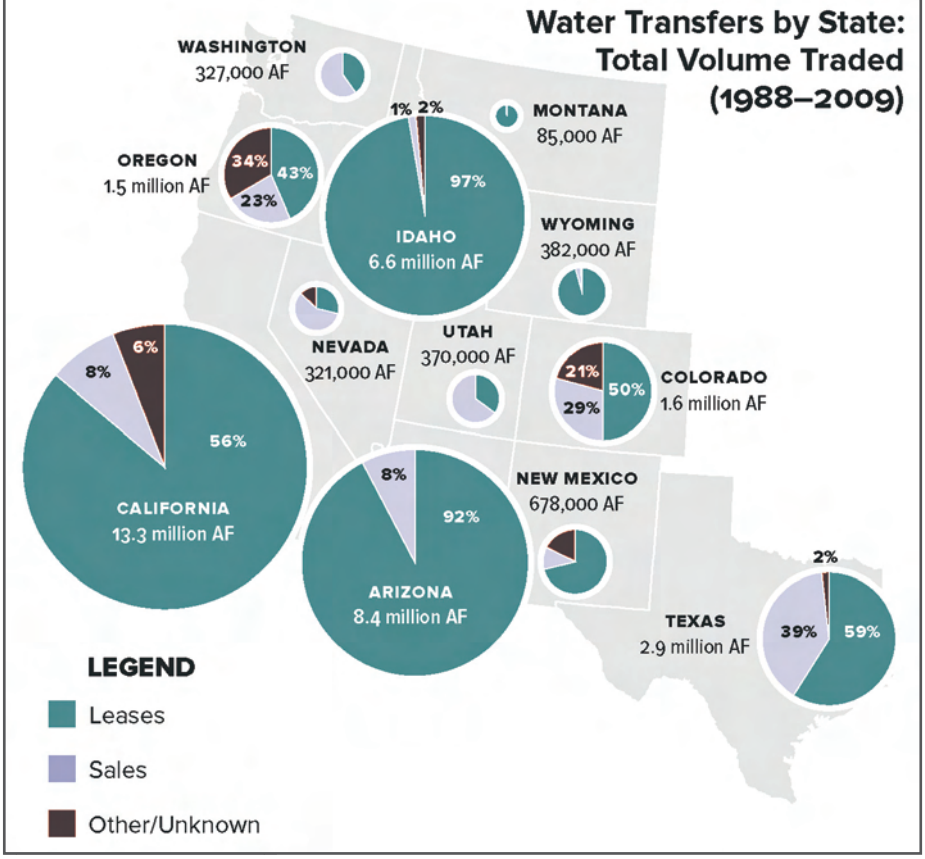
The Palo Verde Irrigation District (PVID), where the farmland entered into the agreement with MWD is located, is home to sunny skies and a dry climate ideal for irrigated agriculture. Prior to the agreement with MWD, PVID used about 450,000 AF annually from the Colorado River for agricultural purposes. Now, water has become a crop for farmers in Palo Verde Valley, sending as much as a quarter of that water to Southern California cities with high returns.

Negotiations for the transfer agreement began in 2001 and farmers began signing up on a voluntary basis in 2004. The farmers received an up-front payment of $3,170 per acre to participate in the program

WATER TRANSFER TRANSACTIONS AND VOLUME



These figures are not definitive and do not include all of the western states or all transfers in the over the time period. At a minimum, this many transfers occurred over a 20 year period, but in some states substantially more have been processed.



and receive an annual payment for each acre that is fallowed each year. Only those farmers who originally entered into the agreement in 2004 may participate under the program; no new applications are accepted at this time.

Under the agreement, between 6,000 and 26,500 acres are fallowed in the irrigation district each year, according to MWD's needs — that is, up to 29% of the more than 91,000 agricultural acres in the Palo Verde Valley. The amount of fallowed land per farm ranges between 10% and 35% of enrolled acreage per year. The conserved water from the fallowing program can be stored in Lake Mead behind Hoover Dam until MWD calls for the water.

In order to mitigate impacts to the community, MWD paid $6 million which helped establish the Palo Verde Valley Community Improvement Fund (CIF), a group comprised of volunteers throughout the Palo Verde Valley. The fund invests in workforce training, small business investment, and development of community resources. A key component of the CIF is that MWD does not have a say in where or how the money is spent in the Valley.

CIF instituted a number of programs that proved successful in stimulating the local economy, including the funding of a truck driving school. CIF put 12 students through the school, nine of whom were directly impacted by the agricultural fallowing program. The program generated a great deal of interest from the local community; CIF received 120 applications for the truck driving school.

For the State of California, the MWD-PVID transfer has been more of a hands-off matter. Reclamation plays a larger role as administrators of Colorado River water use in California. Avoiding over-regulation was important in allowing the transfer to function well. The state's role in bringing together parties in the California 4.4 Plan — to reduce Colorado River diversions to 4.4 MAF — helped create a dialogue between MWD, PVID, and other Southern California water users.

The MWD-PVID water transfer offers an example of how water can be transferred to meet urban needs, while protecting both the interests of the farmers and the communities that could be affected by the transfer. To ensure that the program works effectively, MWD, PVID, and the CIF meet regularly and discuss any issues that arise, recognizing that all the agencies are in the partnership for the long run.

Water Transfers

UPCOMING WEBINAR

The Western Governors' Association is an independent, nonprofit organization representing the governors of 19 states and three US-Flag Pacific islands. Through the WGA, the Western Governors identify and address key policy and governance issues, including natural resources and environmental issues.

The Western States Water Council serves as a resource and advisor on water policy issues for the governors of 18 western states, and consists of state water managers and other experts appointed by their respective governors. WSWC is also a formal affiliate of WGA, and both organizations work closely to develop and implement policies regarding water resource management in the West.

"Ed Smith (PVID) and I have regular dialogue to make adjustments to the program in order to meet our respective needs rather than fighting it out," said William Hasencamp, Manager of Colorado River Resources for MWD. "The long-term relationship between our agencies is more important that saving money one year or arguing over supplies."

CONCLUSION

WESTERN GOVERNORS' ASSOCIATION & THE WESTERN STATES WATER COUNCIL

Water transfers are already a key part of resource management in most western states. As demand for water grows in basins that are already at or near full allocation, states can use this report to consider how transfers figure into their state's water future. With the leadership of the Governors, western states will continue to find means to provide water for new users with provisions that properly value the importance of traditional uses of water.

WGA and WSWC will continue their work on water transfers following the release of the report. Most immediately, they will host a:

Public Webinar Detailing the Report on Thursday, January 24.
For more details, please contact Carlee Brown (see below).

The report, whose full title is "*Water Transfers in the West: Projects, Trends, and Leading Practices in Voluntary Water Trading*" is available for download online at westgov.org/water. Information from past stakeholder workshops, an executive summary, and perspectives from stakeholders are also available online. The authors of "*Water Transfers in the West*" are Tom Iseman and Carlee Brown of the Western Governors' Association and Tony Willardson and Nathan Bracken of the Western States Water Council. Iseman, Willardson, and Bracken also reviewed and commented on this article.

For Additional Information:
Carlee Brown, Western Governors' Association, 303/ 623-9378 or cbrown@westgov.org
Tom Iseman, Western Governors' Association, 303/ 623-9378 or tiseman@westgov.org
Nathan Bracken, Western States Water Council, 801/ 685-2555 or nbracken@wswc.utah.gov
Tony Willardson, Western States Water Council, 801/ 685-2555 or twillardson@wswc.utah.gov

Carlee Brown is the Policy Associate, Water and Wildlife for WGA. Carlee joined WGA in 2011 and works on research, writing, and general support for WGA's Water and Wildlife initiatives. She graduated from Stanford University with a BA in American Studies and a MS in Earth Systems, both with a concentration on agricultural policy. Her interests center around natural resources management, particularly in relation to agriculture and water.

Tom Iseman is the Program Director, Water Policy and Implementation; Climate Adaptation for WGA. Tom received a BA in history from Princeton University (focusing on Western water issues) and an MS in freshwater ecology from the University of Michigan. From 2001-2009, Tom managed the water program for The Nature Conservancy (TNC) in Colorado, where he worked to protect rivers and wetlands and contributed to statewide and regional water supply planning efforts, including Colorado's Statewide Water Supply Initiative and the Upper Colorado River Endangered Fish Recovery Program. Prior to working with TNC, Tom worked for the Department of the Interior in Washington, DC, focusing on water and hydropower issues for the Office of Policy.

Tony Willardson was named as WSWC's Executive Director in July 2009. WSWC is affiliated with the Western Governors' Association. Its members are appointed by the governors of 18 states. Formerly the Deputy Director, he has been with WSWC over 30 years. He holds a BA in political science from Brigham Young University, and a MS in public administration from the University of Utah; and is a member of the National Honor Society for Public Affairs and Administration (Pi Alpha Alpha). He oversees publication of a weekly newsletter, *Western States Water,* which he edited for many years. He is the author of numerous articles and reports covering a wide range of water resource issues, including water project financing and cost sharing, ground water management and recharge, water conservation, drought, and interregional water transfers. He is also one of the principal authors of the WGA's 2006 Report, "*Water Needs and Strategies for a Sustainable Future*" and 2008 "*Next Steps*" Report, as well as a WSWC's 2010 Progress Report.

Nathan Bracken is the Legal Counsel for WSWC. As Legal Counsel, he works with WSWC members, who are appointed by their respective governors, to develop and implement policies and initiatives on water issues affecting the Western US. He has prepared and published a number of articles, reports, and white papers on western water issues, including extensive reports on exempt wells and water reuse, and is the Editor of "*Western States Water*" — WSWC's weekly newsletter. He has also participated in a variety of collaborative work groups focused on water-related issues, including water transfers. Prior to joining the Council, Nathan worked in private practice as an attorney and mediator. He has a BA in English from Brigham Young University and a JD from the University of Utah.

Policy & Science

WATER POLICY & SCIENCE

NEBRASKA'S RIVER BASIN EVALUATION TOOLS

by James Gilbert, Integrated Water Management Division
Nebraska Department of Natural Resources

INTRODUCTION

Unique Management

The State of Nebraska has a unique position with regards to water resources and water resources management. Annual precipitation varies widely across the State, ranging from an average of a little more than a foot in the panhandle (western portion of the State) to over 30 inches in the southeast. Crossed by the Niobrara, Platte, and Republican Rivers as they drain from the Rocky Mountains and high plains towards the Missouri River, the State's water resources are augmented by extensive and productive aquifers. Taking advantage of these available water resources for irrigation of crops has a long history in the State. The first irrigation districts were formed before the turn of the 20th century. Water resources in the State have of course been affected by variability in weather and climate and the impact of 100-plus years of reservoir, canal, and well construction. The continuing evolution of these impacts presents water resource management agencies, like the Nebraska Department of Natural Resources (NDNR), with both challenges and opportunities.

Supply/Use Balance

This article seeks to describe one aspect of the much larger and complex Nebraska water resources management picture — focusing on a new approach to how NDNR evaluates the balance of supplies and uses in the State's hydrologically connected river basins. A brief background on the history of water management legislation is presented, followed by a more detailed explanation of how NDNR has answered the challenge of reconciling the interpretation of law with a practical means of implementation that embraces and utilizes the best available science and data.

REGULATORY BACKGROUND:

A unique regulatory framework has been developed in Nebraska to manage the State's ground and surface water resources.

Surface Water Rights

Nebraskan surface water rights are regulated according to Western Water Law's Doctrine of Prior Appropriation. As is the case in other Great Plains and western states, this doctrine gives priority access to surface water based on how early the water has been claimed and utilized for a recognized beneficial use. In Nebraska, NDNR has — from the inception of water rights granting in 1895 — served as the regulatory entity for issuing, maintaining, and administering surface water rights in accordance with statutes.

Groundwater Regulation (NRDs)

Authority for regulation of the use of groundwater in Nebraska, however, lies with the 23 Natural Resources Districts (NRDs) located within the State. These NRDs are local entities that exist separate from NDNR. NRDs were established in 1972 as a result of the passage of Legislative Bill (LB) 1357 by the Nebraska Unicameral in 1969 (Jenkins, 1975). Originally 24 NRDs were delineated, but the 1989 merger of the Middle Missouri Tributaries and Papio Districts along Nebraska's eastern border reduced that to the 23 districts that exist today. The NRDs were formed from the aggregation of an assortment of local resource-related special purpose districts that existed at the time. NRD boundaries were delineated using the major river basins as a guide, rather than relying on existing political boundaries.

