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Water Rights, Water Quality & Water Solutions in the West

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# WATER MARKETS & WATER TRANSFERS IN TEXAS

by Steve Kosub, Senior Water Resources Counsel, San Antonio Water System

### INTRODUCTION

Policy makers at all levels of government in Texas are slowly coming to grips with the reality that water demand is increasing while available water supplies are decreasing. Municipal water utilities are no longer able to satisfy customer demand by simply drilling a well or installing a pump to access free or inexpensive water in close proximity to their customers. Water rates that were once driven primarily by the cost of treatment and distribution must now also anticipate a substantial cost for acquiring and transporting raw water. New water supplies must be identified, secured, accessed, conveyed, and treated in complex transactions financed with hundreds of millions of dollars in long-term debt to be repaid with higher water rates. Water demand and supply are creating markets where none historically existed. However, these markets are constrained by regulatory uncertainty, regional protectionism, the absence of conveyance infrastructure, and artificially low water rates. As the public sector is forced to confront these challenges, opportunities for private sector involvement in water delivery will grow. Private sector involvement will encourage market expansion and bring new attention to problematic restrictions on water transfers.

### BACKGROUND

Webster's tells us that to transfer is "to convey, carry, remove, or send from one person, place, or position to another." The physical transfer of water in this sense is hardly remarkable; it has been occurring for time immemorial. Transfers from streams to buckets, from buckets to utensils, from wells or rivers or reservoirs to farms and distribution systems — these are the history of water supply. In Texas, however, the water supply historically was close to the point of use. Irrigators and municipalities alike generally had ready access to either nearby rivers or seemingly unlimited supplies of groundwater beneath their feet. This paradigm is rapidly changing.

The population of the State of Texas is expected to nearly double in the next fifty years to approximately 46 million people (*Water for Texas - 2012 State Water Plan*, Chapter 3, Population and Water Demand Projections). Meanwhile, existing water supplies are expected to decrease by ten percent as a result of groundwater depletion and silting of reservoirs. *Id.*, Chapter 5, Water Supplies. If temperatures rise and precipitation decreases as projected by climate models, Texas would see droughts of historic proportion in the mid