Regulation of groundwater and surface water continued to be largely separate until the passing of LB 962 in 2004. Earlier passage of LB 108 in 1997 had established the beginnings of an integrated groundwater-surface water management structure by making provisions for joint action plans. However, LB 108's expansions of the Groundwater Management and Protection act were largely superseded by more comprehensive measures set out in LB962.

Hydrologic Connection

In 2002, a Governor-appointed task force set forth the framework for LB 962. Task force members represented public and private water users and managers from each of Nebraska's major water basins as well as state government entities including: the Legislature's Natural Resources Committee; the Attorney General's Office; and NDNR. Task force work resulted in a bill calling for a proactive approach to managing the State's hydrologically connected groundwater and surface water to provide for the economic viability, social and environmental health, safety, and welfare of river basins. With the passage of the bill, NRDs already involved in an integrated management process ("joint action plan") with NDNR under

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Determination Criteria

previously existing laws (LB 108) automatically moved into the new process laid out by LB 962. These NRDs included portions of the Platte, Republican, and Niobrara River Basins. All were designated as "fully appropriated" i.e., no further rights to appropriate water were to be made available (Ostdiek, 2009).

Legislative Bill 962 also required NDNR to make an "overappropriated" determination for any areas meeting specific criteria.

Overappropriation determination criteria included:

- Being subject to an interstate cooperative agreement between three or more states before July 16, 2004
- Having received a declaration by NDNR (prior to July 16, 2004) of a moratorium on the issuance of new surface water appropriations in the area
- Having had a request by NDNR (prior to July 16, 2004) that each NRD with jurisdiction in the affected area either: (i) close or continue in effect a previously adopted closure of all or part of the area to the issuance of additional water well permits; or (ii) temporarily suspend or continue in effect a temporary suspension, pursuant to statute adopted prior to July 16, 2004, on the drilling of new water wells in the area

(*see* Nebraska Revised Statutes § 46-713(4)(a))

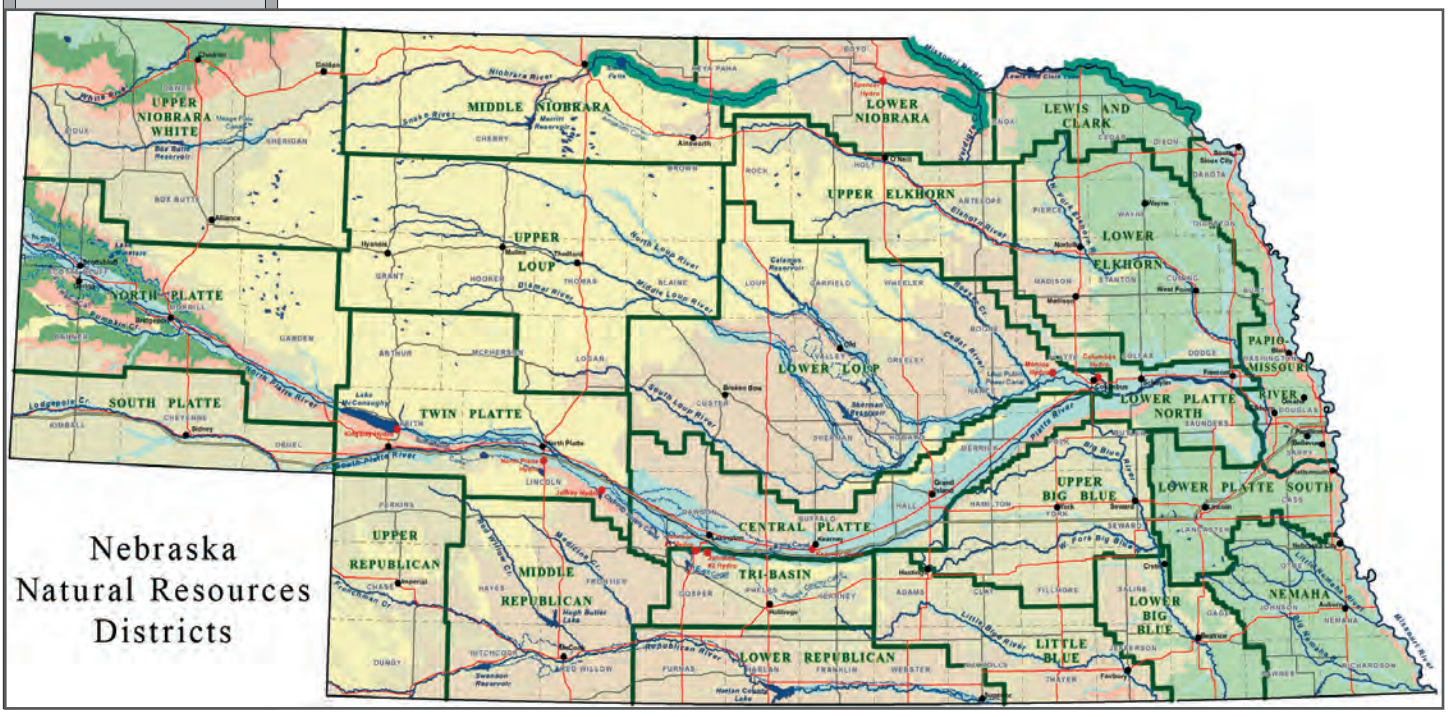
Basin Evaluation

Beyond defining parts of the State as fully or overappropriated based on 2004 conditions, LB 962 also set forth rules and a framework for the future evaluation and designation of the State's remaining areas. The legislation, specifically Neb. Rev. Stat. § 46-713, set out requirements for NDNR to annually evaluate all basins not presently designated as fully appropriated. The statutes further stipulate that a basin be designated as fully appropriated when the current uses of hydrologically connected surface water and groundwater cause, or will in the reasonably foreseeable future cause, the surface water supply to be insufficient to sustain the beneficial purposes for which natural flow, storage, or instream flow appropriations were granted. An area may also be deemed fully appropriated when the streamflow is insufficient to sustain the long-term beneficial uses from wells constructed in aquifers dependent on recharge from the water body involved, and when reduction in the streamflow will cause noncompliance with an interstate compact or decree, other formal state contracts or agreements, or applicable state or federal laws (Neb. Rev. Stat. § 46-713(3)).

Statutory Designation

Evaluation Standard

The legislators that composed LB 962 recognized the importance of science and data to such an evaluation. Neb. Rev. Stat. § 46-713 states that NDNR is required to utilize the "…best scientific data, information, and methodologies readily available…" in the evaluation and reporting of results. The stipulation for the use of the best available science and data in analyses, plans, and assessments occurs throughout LB 962 and constitutes a standard to which NDNR adheres in fulfilling its statutory responsibilities.



TRANSLATING POLICY INTO IMPLEMENTATION USING SCIENCE

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Interpretation & Implementation

NDNR's primary functions are to carry out the policies that follow from water resources legislation. Figure 1 shows a common conceptualization of the policy implementation process (adapted from *Public Policymaking: An Introduction* by James Anderson, 2011). In the case of the statutes resulting from LB 962, considerable effort and a burgeoning Integrated Management Division have been devoted to performing that role — in particular the translation of statute into agency rules, regulations, action, and enforcement. A comprehensive explanation of NDNR's interpretation of the entirety of LB 962 is beyond the scope of this article. Instead, the intent here is to provide a perspective on how NDNR approaches a policy interpretation and implementation question while incorporating a defensible scientific approach by using the annual basin evaluation statute as a representative example.

Scientific Tools

As noted above, performing a scientifically-defensible evaluation of the balance of hydrologically connected supplies and uses in the Nebraska's river basins was made a central responsibility of NDNR through the passage of LB 962 in 2004. An initial methodology for performing these evaluations was developed and put to use by NDNR staff starting in 2006. This methodology was based on an interpretation of the statutes that uses erosion of junior surface water rights as a measure of the balance between supplies and uses. However, just as science and practice of hydrology is continually evolving, so too does the interpretation and implementation of the statute. An effort at NDNR is presently underway to develop the scientific tools and data necessary to support a new annual basin evaluation methodology. The rest of this article will detail several technical aspects of that effort and the role they play in helping NDNR to meet its statutory obligations.

Spatial Extents

Neb. Rev. Stat. Section 46-713 also provides that annual evaluations can be done on a basin, sub-basin, or reach basis. In other words, NDNR has flexibility to assess the balance of hydrologically connected supplies and uses at varying spatial extents. Ensuring the flexibility and capability of performing assessments at various locations and scales was therefore a main objective in developing the new methodology and data and tools to support it. The statute also refers to the importance of changes in supplies and uses over time (e.g., "…then-current uses….available near-term and long-term water supplies" and "...reasonably foreseeable future") and makes consideration of such present and future effects an integral component of the evaluation. Because different components of a hydrologic system function on different time scales — e.g. changes in river flow due to the depletion by groundwater use occur much more slowly than from direct use of river water — another primary objective of the methodology was to have the capability to incorporate relevant variations in uses and supplies over time. Understanding how the balance of supplies and uses varied in the past and how they may vary in the future provides NDNR with useful information with which to assess the temporal variations in water supplies — critical elements in helping to address the requirements of the statutes.

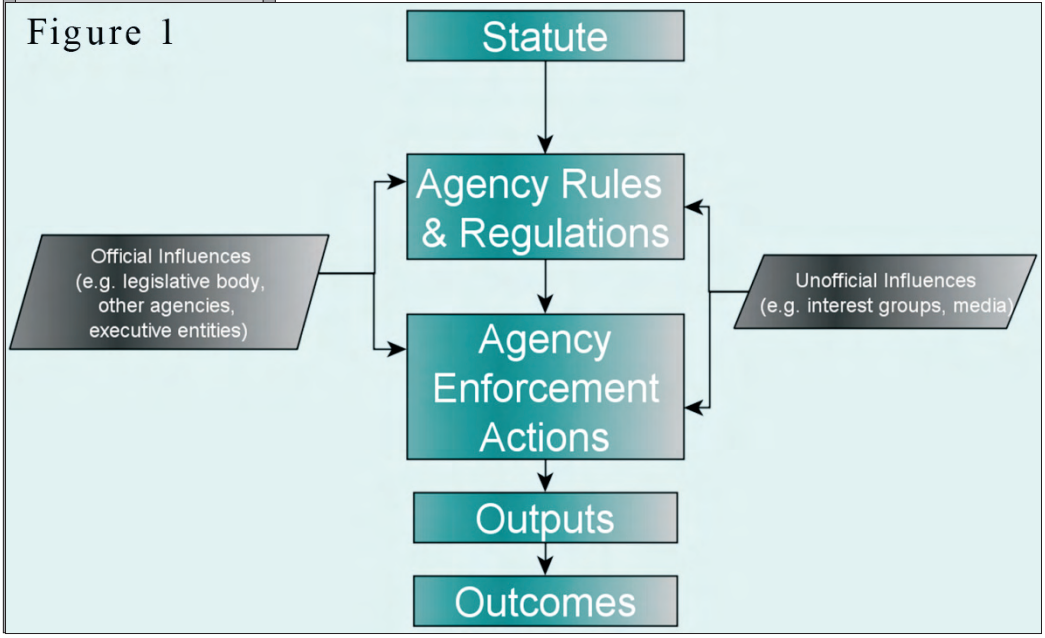
Time Component

"Basin Water Supply"

Basin Water Supply: Concept

To address these objectives, the new evaluation methodology was founded on the concept of "basin water supply." [This concept is also sometimes referred to, especially in work done by NDNR for the Republican River Compact, as a "virgin water supply." For the purposes of this article, the two terms can be used interchangeably and are meant to refer to the same general idea (legal and interpretive distinctions notwithstanding).] Basin water supply is defined as the amount of water upstream or upgradient of a geographic point that would exist in the absence of human activities. The concept can be applied in many ways, but NDNR uses streamflow as the proxy for basin water supply. Admittedly, defining basin water supply in this manner does not fully take into account the total supply of groundwater available (water in aquifer storage).

Figure 1



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Consumptive Uses

Supply Context

Water Budget Components

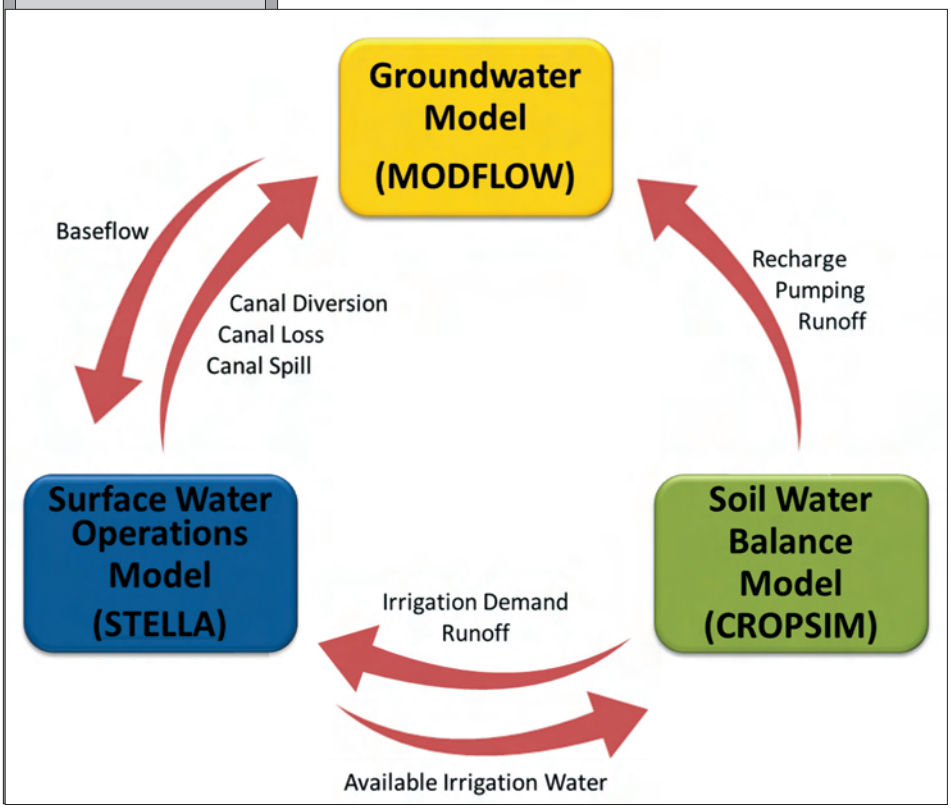
However, streamflow is useful in that it: acts as an indicator and aggregator of upstream conditions; reflects the response of a basin or sub-basin to climatic and anthropogenic stresses; and is consistent with NDNR's statutory surface water and integrated management authorities. The sum of the measured gage flow and the amount of flow not realized due to consumptive uses and depletive activities then becomes a time-varying basin flow hydrograph. The activities considered to contribute to the basin water supply include consumptive uses of water that affect streamflow, with significant examples in most Nebraska basins being crop irrigation using pumped groundwater or diverted surface water.

As a functional formulation, NDNR defines "basin water supply" as the sum of three components:

1) gaged streamflow
2) consumptive uses due to the diversion of and irrigation with surface water
3) depletions of surface water due to groundwater consumptive uses

The basin water supply concept benefits an assessment of the balance of supplies and uses in several ways. First, it is a useful metric in that it provides the framework for a more comprehensive picture of supplies than could be gleaned from an accounting of streamflow or available groundwater alone. Furthermore, by virtue of the way it is defined and calculated, the basin water supply approach puts the effects of water uses in the context of that supply picture. Beyond that, the use of streamflow as the supply proxy means that the calculation of the supply has as its basis a measurable, visible, and responsive characteristic of the basin, sub-basin, or reach that is to be assessed. The geographic and temporal application of the concept is therefore flexible, with the locations and lengths of pertinent gage records being the main limitations.

Extending the basin water supply from concept to implementation for use in a basin assessment raises several questions. First, obtaining a measure of streamflow is a relatively simple matter if one assumes stream gaging records reflect flow in the river to a degree accurate enough to support the intended analysis. However, the other components of the basin water supply formulation, i.e. consumptive use of diverted surface water and depletions to surface water resulting from groundwater uses, are less straightforward to obtain. Furthermore, the specification of supplies and uses in the statute as "hydrologically connected" adds an additional level of complexity to the derivation of a basin water supply. To satisfy this requirement, one must determine a functional definition of "hydrologically connected" and a means of integrating that definition with the quantification of the basin water supply in a way that is meaningful for the basin assessment. NDNR addresses these considerations — i.e., quantifying depletions to surface water over a useful time period and at various locations and classifying supplies as hydrologically connected — through a linked total water budget modeling framework.



Basin Water Supply: Linked Models as Tools

NDNR has developed a framework of linked models that interact to capture the relevant and significant water budget components and fluxes at a regional scale within the State's basins.

NDNR's basin water budget modeling framework includes:

- the soil water balance model "CROPSIM"
- the groundwater flow model "MODFLOW"
- a tool built using the "STELLA" systems dynamics modeling interface for simulating managed water (i.e. canals, reservoirs, and other water infrastructure)

The integration among model components is loose (they run independently). Feedback among models occurs through the transfer of a set of outputs for the complete simulated time period. Figure 2 shows the portions of the water budget addressed by each model and the interactions among them.

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Soil Water Balance

Wet-Dry Climate Oscillations

Water Demand

Irrigation Demand

Groundwater Flow

Water Budget Categories

CROPSIM

The CROPSIM model has been developed by Dr. Derrel Martin at the University of Nebraska-Lincoln to simulate a daily soil water balance at varying spatial scales. Most generally, CROPSIM is used as part of the integrated modeling framework to simulate the portion of the water budget modified by activities at the land-atmosphere interface, with particular emphasis on water demands and water uses by major agricultural crops in Nebraska. Inputs to the CROPSIM model include land use, soils, and climate data. The soils dataset is necessary to define the water-holding and water-transmission capabilities of the portion of the soil column in the root zone. This soil information can be queried from soil information and mapping databases (e.g., SSURGO or STATSGO) and lumped together or further refined as necessary to suit the needs of an application.

The land use and climate input datasets are temporally variable and function to capture important changes in crop type, irrigation practice (e.g. surface water transitioning to commingled surface/groundwater irrigation), and precipitation. The climate datasets are developed based on quality-controlled measurements made by a network of weather stations throughout the State. Through interpolation techniques this network provides full coverage of all basins in the State and facilitates the development of basin-specific model applications. The amount and value of climate information available decreases as one looks at more distant time periods in the past. The weather station network has, however, been reliably utilized for models simulating conditions from 1960 to present, capturing several significant wet-dry climatic oscillations. [A more detailed description of the mechanics and mathematics of how the soil water balance is implemented in a CROPSIM application is available as part of NDNR's previous basin evaluation reports (NDNR, 2011), for example: http://dnr.ne.gov/IWM/AnnualReport_2011/AppendixE.pdf].

The CROPSIM model provides an essential function within the integrated modeling framework used by NDNR in that it partitions crop water demands and water supplies into water budget components. These water budget components become the inputs that drive the groundwater and operations models. Vegetation or crop type, part of the land use dataset, and relevant weather parameters are used to calculate an effective plant water demand. This water demand can be satisfied through precipitation, applied (irrigation) water, or by a depletion of soil water. Antecedent conditions, availability of irrigation water, and assumptions of how and when irrigation water is generally applied in different parts of the State are then used as criteria to build a time series of irrigation demands. On cropland or rangeland not served by either groundwater irrigation wells or canal deliveries (an attribute included as part of the land use dataset development), precipitation is the only source of water input to the soil zone. In that case, CROPSIM precipitation inputs are partitioned into **e**vapo**t**ranspiration (ET), **o**verland **r**unoff (RO), and **d**eep **p**ercolation below the root zone (DP). On irrigated cropland served by surface water (canals), the precipitation is again partitioned into ET, RO, and DP with the additional step that shortfalls of precipitation in meeting crop water demands are then translated to a surface water irrigation demand — an input to the STELLA operations model. The same holds true for the land served by a groundwater irrigation well, except that the irrigation demand is translated to a pumping demand input to the MODFLOW groundwater model. The deep percolation portion is aggregated into a base recharge input to the groundwater model while the runoff portion is aggregated by sub-regional catchment zones and used as an input to the operations model.

MODFLOW

The subsurface component of the integrated simulation framework is built using the three-dimensional finite-difference groundwater flow model MODFLOW (McDonald and Harbaugh, 1988). The groundwater model's function is to propagate the effects of variation in precipitation and land use that occur at the land surface throughout the subsurface flow system, from upgradient regional recharge zones to discharge zones in rivers and streams. Rendered spatially discrete by a finite-difference grid, the groundwater models are constructed to capture the hydrogeologic features that contribute significantly, over a regional scale, to the flow of groundwater to and from surface water features. Recharge and pumping, estimated using the CROPSIM process, are the main drivers of variation in simulated head in the groundwater model. MODFLOW groundwater models are constructed with boundary conditions (i.e. mathematical abstractions superimposed on portions of the finite difference grid) to simulate particular fluxes of water to and from the aquifer. The groundwater models being used to support the new annual evaluation methodology and the basin water supply formulation include boundary conditions to represent major portions (relative to the groundwater system) of the water budget. These water budget categories can include: subsurface inflow (and outflow) from (and to) beyond the active boundary of the model; evapotranspiration from a shallow water table; and flow to or from a stream, river, or lake. Accurately representing the amount and character of this last type, flow to and from streams and rivers, is particularly important in the construction of models to support the basin water supply analysis. Typically implemented as a "stream" (STR) or "streamflow routing" (SFR) package (Prudic, 1989; Prudic, Konikow, & Banta, 2004), considerable effort is expended

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Groundwater Contribution

Infrastructure Involvement

Transmission Losses

Modeling Projects

Evaluation Methodology

to ensure that these boundary conditions are configured to accurately reflect how measurements, observation, and our conceptual understanding of system hydrology indicate rivers and streams interact with groundwater. The ability of the model to simulate groundwater contributions to (and from) streams and rivers is checked through a calibration of modeled baseflow gains and losses, often on a reach-by-reach basis where data exists, with baseflow estimates derived from measured streamflow. This calibrated and modeled groundwater contribution to streamflow then becomes an input to the STELLA operations model and potentially fed back to the CROPSIM process.

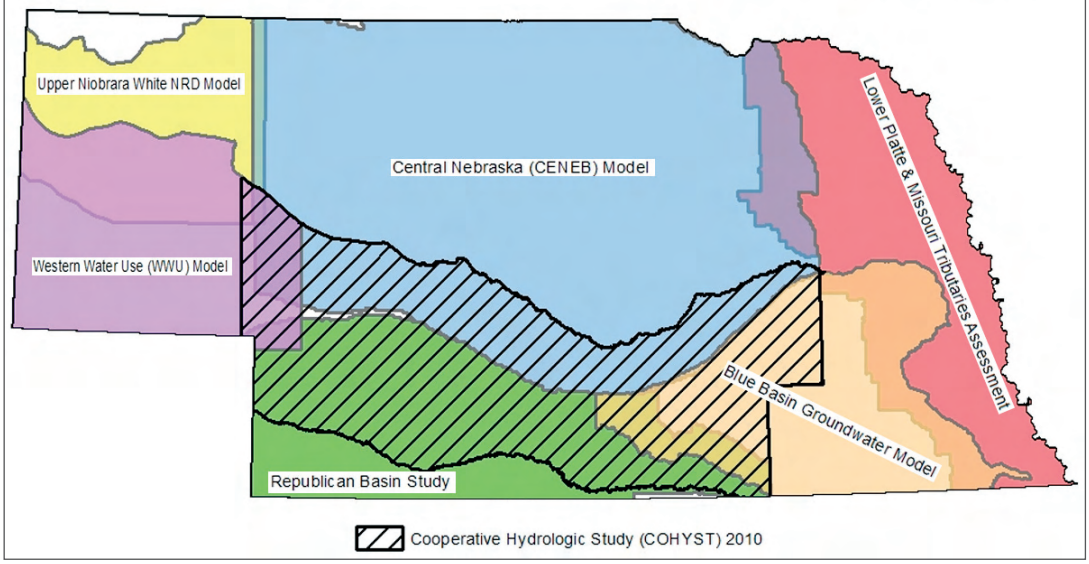
STELLA

STELLA is a systems dynamics modeling tool and interface produced and distributed by ISEE Systems, Inc. The role of the STELLA system in the integrated modeling framework is to aggregate the water flowing to the rivers and streams of interest as simulated by the CROPSIM and MODFLOW processes (as overland flow and baseflow) and route it through canal and reservoir infrastructure in a manner that can reflect real-world operational rules. The degree of complexity and how closely a STELLA component model is linked with the CROPSIM and MODFLOW components depends heavily on extent and complexity of the involved infrastructure. The integrated models being developed for various basins in the State have differing levels of operational complexity. For instance, in areas with no organized surface water irrigation districts (and thus no major diversions or reservoirs to include in streamflow accounting) a STELLA component is unnecessary. However, the use of a STELLA operations model can provide useful flexibility in integrating the CROPSIM and MODFLOW components. In the central Platte River (COHYST2010) model suite, a STELLA framework: aggregates baseflow and runoff to mainstem reaches; apportions and routes the available water through canal systems according to operational rules and surface water irrigation demands calculated by CROPSIM; and accounts for transmission losses in the process. The transmission losses that result from seepage into the soil profile are then fed back to the CROPSIM process and can be incorporated into the calculated recharge output. Similarly, the canal diversion and return information calculated by the STELLA model (as well as CROPSIM runoff) can also be linked with the groundwater model cells that simulate the river so that the groundwater model has the option to simulate groundwater-surface water interaction with the entire amount of water in the river (rather than just baseflow).

Applying the Linked Models – Supplies and Uses

NDNR currently has modeling projects that fit this framework and link either: 1) a CROPSIM model and a MODFLOW groundwater model; or 2) CROPSIM, MODFLOW, and surface water operations models in basins that cover most of the State. Figure 3 shows the portions of the State covered by these various projects. Model systems are in various stages of development in: two portions of the Platte River basin; two portions of the Niobrara basin; the Elkhorn-Loup basin in central Nebraska; and the Blue River basin in the southeast. Each set of basin models is being constructed to accomplish varying statutory obligations, with supporting the annual evaluation methodology being a primary objective for the lower Niobrara, Elkhorn-Loup, and Blue River basin models.

Figure 3: Ongoing Nebraska Water & Groundwater Modeling Studies



Policy & Science

Streamflow Depletion

Crop Water Demands

"Lag Effect"

"10/50" Rule

Streamflow Depletion Estimate

Informed Decisions

Upcoming Rules

As mentioned earlier, the integrated modeling framework described here provides the tools to quantify two important parts of the basin water supply formulation. The quantification of consumptive uses by direct surface water usage can, of course, be accomplished through the coupling of gaged canal diversion and field delivery records with assumptions of what portion of diverted or delivered water is consumed. However, records may not always exist for the time period or location along a reach needed to support the intended evaluation. In such cases, a calibrated CROPSIM model coupled with a calibrated STELLA canal operations tool can be utilized to augment existing data with useful estimates of surface water consumptive uses. The MODFLOW groundwater model components of a basin modeling suite readily addresses the question of the effect of groundwater use on surface flow. By running the groundwater model with groundwater pumping active and running it once with groundwater pumping deactivated, a time-varying difference in flow to rivers and streams can be calculated. This difference represents the streamflow depletion time-series, the third component of the basin water supply formulation.

The framework of crop/soil water balance, groundwater, and operations models that supports the calculation of basin water supply components as just described is also useful in quantifying a time-series of basin water uses or demands. The CROPSIM process estimates crop water demands and uses over time and provides a structure by which other uses can be incorporated. The coupling of CROPSIM-estimated groundwater pumping with a MODFLOW groundwater model also allows flexibility in how groundwater uses are used in the supply-use balance. The effect of a pumping well on river flow depends on the distance of the well from the river and the characteristics of intervening aquifer and streambed materials. Because of this phenomenon — often referred to as the "lag effect" — the reduction in streamflow at the start of pumping is only some small portion of total volume pumped. Over time, the portion of groundwater pumped that comes from reduced streamflow increases. Therefore, groundwater uses can be accounted for in the methodology as the effect realized at the river at that present time, or as the total groundwater use occurring at that time, essentially an upper bound reflecting the potential depletion to the river if the use were carried on indefinitely into the future.

Applying the Linked Models – Hydrologic Connection

The degree of hydrologic connection of water supplies is another significant consideration in using the modeling tools to support the basin evaluation methodology. The statutes do not specify a definition for hydrologically connected ground and surface water. However, NDNR has adopted an interpretation that the geographic area within which a well would deplete a river's flow by ten percent of the amount of water the well could pump over a 50-year period be defined as a zone of hydrologic connection, often referred to as the "10/50" rule (Nebraska Admin. Code Title 457, Ch. 24.001.02). Groundwater models provide the data to support the use of such a criterion. Analytical methods are useful in areas where numerical models have not been constructed, but the framework on which the linked system of MODFLOW-CROPSIM-STELLA models can facilitate a more comprehensive basin-wide analysis that maintains conceptual consistency with the water supply and use accounting. The geographic extent of the 10/50 area is determined using a calibrated MODFLOW groundwater model and applying a roving single well analysis. In this process a single pumping well is added to cells in the model and water is extracted from the model for 50 years. Comparing the flow to the river between a baseline condition without the additional pumping and a condition with the pumping provides an estimate of streamflow depletion. This streamflow depletion and the volume pumped are then used to calculate a 50-year depletion percentage. If that percentage is 10% or greater, that cell is designated as being in the 10/50 zone. Repeating this analysis for cells throughout the grid of a numerical MODFLOW model allows NDNR to map out a 10/50 area and define hydrologically connected water supplies, supporting the evaluation and satisfying statutory requirements.

SUMMARY

The methods and techniques described here provide the foundation of data and information necessary to make defensible, long-term water management decisions in Nebraska. The modeling and data gathering provides the means to develop robust tools like basin water supply and use hydrographs that can be parsed by river gage location.

The next step is determining the most appropriate means by which to assess the information in those hydrographs and how that can be translated to a metric that indicates the balance of supplies and uses in an area has reached a fully appropriated condition or not. These procedures are presently in development and will be finalized into rules that NDNR will put into practice starting in 2013. Information regarding potential statistical methodologies being considered is available in a technical memo on NDNR's website (see HDR, Inc. and The Flatwater Group reference below).

Policy & Science

Basin Water Budget

The character of Nebraska's valuable surface and groundwater resources and the unique regulatory framework that has evolved through legislation to manage those resources has provided great opportunities to the State and its water users. NDNR is charged by state statutes with a number of responsibilities relating to water resources planning and management. Putting these responsibilities into action requires an interpretation and plan for implementation that is informed by and integrates the best scientific understanding. The development of a new basin evaluation methodology to incorporate the best available science and data is a significant example of how NDNR is presently addressing this challenge. This new methodology is founded on a basin water supply concept and relies on a set of linked models that reliably capture the basin water budget. This framework of linked models provides NDNR with flexibility to meet the temporal and spatial aspects prescribed by statutes. The application of the new methodology will take place in 2013 and represents another step in the evolution of Nebraska's unique approach to regulating water.

For Additional Information:
James Gilbert, Nebraska Department of Natural Resources Integrated Water Management Division
402/ 471-3948 or james.gilbert@nebraska.gov

NDNR Integrated Water Management Division website: http://dnr.ne.gov/IWM/

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James Gilbert is a Coordinator within the Integrated Water Management Division of the Nebraska Department of Natural Resources where he leads technical projects and investigations to support the agency's objectives. In his two-and-a-half years with NDNR he has been involved with a number of regional modeling projects including the Platte River Cooperative Hydrology Study, COHYST. Prior to joining NDNR James received his Master's degree in hydrologic science through the School of Natural Resources at the University of Nebraska-Lincoln.

Colorado River Basin

Water Planning

Watershed Events

Unprecedented Study

Study Objectives

The author wishes to thank some of his colleagues for their invaluable review and input for the article, notably: Jennifer Gimbel, Shanti Rossett-O'Donovan, and Carly Jerla.

COLORADO RIVER MANAGEMENT

PLANNING, AGREEING & ACTING

by Ted Kowalski
Chief of the Interstate, Federal and Water Information Section of the Colorado Water Conservation Board

INTRODUCTION

In January 2012, Colorado's Governor Hickenlooper declared 2012 as the "Year of Water" in the State of Colorado — an action which recognized the 75th anniversary of the founding of the Colorado Water Conservation Board, as well as the Colorado Water Conservation District, and the Northern Colorado Water Conservancy District. Many other water organizations also celebrated anniversaries. Unfortunately, 2012 also turned out to be "the year with no water."

Throughout 2012, anyone involved with Colorado River issues, and on water issues in Colorado specifically, could not turn around without bumping into one of the many committees that were working on planning the water future of Colorado and the Colorado River.

It should be noted that 2012 also included important Colorado River water-related anniversaries outside the State of Colorado. The Colorado River Compact of 1922, the foundational agreement between the United States and the seven Colorado River basin states which established the basis for allocating the Colorado River, turned 90 years old. And in California, the Colorado River Board or California celebrated its 75th anniversary.

Upon reflection, I would say that 2012 was "The Year of the Colorado River — Planning, Agreeing, and Acting." This designation recognizes a number of watershed events that occurred in the last six weeks of 2012 after many years of difficult and demanding work by many water policy leaders and water managers within the Basin.

PLANNING: BASIN STUDY

The Colorado River Basin Water Supply and Demand Study (Basin Study) was an unprecedented regional effort conducted jointly by the US Bureau of Reclamation (Reclamation) and the seven Colorado River Basin States — Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming (Basin States). [The Basin Study was previously the subject of two articles in *The Water Report, — see TWR* #90 (August 2011) & *TWR* #100 (June 2012).]

The Colorado River Basin Water Supply and Demand Study

The Basin Study was conducted to:

1) project Colorado River basin water supply and demand through 2060;
2) analyze how the projected supply and demand could affect system reliability for key water dependent factors (water supplies, power, water quality, environmental, and recreational needs); and
3) explore a variety of options and strategies to understand how they could alleviate the projected supply/demand imbalances.

The final *Colorado River Basin Water Supply and Demand Study Report* (Report) was published in December 2012 and has been the focus of extensive press coverage and a number of criticisms — as every stakeholder jostled to explain what it meant and what "call to action" might (or might not) be warranted.

The Executive Summary of the Report is a masterful summary of the Report's more than 1400 pages. I encourage anyone who is interested in the Study to start by reading the Executive Summary, which can be found along with the rest of the Report at: www.usbr.gov/lc/region/programs/crbstudy.html.

Without trying to re-create the entire Executive Summary, suffice it to say that the Basin Study effort has provided several key innovations that constitute major steps forward in basin water planning.

First, the Basin Study took an important step forward by using a scenario-based planning approach for the first time (see Technical Report A, Section 3 for a more detailed description of this planning approach). The Basin States and Reclamation have known for decades that Colorado River water demands are greater than the historic long-term supplies and that, absent adequate action, the water supply/demand imbalance would only continue to grow. However, establishing a broad and useful fact-based perspective to address supply/demand imbalance remained illusive. To meet this challenge, scenario-based planning uses plausible water supply and water demand projections to articulate the range of possible water imbalances.

Colorado River Basin

Scenario Strengths

Vulnerability "Signposts"

This approach is a major strength of the Report and will prove very helpful to future water managers — it presents a broad range of possible outcomes that will allow the States, Reclamation, the Tribes, and the other interested stakeholders to engage in a frank and realistic dialogue about how to move forward. Using the range of future supply and demand scenarios is appropriate because the exact quantity of water supply and demand in 2060 is unknown. To assure future water supply and demand balance, we must proceed to plan in light of the knowledge that each of the projections is plausible.

Reclamation and the Basin States used 112 projections of future temperature and precipitation from 16 **g**lobal **c**limate **m**odels (GCMs) to develop streamflow projections throughout the Colorado River basin. (For a description of how these GCMs were used to project streamflows, see Technical Report B, Section 8.0). Similar methods have been used in other Colorado studies (most notably in the Colorado Water Availability Study conducted by the Colorado Water Conservation Board). However, for Reclamation and the Basin States to jointly utilize this work for future planning is groundbreaking.

The Basin Study also identified a number of vulnerability "signposts" — i.e., conditions that, if present, tend to indicate that vulnerabilities may be more likely (see Technical Report G, Sections 6.2, 6.3 and 6.4 for a more detailed discussion of "signposts" and vulnerabilities). The concept of signposts can help reduce uncertainty and help guide future water management decisions in a measured, methodical, and sequential way.

Adapted from: Colorado River Basin Supply & Demand Study, Interim Report #1, USBR, June 2011

Colorado River Basin

Metrics Developed

Technical Platform

Negotiation's Terms of Reference

Workgroups

"Minutes" Role

Yuma Desalting Plant

Cienega de Santa Clara Offset

Finally, Reclamation and the Basin States developed a broad set of metrics for measuring Colorado River Basin resource performance and health. These metrics included: water deliveries; hydropower; water quality; flood control; environmental; and recreational metrics. (See Technical Report D for a description of the metrics used in the report, and Technical Report G, Section 6.0 for a description of how these metrics performed under various scenarios and portfolios of options to reduce water supply/demand imbalances.) It is helpful when developing solutions for potential problems to first understand the scope and timing of the problems you might expect to see. Consideration of how these metrics perform under different futures of supply and demand will inform decision-making. However, in several cases many simplifying assumptions were made in developing these metrics. As such, a careful balance must be struck when using them in future efforts. While these metrics are helpful for providing a broad understanding of resource performance, they are not meant to be used in efforts that aim to identify future regulatory requirements.

Good studies shouldn't just sit on the shelf. The Basin Study in particular — with its new approaches, tools, and broad base of information — should be put to work. The knowledge gained through the Basin Study can be used to frame discussions and will allow decision-makers to have a common technical platform from which to make informed decisions about the future options for reducing water supply/demand imbalances.

AGREEING: A SERIES OF "MINUTES"

While 2012 witnessed a number of agreements involving the water resources of the Colorado River, none were as important and history-making as Minute 319 and the associated supporting agreements among the Colorado River Basin States and the various federal agencies. Minute 319 represents the culmination of years of meetings, relationship building, and negotiations on how best to manage Colorado River resources for the benefit of both the United States and Mexico.

US-Mexico Agreement

In August 2007, the US and Mexico issued a joint statement that it was their intention to explore opportunities for future management decisions associated with the Colorado River that could benefit both countries. Then in 2008, the US and Mexico exchanged letters that confirmed "terms of reference" for the US-Mexico negotiations. The terms of reference were largely procedural rules for meetings between the Colorado River stakeholders within the two countries. In a nutshell, the terms of reference established a bi-national core group that consisted of one representative and two alternates for each of the following interests: 1) Upper Basin states; 2) Arizona; 3) California; 4) Nevada; 5) the International Boundary Waters Commission (IBWC); 6) Bureau of Reclamation; and 7) Non-Governmental Organizations (NGOs). There were similar representatives and alternates for: 1) the State of Baja California; 2) the State of Sonora; 3) Mexican section of the IBWC; 4) the National Water Commission; 5) SEMARNAT (Mexican's environmental ministry); 6) the Embassy of Mexico; and 7) NGOs. The terms of reference contemplated bi-national core group meetings and work group meetings associated with the following four workgroups: 1) new water sources; 2) system operations; 3) conservation; and 4) environment. It was this process that set the stage for each of the following four "Minutes" that were agreed to by the US and Mexico, all within the last two years. "Minutes" are agreements between two countries that are party to a treaty about how the treaty will be implemented or interpreted. "Minutes" are not formal amendments to the treaty that have to be re-ratified. Rather they are agreements about interpretation and implementation of treaty language.

Minute 316

The first of these series of "Minutes" since the joint statement was issued, in August 2007, was Minute 316. Minute 316 became effective on April 16, 2010, and spelled out the actions that the US and Mexico would take to allow a pilot run of the Yuma Desalting Plant. This pilot run was conducted in 2010 and 2011 to: collect data and cost information; test the plant operations after having implemented changes to operations over the last several decades; and ascertain if any additional changes would be needed to operate the plant over the long term. Operation of the plant could negatively affect the Cienega de Santa Clara — an important wetland for birds and other wildlife in Mexico — by intercepting water (approximately 30,000 acre-feet) that would normally reach the Cienega. Because of this, the US, Mexico, and the Basin States, as well as several Lower Colorado Basin water providers and concerned **n**on-**g**overnmental **o**rganizations (NGOs) agreed to provide water to offset these depletions to the Cienega. The US, Mexico, and the NGOs each agreed to provide at least 10,000 acre-feet of water to the Cienaga through the Welton Mohawk Bypass Drain (see map). By the time the pilot run was completed, each of these three commitments had been met. Minute 316 was a success, and that success paved the way for additional bi-national cooperation.

Minute 317

Minute 317, executed in 2010, reconfirmed the process established in the earlier adopted "terms of reference," and added a new component: the "Consultative Council." The bi-national Consultative Council is made up of representatives of the International Boundary Waters Commission (IBWC), the respective federal governments, and the basin states. The charge of the Consultative Council is to assist the IBWC

Colorado River Basin

in the consideration of legal, administrative, and policy issues related to opportunities for cooperation associated with management of the Colorado River. Minute 317 laid the framework for consideration of additional minutes (like Minute 318 and 319) that followed.

Minute 318

Minute 318 continued to break through institutional and legal barriers to allow the US and Mexico to work together to meet mutual goals. This Minute arose out of a catastrophe that occurred in Mexico on Easter weekend in April 2011. A 7.2 magnitude earthquake in the Mexicali area damaged hundreds of miles of canals, and other infrastructure in Mexico that is used to convey water throughout Mexico. The earthquake killed four people and injured many others. The earthquake also caused damage within the US. In the months following this earthquake, the Consultative Council worked to see if there was a way that Mexico could, for the first time in history, store its annual water allocation in US reservoirs to take for use in a later year once the Mexican infrastructure had been repaired. This had benefits within the US by temporarily raising pool levels in Lake Mead and other US reservoirs to help avoid Reclamation declaring a regulatory shortage in the Lower Basin of the Colorado River. Shortages in the Lower Basin are prescribed pursuant to the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Reservoir Operations for Lake Powell and Lake Mead (2007 Interim Guidelines). Pursuant to the 2007 Interim Guidelines, shortages in the Lower Basin occur when Lake Mead's level drops below elevation 1075 and in November 2010, Lake Mead dropped to within seven feet (elevation 1082) of a declared shortage. Later in 2011, the Colorado River Basin saw a record runoff that alleviated the possibility of a declared shortage for the next several years. Since the adoption of Minute 318, Mexico has stored more than 157,000 acre-feet in US reservoirs for later delivery. It is important to note that this Minute would not have been possible without the cooperation and agreement of Reclamation and the Basin States. While Minute 318 was a humanitarian effort and was created out of circumstances beyond the parties' control, the parties rose to the occasion and paved the way for the adoption of Minute 319.

Mexican Infrastructure

Allocation Storage

Mexico's Storage

Minute 319

On November 20, 2012, in San Diego, California, Secretary of the Interior Ken Salazar, representatives of the US Bureau of Reclamation, US Commissioner of the IBWC Edward Drusina, the Basin States' representatives and their Mexican counterparts, signed Minute 319 and the supporting agreements. This agreement has been described by the Secretary of the Interior (and others) as the most important agreement between the US and Mexico on the Colorado River since the signing of the 1944 Water Treaty between the US and Mexico. Others have described the agreement as "momentous," "monumental," and a "blueprint" for future water agreements "across the globe." While the agreement is only a five-year agreement, it is an extraordinary agreement and it accomplishes a number of breakthroughs in water management on the Colorado River.

First, this agreement extends and builds on Minute 318 in that it allows Mexico to defer its annual deliveries for use in a later year through December 31, 2017. The idea that Mexico can convert its annual treaty allocation to Intentionally Created Mexican Allocation (ICMA) is monumental in and of itself. ICMA allows Mexico to control its own destiny by allowing storage of water that is not needed in one year, for use in a subsequent year when needs may be greater.

Deferred Delivery & Storage

Second, the agreement provides that Mexico will accept voluntary reductions in deliveries during certain low elevation reservoir conditions and that Mexico will share in increases during certain high elevation reservoir conditions. This Minute maintains the framework agreed to in the original 1944 Water Treaty. However, it provides new flexibility for Mexico by giving Mexico the option to store water in times of plenty so that it can use its reserves as reservoir levels decline. Minute 319 also included adjustment of salinity levels established under Minute 242, which relates to salinity levels of the water delivered to Mexico that the US must meet under the 1944 Water Treaty. This adjustment protects the US from any negative impact that may result from any increases in salinity that would result from Mexico storing water in the US to create ICMA reserves.

Voluntary Reductions

Salinity Levels

Third, Minute 319 recognizes the importance of the Colorado River limotrophe (area adjacent to the river) and the delta ecosystem, and provides a means to create almost 160,000 acre-feet of water for base flow and pulse flows for the Colorado River limotrophe and its Delta. This pilot program will explore the aspects involved in creating water for the environment, and an ICMA to Intentionally Created Surplus (ICS) exchange project. This pilot program relies on the Consultative Council to prepare a delivery plan for review and execution, if acceptable, by the IBWC and its Mexican counterpart. It also provides for the contribution of $21 million dollars from the US (and US entities) to Mexico for infrastructure and environmental projects in Mexico. In return for the infrastructure investments by the US, Mexico will provide to the US 124,000 acre-feet of water that will be converted from ICMA (for use within Mexico only) to ICS (for use within the US only). ICS is a type of "surplus" water that can be created and stored within the Lower Basin of the Colorado River for use at a later time. There are essentially four types of ICS water: 1) tributary conservation ICS; 2) Groundwater imported ICS; 3) system efficiency ICS; and 4) extraordinary conservation ICS. ICS is the equivalent of ICMA, but for the Lower Colorado Basin states within the US.

Pulse Flows

"Surplus" Water Creation

Colorado River Basin

Potential Projects

High Flow Experiment

Compliance Documents

Ecosystem Functions

Storage Level Protection

Finally, Minute 319 provides for the exploration and implementation of certain projects that could provide bi-national benefits. Some of these projects include: 1) the restoration of the Miguel Aleman Site in Mexico; 2) water conservation projects; 3) projects associated with system operations including the conveyance of Mexican water through the All-American Canal; and, 4) new water sources projects. Clearly, Minute 319 takes the US-Mexico partnership associated with the Colorado River to a new level.

ACTING: HIGH FLOW EXPERIMENT

The release of thousands of cubic feet per second epitomizes the word "action." For the first time in four years, the Department of the Interior performed another High Flow Experiment (HFE) by releasing water out of Lake Powell through the bypass tubes at Glen Canyon Dam, after establishing a protocol for allowing these HFEs to occur when there is a certain amount of sediment available in the system downstream from Glen Canyon Dam.

Glen Canyon High Flow Experiment

This past year, Reclamation, the Basin States, Colorado River basin tribes, and a number of other stakeholders, worked on the environmental compliance documents associated with establishing the High Flow Experimental Protocol (HFE Protocol) and the Non-Native Fish Control (NNFC) for managing the Colorado River between Glen Canyon Dam and Lake Mead. The two Environmental Assessments (EAs) were completed in May 2012, and the decisional documents for both the protocol and the control efforts can be found at: www.usbr.gov/uc/envdocs/index.html. The NNFC decisional documents have not been used to support specific actions by Reclamation, to date, because the non-native fish populations and the endangered Humpback Chubb populations have both been rising in recent years. Secretary Salazar triggered the first HFE under the new HFE Protocol on November 19, 2012 (the day before the signing of Minute 319) — declaring it to be a "historic milestone."

The HFE test this past November was intended to use the inflow of additional sediment and sand from the Pariah River that occurred this year in the fall to create additional sandbars, beaches for recreational use, and for other purposes. This test will also allow scientists to continue to develop a body of scientific knowledge in order to better understand how the Colorado River ecosystem functions and changes under different operational regimes. There have been three other HFEs in recent history (1996, 2004, and 2008) and with each one of those HFEs the scientists working on Grand Canyon issues have learned different lessons. Importantly, Lake Powell and Lake Mead will be operated so that the HFE will not affect their end of water year levels. Lakes Powell and Mead are important resources for the Colorado River Basin States and they must be operated in a way to comply with the "Law of the River," the body of law that includes interstate compacts, treaties, federal laws, US Supreme Court decisions, federal decisions, and more specifically, to comply with the 2007 Interim Guidelines.

CONCLUSION

I suspect that this will only be the first in a number of HFEs that will occur over the next ten years. Hopefully, the experimental design, the planning and consultation efforts, and the associated monitoring will all improve from this past year's HFE, but only time will tell. Moreover, this same cast of characters has started the initial groundwork to help the Department of the Interior decide how to manage Glen Canyon Dam Releases, within the parameters of the established Law of the River and the 2007 Interim Guidelines.

The Basin Study will certainly result in additional workshops and meetings to help frame where we go from here. Implementation of Minute 319 has already begun, and will certainly raise new issues and questions. There will be no shortage of work for those involved in Colorado River management decisions in 2013 and beyond.

For Additional Information:
Ted Kowalski, Colorado Water Conservation Board, 303/ 866-3441 x3220 or ted.kowalski@state.co.us

Ted Kowalski is the Chief of the Interstate, Federal and Water Information Section of the Colorado Water Conservation Board. The Colorado Water Conservation Board was established in 1937 to protect and develop Colorado's water resources for the benefit of present and future inhabitants of the State. Ted Kowalski manages this section, which is responsible for overseeing the Upper Colorado Endangered Fish, the San Juan River, and the Platte River Recovery Implementation Programs for the State of Colorado. For the last ten years, he has also represented Colorado in a number of federal, interstate, and international negotiations related to the Colorado River. He has testified before US Congress, before the Colorado General Assembly, and before a number of water courts and administrative bodies. He has also appeared on Rocky Mountain PBS-Colorado State of Mind, presented at dozens of water conferences and seminars, and written articles for the Denver Water Law Review, *The Water Report*, and the Colorado Water Law Benchbook. Before working for the Water Supply Protection Section, Ted Kowalski worked for the Stream and Lake Protection Section protecting Colorado's instream flow water rights. Previously, he was employed by the Colorado Office of the Attorney General, as an Assistant Attorney General in the Water Unit where he represented the State Engineer, the Colorado Water Conservation Board, the Division of Wildlife, and other State agencies. He graduated from the University of Colorado School of Law and obtained his undergraduate degree from Cornell University.

WATER BRIEFS

WATER MARKETING CA

GROUNDWATER BANKING

The Public Policy Institute of California released a report in November entitled "California's Water Market, By the Numbers, Update 2012" by Elaine Hanak and Elizabeth Stryjewski. This report provides an overview of the policy context for water marketing and the related practice of groundwater banking and summarizes recent trends in both areas.

The water market enables the temporary, long-term, or permanent transfer of the rights to use water in exchange for compensation. The ability to transfer these rights adds flexibility to the state's water supply — helping to address temporary drought conditions and to accommodate longer-term changes in the pattern of demand. Groundwater banking involves the deliberate storage of surface water in aquifers during relatively wet years, for use in dry years. California has considerable capacity to engage in such banking, with suitable aquifers in many population and farming centers. In many of these aquifers, years of overdraft — when withdrawals exceed natural recharge — have made substantial storage space available. Groundwater banking is a relatively cost-effective way to augment California's overall potential to store water, particularly for dry years (California Department of Water Resources, 2009; Hanak et al., 2011).

Both tools are part of a modern water management portfolio that will enable California to manage its water resources sustainably, benefitting both the economy and the environment. Given the physical, financial, and environmental limits on expanding overall water supplies in California and the prospect of supply reductions caused by a warming climate, both tools are likely to become increasingly important.

For many water managers, groundwater banks and water markets are complementary tools for accessing and managing supplies. A well-functioning water market also facilitates groundwater banking, because it enables managers to purchase and bank additional water for later use. Likewise, well-functioning groundwater banking programs can augment the volume of water available for lease or sale by moving water from wetter to drier periods. Both the water market and groundwater banks help tie together California's often fragmented water infrastructure, and they increase incentives for local water managers in different parts of the state to cooperate.

State and federal policies have supported water marketing and groundwater banking in California over the past several decades through a suite of actions, including legal changes to facilitate marketing, direct purchases of water, grants to help fund groundwater banking infrastructure, and other policy initiatives. But while state and federal agencies oversee most water transfers, no official publications track the evolution of the market as a whole. Similarly, no official repository exists that documents the evolution of groundwater banking in California.

Jump-started by a prolonged drought in the late 1980s and early 1990s, the water market now accounts for roughly 5 percent of all water used annually by California's businesses and residents (about 2 million acre-feet of water trades are committed annually, with around 1.4 million acre-feet in actual flows exchanging hands). Over time, the market has shifted from primarily short-term (single-year) contracts to one dominated by longer-term and permanent trades. Farmers are the primary source of water, and the destinations include other farmers, cities, and the environment. Market growth has slowed since the early 2000s, reflecting a variety of infrastructure and institutional constraints, including new pumping restrictions in the Sacramento-San Joaquin Delta (a major conveyance hub) and more complicated approval procedures.

Although water agencies in several parts of the state have engaged in active groundwater storage for local water users for some decades, the practice accelerated in the mid-1990s with a new form of banking involving storage for offsite parties. These water banks — located in Kern County and Southern California — had built up reserves of nearly 3.4 million acre-feet by 2006. During the drought of the late 2000s, they made nearly 1.9 million acre-feet available to their depositors, considerably more than the drought-related water market sales. In Kern County, where basin management is still voluntary, these withdrawals have sparked controversies because they occurred during a time when overall groundwater levels were falling.

The report offers a number of recommendations for strengthening these tools and fostering their responsible development, including the following:

- Address infrastructure weaknesses in the Delta, which have already limited the market's ability to furnish dry-year water supplies, and which have begun to limit the availability of wet-year water supplies to replenish groundwater banks.
- Clarify and simplify the institutional review process for transfers, while continuing to prevent harm to the environment and adverse effects for other legal users of the state's waters.
- Strengthen local groundwater management to support both marketing and groundwater banking. Outside pressure — with a credible threat that the state would step in if local agencies fail to do so — might be the best way to proceed, ideally accompanied by positive financial incentives to improve basin management.
- Develop models for mitigating the economic effects of large-scale land fallowing deals. Economic shifts make it likely that some cropland will be permanently retired in the future, and alleviating the community-related effects of fallowing would help ease economic transitions.
- California should continue to pursue — and find the funds to support — environmental water purchases, which can help reduce the conflicts associated with reallocating water to the environment while improving the efficiency of environmental water management.
- Because routinizing marketing and banking transactions will require some risk-taking, high-level state and federal officials should be involved. One option might be to develop a coordinating committee from relevant agencies, with the authority to facilitate discussions and transactions.

For info: Full Report available at: www.ppic.org/main/publication.asp?i=1041

WATER BRIEFS

Texas v. New Mexico **TX/NM**
RIO GRANDE COMPACT

On January 8, the state of Texas filed a complaint with the US Supreme Court (Court), asking the Court to command New Mexico to deliver water apportioned to Texas under the 1938 Rio Grande Compact (Compact). The Compact was entered into between the states of Texas, New Mexico, and Colorado to divide the waters of the Rio Grande. Due to New Mexico's ongoing litigation to avoid its water obligation, Texas finally felt compelled to act to protect its rights to the water legally apportioned to it, according to the Texas Commission on Environmental Quality's (TCEQ's) press release. "It is unfortunate that we have had to resort to legal action, but negotiations with New Mexico have been unsuccessful, and Texas is not getting the water that it is allocated and legally entitled to," said TCEQ Commissioner Carlos Rubinstein. Rubenstein maintains that New Mexico is engaged in litigation in both state and federal courts in New Mexico in an attempt to circumvent the Rio Grande Compact and the operation by the US of the Rio Grande Project. TCEQ is asserting that farmers in Texas and the City of El Paso — which relies on Texas' water allocation for half of its water supply — are being negatively impacted by illegal diversions by the state of New Mexico.

TCEQ maintained that historically, water apportioned under the Compact has resulted in approximately 57% of the water supply below Elephant Butte Reservoir being delivered to New Mexico, and 43% being delivered across the New Mexico-Texas state line for Texas use. They also stated that New Mexico has allowed a reduction of Texas' water supplies and the apportionment of water it is entitled to under the Compact by illegally allowing diversions of both surface and underground water hydrologically connected to the Rio Grande downstream of Elephant Butte Reservoir. TCEQ believes that the diversions of water through 2011 have amounted to tens of thousands, if not hundreds of thousands, of acre-feet annually. "Essentially, New Mexico is delivering water to Texas at Elephant Butte Reservoir and then re-diverting Texas' water below the reservoir as it is being released to Texas." TCEQ Press Release.

The State of Texas is requesting no action from Colorado — it was included only because that state is a signatory to the compact. The US Supreme Court has original and exclusive jurisdiction of this suit. In addition to requesting the Court to issue a decree on Texas' rights under the Compact and the Rio Grande Project Act, Texas is also seeking "damages and other relief, including pre- and postjudgment interest, for the injury suffered by the State of Texas as a result of the State of New Mexico's past and continuing violations of the Rio Grande Compact and the Rio Grande Project Act." *Complaint* at 16.

For info: Terry Clawson, TCEQ, 512-239-0046; Complaint available at: www.tceq.texas.gov/assets/public/agency/01-08-13-motion-complaint-brief.pdf; Rio Grande Compact info at New Mexico State Engineer's Office website: www.ose.state.nm.us/isc_rio_grande_compact.html

COLORADO BASIN STUDY **SW**
WATER SUPPLY & DEMAND

On December 12, Secretary of the Interior Ken Salazar announced the release of a study — authorized by Congress and jointly funded and prepared by the Bureau of Reclamation and the seven Colorado River Basin states — that projects water supply and demand imbalances throughout the Colorado River Basin and adjacent areas over the next 50 years. The *Colorado River Basin Water Supply and Demand Study*, the first of its kind, also includes a wide array of adaptation and mitigation strategies proposed by stakeholders and the public to address the projected imbalances. The Study did not result in a decision as to how future imbalances should or will be addressed. Rather, the Study provides a common technical foundation that frames the range of potential imbalances that may be faced in the future and the range of solutions that may be considered to resolve those imbalances.

The average imbalance in future supply and demand is projected to be greater than 3.2 million acre-feet by 2060, according to the study. One acre-foot of water is approximately the amount of water used by a single household in a year. The study projects that the largest increase in demand will come from municipal and industrial users, owing to population growth. The Colorado River Basin currently provides water to some 40 million people, and the study estimates that this number could nearly double to approximately 76.5 million people by 2060, under a rapid growth scenario. The River and its tributaries supply water used to irrigate nearly 5.5 million acres of land, provides hydropower for more than 4,200 megawatts of generating capacity, and is also the lifeblood for at least 22 federally recognized tribes.

The Colorado River system is operated in accordance with the "Law of the River," an array of treaties, compacts, decrees, statutes, regulations, contracts and other legal documents and agreements applicable to the allocation, appropriation, development, exportation, and management of the waters of the Colorado River Basin. Apportioned water in the Basin exceeds the approximate 100-year record (1906 through 2011) Basin-wide average long-term historical natural flow of about 16.4 **m**illion **a**cre-**f**eet (maf). However, the Upper Basin States have not fully developed use of their 7.5-maf apportionment, and total consumptive use and losses in the Basin has averaged approximately 15.3 maf over the last ten years. Because of the Colorado River system's ability to store approximately 60 maf, or nearly 4 years of average natural flow of the river, all requested deliveries were met in the Lower Basin despite recently experiencing the worst 11-year drought in the last century.

For additional details on the Study, see earlier articles in *The Water Report* #90 and #100, and the full Report at Reclamation's website below.

For info: Pam Adams, 702-293-8500, ColoradoRiverBasinStudy@usbr.gov or www.usbr.gov/lc/region/programs/crbstudy.html

WATER BRIEFS

TRANSBOUNDARY CASE US
POLLUTION LIABILITY UNDER US LAW

On December 14, a federal judge in the US District Court in Yakima, Washington issued a ruling that Canadian mining and smelting company Teck Metals Ltd. (Teck) is liable under US environmental law for contaminating the Columbia River with millions of tons of smelting waste. *Pakootas v. Teck*, CV-04-256 (12/14/12). Jim Pendowski, manager of the Washington Department of Ecology's Toxics Cleanup Program issued the following statement: "The District Court has made a just decision in holding Teck Metals responsible for pollution in Washington that came from the company's smelting facility in Trail, B.C. Teck discharged an immense amount of waste to the river over the last century, in close proximity to the border. This included 10 million tons of slag waste, much of which visibly accumulated along the beds and beaches of the river in Washington State. Experts in the case confirmed Teck to be the dominant source of metals contamination in the Columbia River, south of the border. These facts fully support the court's ruling. The State and Tribes can now recover from Teck their costs for responding to the contamination in Washington. This will also ultimately allow the federal government, in conjunction with the State and Tribes as resource trustees, to hold Teck Metals accountable to perform cleanup and to restore or compensate for natural resources injured by the contamination. Had the court not found Teck liable, the burden of paying for a long and expensive cleanup could have fallen on taxpayers."

In the "Findings of Fact and Conclusions" Judge Lonny Suko stated, "Pursuant to CERCLA, 42 U.S.C. § 9607(a)(4)(A), Teck is jointly and severally liable to the Tribes and the State in any subsequent action or actions to recover past or future response costs at the UCR site." *Slip Op*. at 43. The opinion stated that the "UCR site includes the reaches of the Columbia River from immediately downstream of the international border to the Grand Coulee Dam." *Id*. at 2. The decision also noted that "Phase I of this litigation regarding liability for response costs is now concluded. Phase II will concern liability for natural resource damages." *Id*. at 44. Among the many damning factual findings in the decision, the court found that "[B]etween 1930 and 1995, Teck discharged at least 9.97 million tons of slag directly into the Columbia river via outfalls at its Trail smelter. This discharge was intentional." *Id*. at 5. For additional details regarding the case, see Du Bey, TWR #15 and #18 and Du Bey, Clark & Weir, TWR #85.
For info: Decision at: www.waed.uscourts.gov/opinions/04-256-lrs-1955.pdf

CLIMATE CHANGE PLAN US
EPA STRATEGY

EPA released the "National Water Program 2012 Strategy: Response to Climate Change" in December. It describes how EPA's water-related programs plan to address the impacts of climate change and provides long-term visions, goals, and strategic actions for the management of sustainable water resources for future generations. The strategy, which builds upon EPA's first climate change and water strategy released in 2008, focuses on five key areas: infrastructure, watersheds and wetlands, coastal and ocean waters, water quality, and working with Tribes. It emphasizes working collaboratively with partners and stakeholders, developing information and tools, incorporating adaptation into core programs, and managing risks of impacts including from extreme weather events. The 2012 strategy also includes goals and strategic actions for EPA in 10 geographic climate regions.
For info: www.epa.gov/water/climatechange

DRILLING LEASES WY
CONSERVATION PURCHASE

The Trust for Public Land (TPL), working with a broad coalition of environmental organizations, concerned citizens, and more than 1,000 donors, announced January 2 it has completed a transaction to purchase oil and gas leases on 58,000 acres of sensitive land in Wyoming's Hoback Basin. The acquisition means that affected land inside the Bridger-Teton National Forest near Grand Teton National Park will be forever saved from oil and gas drilling and preserved for hunting, fishing, and recreation. TPL purchased the leases from Plains Exploration & Production Company. Local and national supporters joined forces to raise the $8.75 million needed to meet the December 31 purchase deadline.

The Hoback Basin is beloved by local residents for its rich hunting and fishing grounds and astounding natural beauty. The land affected by the oil and gas leases acquired under this agreement includes the headwaters of the Hoback River, a congressionally designated wild and scenic river. The river was named America's 5th most endangered in 2012 by American Rivers. The Hoback Basin is also a crucial pathway for migrating animals including mule deer, pronghorn antelope, and elk.

Approximately 85 percent of the acquired leases fall within the boundaries of the Wyoming Range Legacy Act, a landmark land conservation measure signed into law as part of the Omnibus Public Land Management Act of 2009. Among other provisions, the Legacy Act allows leases to be retired permanently when bought out, instead of being re-sold to other oil and gas companies. TPL will hold title to the remaining leases for a limited time while developing a long-term retirement solution with state and federal officials.
For info: www.tpl.org

ORPHAN MINE SITES US
"GOOD SAMARITANS" LIABILITY

On December 12, EPA issued a memorandum to its regional offices that encourages cleanup activities at hard rock abandoned mine sites. The memorandum is intended to reduce the perceived Clean Water Act (CWA) legal vulnerability faced by "Good Samaritans" who want to clean up their communities. There are hundreds of thousands of abandoned mine sites across the nation and many pose serious health, safety, and environmental

WATER BRIEFS

hazards. Many community organizations have been looking at opportunities to clean up these sites and EPA's memorandum clarifies that these "Good Samaritans," or non-liable parties, who volunteer to clean up these abandoned sites are generally not responsible for obtaining a permit under the CWA both during and following a successful cleanup.
For info: http://water.epa.gov/action/goodsamaritan

SOUTH PLATTE WELLS CO
OVER-AUGMENTATION DAMAGE

Conflict between groundwater and surface water users on the South Platte River has been a concern in Colorado. At issue currently is whether the strict augmentation of water supplies now required of those who use wells is actually over-augmenting the alluvial aquifer, causing damage from high water tables. The Colorado Water Institute (CWI) at Colorado State University is studying the issue under the direction of the state legislature. Members of the CWI study team will meet with stakeholders and the public in Longmont, Sterling, and Gilcrest, Colorado, in January to inform people about the study and to facilitate dialogue (see Calendar, this *TWR*).

Earlier this year, Colorado HB 12-1278 was passed, authorizing the first comprehensive study since the landmark study of 1968 that preceded the "Water Right Determination and Administration Act of 1969." That act was Colorado's attempt to bring groundwater under the same prior appropriation system as surface water rights. "It's time for the state to evaluate the relative success of augmentation plans authorized by the 1969 Act to meet the dual goals of protecting senior surface water diverters and maximizing the use of both groundwater and surface waters of the state," said Rep. Randy Fischer, one of the bill's sponsors. CSU's work collecting and analyzing available data is intended to bring objectivity to this polarizing issue. Results are due to the state legislature in December 2013.
For info: www.cwi.colostate.edu/southplatte/index.html

EPA FRACKING STUDY US
UPDATE RELEASED

On December 21, EPA provided an update on its ongoing national study currently underway to better understand any potential impacts of hydraulic fracturing on drinking water resources. Results of the study, which Congress requested EPA to complete, are expected to be released in a draft for public and peer review in late 2014. The update outlines work currently underway, including the status of research projects that will inform the final study. EPA noted that while this progress report outlines the framework for the final study, it does not draw conclusions about the potential impacts of hydraulic fracturing on drinking water resources, which will be made in the final study.

Among the information released are updates on 18 research projects and details on the agency's research approach as well as next steps for these ongoing projects and analyses. The update follows the November 2011 release of the agency's final study plan, which underwent scientific peer review and public comment. EPA has engaged stakeholders, including industry, to ensure that the study reflects current practices in hydraulic fracturing. EPA continues to request data and information from the public and stakeholders and has put out a formal request for information which can be accessed through the federal register at: www.federalregister.gov/articles/2012/11/09/2012-27452/request-for-information-to-inform-hydraulic-fracturing-research-related-to-drinking-water-resources.

The study has been designated a Highly Influential Scientific Assessment, meaning it will receive the highest level of peer review in accordance with EPA's peer review handbook before it is finalized. The 2014 draft report will synthesize the results from the ongoing projects together with the scientific literature to answer the study's main research questions. EPA's Science Advisory Board (SAB) is forming a panel of independent experts which will review and provide their individual input on the ongoing study to EPA. The SAB will provide an opportunity for the public to offer comments for consideration by the individual panel members. For more information on the SAB process, please visit: http://yosemite.epa.gov/sab/sabpeople.nsf/WebCommittees/BOARD
For info: www.epa.gov/hfstudy

PATHOGENS RULE UPDATE US
LIMIT FOR E. COLI

On December 20, EPA updated the rule for pathogens in drinking water, including setting a limit for the bacteria E. coli to better protect public health. The Revised Total Coliform Rule ensures that all of the approximately 155,000 public water systems in the US, which provide drinking water to more than 310 million people, take steps to prevent exposure to pathogens like E. coli. Pathogens like E. coli can cause a variety of illnesses with symptoms such as acute abdominal discomfort or, in more extreme cases, kidney failure or hepatitis.

Under the revised rule, public drinking water systems are required to notify the public if a test exceeds the maximum contaminant level (MCL) for E. coli in drinking water. If E. coli or other indications of drinking water contamination are detected above a certain level, drinking water facilities must assess the system and fix potential sources and pathways of contamination. High-risk drinking water systems with a history of non-compliance must perform more frequent monitoring. The revised rule provides incentives for small drinking water systems that consistently meet certain measures of water quality and system performance.

Public water systems and the state and local agencies that oversee them must comply with the requirements of the Revised Total Coliform Rule beginning April 1, 2016. Until then, public water systems and primacy agencies must continue to comply with the 1989 version of the rule. The Safe Drinking Water Act requires that EPA review each National Primary Drinking Water Regulation, such as the Total Coliform Rule, at least once every six years. The outcome of the review of the 1989 Total Coliform Rule determined

WATER BRIEFS

that there was an opportunity to reduce implementation burden and improve rule effectiveness while at the same time increasing public health protection against pathogens in the drinking water distribution systems.
For info: http://water.epa.gov/lawsregs/rulesregs/sdwa/tcr/regulation.cfm

SETTLEMENT EXTENDED CA/OR
KLAMATH RESTORATION AGREEMENT

All 42 original Settlement parties, comprised of Klamath River tribes, irrigation districts, conservation groups, fishermen, and local and state governments have agreed to extend the Klamath Basin Restoration Agreement (KBRA). The Klamath Water Users Association issued a press release on December 31st noting the extension. As originally drafted, the KBRA would have terminated on December 31, 2012 unless Congress passed authorizing legislation. Because it was increasingly clear that Congress would not act before the KBRA's self-imposed deadline, the Parties agreed to a KBRA amendment that would extend the deadline until December 31, 2014. The Klamath Hydroelectric Settlement Agreement does not have a termination date and the changes do not affect the proposed dam removal date of 2020.

Extension of the KBRA also advances the protection from potential senior tribal water right calls that may affect Project irrigators after the state files its Order of Determination in the Klamath River Basin Adjudication sometime in 2013. Under the KBRA, Project water users have agreed not to contest senior tribal water rights claims and, in turn as part of the settlement package, the Klamath Tribes will limit exercising those rights (whatever they turn out to be) against Project irrigators.

KWUA's press release also noted that in addition to extending the deadline for Congressional action, the amendments underscore that the KBRA does not create water rights and clarifies that Clear Lake, Gerber Reservoir, and the Lost River above Harpold dam are not required to provide water for delivery as part of the refuge allocation. Other amendments confirm issues related to funding and signatory tribe's roles in restoration activities; clarify procedures for use of Habitat Conservation Plans to provide protection from ESA regulation; clarify eligibility for the KBRA power program (aimed at reducing unsustainable irrigation power costs in the Project); adds a new party; and makes other relatively minor changes.
For info: Paul Simmons, KWUA Counsel, 916/ 446-7979; Summary and copy of the amendments available at: www.klamathcouncil.org

STORMWATER RULING US
US SUPREME COURT

On January 8, 2013 the US Supreme Court issued the first of two rulings on Clean Water Act stormwater permitting cases argued in December 2012. (The second, yet to be decided as we go to print, involves logging roads and stormwater runoff.)

The Court reversed an earlier decision in the 9th Circuit involving urban stormwater and held that the discharge of pollutants from an improved portion of a waterway into an unimproved portion of the same waterway does not require a permit (*Los Angeles County Flood Control District v. NRDC*, U.S., No. 11-460, 1/8/13).

The lower court had ruled that Los Angeles County Flood Control District violated its permit by channeling polluted stormwater from concrete-lined to unlined portions of the Los Angeles and San Gabriel rivers (*NRDC v. County of Los Angeles*, (9th Cir. 2011)). The Supreme Court granted review to determine whether water flowing from one portion of a river through an artificial channel into another portion of the same river constituted a discharge subject to Clean Water Act permitting requirements.

The Supreme Court's decision reaffirmed that the transfer of polluted water between two parts of the same water body generally does not constitute a "discharge of pollutants" citing its prior 2004 decision in *South Florida Water Management District v. Miccosukee Tribe of Indians*, 541 U.S. 95, 105, 58 ERC 1001 (2004).

"I hope the decision can remove some of the uncertainty on jurisdiction without removing any incentives for municipalities and water managers to monitor and protect downstream water quality," added Ben Grumbles, President of the US Water Alliance. "The decision will be one of the hot topics discussed at the US Water Alliance's fourth annual Urban Water Sustainability Leadership Conference, which is being held in Los Angeles in September 2013."
Source: US Water Alliance website: www.uswateralliance.org
For Info: The Supreme Court decision is available at: www.supremecourt.gov/opinions/12pdf/11-460_3ea4.pdf

SHASTA LAKE COMMENTS CA
WATER RESOURCES INVESTIGATION

On December 7, the Bureau of Reclamation (Reclamation) announced an extension of the comment period for the Draft Feasibility Report on the Shasta Lake Water Resources Investigation to Monday, January 28. The public comment period was scheduled to end on December 28.

Reclamation initially released the Draft Feasibility Report in February 2012. Any additional comments from interested individuals, agencies, and organizations will be accepted through January 28. All comments received will be considered as Reclamation completes the remaining engineering, environmental, economic, and financial studies and related reports.

The Draft Feasibility Report is available on Reclamation's website at www.usbr.gov/mp/slwri/index.html. To request an electronic copy of the draft documents, contact Louis Moore at 916-978-5106 (TTY 916-978-5608) or by email at wmoore@usbr.gov. Written comments can be submitted via email to BOR-MPR-SLWRI@usbr.gov or by mail to: Katrina Chow, Project Manager, Bureau of Reclamation, 2800 Cottage Way, MP-720 Sacramento, CA 95825-1893.
For info: Katrina Chow, Reclamation, 916-978-5067; Additional information about the Shasta Lake Water Resources Investigation at: www.usbr.gov/mp/slwri/index.html.

CALENDAR

January 15 OR
Endangered Species & the Ruby Pipeline Brownbag, Portland. Stoel Rives LLP, 900 SW Fifth Ave., Ste. 2600, 12-1:30pm. Sponsored by Environmental & Natural Resources Section. For info: RSVP to Anzie.Nelson@portofportland.com

January 22-24 ID
Idaho Water Users Ass'n 76th Annual Convention, Boise. Riverside Hotel. For info: www.iwua.org/

January 22-24 FL
Underground Injection Control Conference 2013: Aquifer Management & Underground Injection, Sarasota. Lido Hotel. Sponsored by Ground Water Protection Council. For info: www.gwpc.org/events

January 23 CA
Beyond the Water Wars: Cooperative Management Solutions for a Shared Resource (Symposium), Davis. UC Davis. Sponsored by California Water Law Symposium. For info: www.waterlawsymposium.com/

January 23 CA
Reining in the Rain: "Low Impact Development" Site Design & Permeable Pavements for Stormwater Management Workshop, Eureka. The Wharfinger Bldg, 1 Marina Way. Presented by North Coast Stormwater Coalition. For info: http://northcoaststormwatercoalition.org/events

January 24 OR
Managing Environmental Enforcement Risk Seminar, Tigard. Oregon State BAR Ctr., 16037 SW Upper Boones Ferry Road. For info: www.osbarcle.org

January 24-25 WA
19th Annual Endangered Species Act Seminar, Seattle. Red Lion Hotel on 5th. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

January 25 OR + WEB
Development of Regional Climate Scenarios & Their Application Seminar, Corvallis. 202 Kidder Hall - OSU or WEB. Phil Mote, Director, Oregon Climate Change Research Institute. For info: http://water.oregonstate.edu/ww2100/calendar

January 28-30 AZ
Energy, Utility & Environment Conference 2013, Phoenix. Phoenix Convention Ctr. For info: www.euec.com

January 28-31 NV
2013 Nevada Water Resources Ass'n Annual Conference Week, Reno. Peppermill Resort Spa & Casino. For info: www.nvwra.org

January 30 OR
2013 Oregon State Legislative Session - Outlook for Sustainability Initiatives Briefing, Portland. Tonkon Torp LLP, 888 SW Fifth Ave. Sponsored by Sustainable Future Section Oregon BAR. For info: RSVP to nhawkins@stoel.com; www.osbar.org

February 1 CA
GIS for Watershed Analysis: Advanced Course, Davis. UC Davis, 1137 Lab, Plant & Enviromental Sciences. For info: UC Davis Extension, 800/ 752-0881 or http://extension.ucdavis.edu/

February 4 CO
Hydrogeology Fundamentals & Refresher Course, Denver. Sponsored by National Ground Water Ass'n. For info: www.ngwa.org

February 4-5 CA
California Irrigation Institute Annual Conference: Embracing Innovation - The Next Generation, Sacramento. Arden West Hilton. For info: www.caii.org

February 4-8 WA
12th Annual RRNW Stream Restoration Symposium, Stevenson. Skamania Lodge. Sponsored by River Restoration Northwest. For info: www.rrnw.org/

February 5 CA
Investing in California's Water Seminar, Santa Monica. Sheraton Delfina. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

February 6 CA
CEQA Update, Issues & Trends Course, Sacramento. Sutter Square Galleria, 2901 K Street. For info: UC Davis Extension, 800/ 752-0881 or http://extension.ucdavis.edu/

February 6 CA
Ecological & Environmental Mitigation Banking Seminar, Santa Monica. Sheraton Delfina. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

February 6-7 CO
Fundamentals of Groundwater Geochemistry Course, Denver. Sponsored by National Ground Water Ass'n. For info: www.ngwa.org

February 6-8 CO
Low-Cost Remediation Strategies for Contaminated Soil & Groundwater Course, Denver. Sponsored by National Ground Water Ass'n. For info: www.ngwa.org

February 8 CA
Hydraulic Fracking Seminar, Santa Barbara. Bacara Resort & Spa. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

February 8 OR + WEB
Land-Use Models for Willamette Water 2100, Corvallis. 202 Kidder Hall - OSU or WEB. Andrew Plantinga, Bren School of Environmental Science & Management. For info: http://water.oregonstate.edu/ww2100/calendar

February 8 AZ
Rethinking Water Infrastructure: Philadelphia & San Francisco's Approaches to Implementing Stormwater Infrastructure Programs (Brownbag), Tucson. WRRC, 350 N. Campbell Ave., 12-1:30pm. Sponsored by Water Resources Research Ctr. For info: Jane Cripps, WRRC, 520/ 621-2526, jcripps@cals.arizona.edu or http://ag.arizona.edu/azwater/

February 10-13 CA
IECA Annual Conference - Environmental Connection: The World's Largest Soil & Water Event, San Diego. Town & Country Resort & Convention Ctr. Sponsored by International Erosion Control Ass'n. For info: www.ieca.org/conference/annual/ec.asp

February 14-15 DC
Natural Resources Damages Seminar, Washington. Thurman Arnold Bldg. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

February 20 CA
Low Impact Development - Biorention Design Course, Sacramento. Sutter Square Galleria, 2901 K Street. For info: UC Davis Extension, 800/ 752-0881 or http://extension.ucdavis.edu/

February 21-22 Ontario
2013 Stormwater & Urban Water Systems Modeling Conference, Toronto. Marriott Courtyard Toronto Brampton. For info: www.chiwater.com/Training/Conferences/conferencetoronto.asp

February 21-22 NV
2013 Family Farm Alliance Annual Meeting & Conference, Las Vegas. Monte Carlo Resort. For info: www.familyfarmalliance.org

February 22 OR
The Freshwater Trust Annual Gala & Auction, Portland. For info: www.freshwatertrust.org

CALENDAR

February 26-28 DC
Ass'n of California Water Agencies 2013 Washington D.C. Conference, Washington. Washington Court Hotel. For info: www.acwa.com/events/acwa-dc2013-annual-washington-dc-conference

February 27-28 GA
12th Annual Wetlands & Water Law Update, Atlanta. Hyatt Regency. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

February 28-March 3 OR
Earth: Too Big to Fail: PIELC Environmental Law Conference 2013, Eugene. University of Oregon. For info: www.pielc.org

March 1 IN
Great Lakes Natural Resource Goverance Symposium, Indianapolis. Indiana University School of Law. Call for Papers in October. For info: http://indylaw.indiana.edu/programs/ENR/symposium.htm

March 2 CA
Land Use Planning for Non-planners, Sacramento. Sutter Square Galleria, 2901 K Street. For info: UC Davis Extension, 800/ 752-0881 or http://extension.ucdavis.edu/

March 5 AZ
Water Security From the Ground Up: 2013 Annual Conference, Tucson. Student Union Memorial Ctr. Sponsored by Water Resources Research Ctr., Featured: Colorado River Basin Water Supply & Demand Study. For info: Jane Cripps, WRRC, 520/ 621-2526, jcripps@cals.arizona.edu or http://ag.arizona.edu/azwater/

March 5 CA
ACWA 2013 Legislative Symposium, Sacramento. Sacramento Convention Ctr. Sponsored by Ass'n of California Water Agencies. For info: www.acwa.com/events/acwa-2013-legislative-symposium

March 7 WA
Managing Stormwater in the Northwest Conference, Tacoma, Tacoma Convention Center. Presented by the NW Environmental Business Council and Co-Sponsored by *The Water Report.* For info: www.nebc.org

March 8 CA
Annual California Land Use Law Review & Update Course, Sacramento. Sutter Square Galleria, 2901 K Street. For info: UC Davis Extension, 800/ 752-0881 or http://extension.ucdavis.edu/

March 10-13 AZ
Water Utility Management Conference, Glendale. Renaissance Phoenix Glendale Hotel. Sponsored by American Water Works Ass'n & Water Education Foundation. For info: www.awwa.org/conferences/

March 11-15 CO
River Crossings: Linking River Communities - 2013 Research Conference & Workshop, Grand Junction. Colorado Mesa University. For info: Audrey Butler, 970/ 256-7400, abutler@tamariskcoalition.org or www.tamariskcoalition.org

March 14 GA
Endangered Species Act Seminar, Atlanta. Cobb Galleria Centre. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

March 14-15 NV
Law of the Colorado River Conference, Las Vegas. The Venetian. For info: CLE International, 800/ 873-7130 or www.cle.com/

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

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 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 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 16-19 Spain
12th International UFZ-Deltares Conference on Groundwater-Soil-Systems & Water Resource Manaagement (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. TENTATIVE. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

April 23 WA
9th Washington Hydrogeology Symposium, Tacoma. Hotel Murano. For info: http://depts.washington.edu/uwconf/hydrogeo/

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 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/

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CALENDAR

(continued from previous page)

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 6-7 AZ
17th Annual Water Reuse & Desalination Research Conference, Phoenix. Sheraton Downtown. For info: www.watereuse.org/foundation/research-conference-17

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

May 13-16 France
4th International Multidisciplinary Conference on Hydrology & Ecology, Rennes. Univerisite de Rennes. For info: http://osur.univ-rennes1.fr/HydroEco2013/

May 17-20 MO
River Rally 2013, St. Louis. Sponsored by River Network & Waterkeeper Alliance.

May 19-22 OH
World Environmental & Water Resources Congress 2013, Cincinnati. Duke Energy Convention Ctr. Sponsored by American Society of Civil Engineers. For info: http://content.asce.org/conferences/ewri2013/

June 5-7 NV
ABA Water Law Conference, Las Vegas. Red Rock Resort. Sponsored by the American Bar Ass'n. For info: www.americanbar.org/groups/environment_energy_resources.html

June 11-13 CA
Sustaining Water Resources & Ecological Functions in Changing Enviroments Conference, Lake Tahoe. Sponsored by Universities Council on Water Resources. For info: http://ucowr.org/conferences/item/36-2013-conference

June 24-26 CT
2013 AWRA Summer Specialty Conference: Environmental Flows, Hartford. Hilton Hotel. For info: www.awra.org/meetings/EnvironmentalFlows2013/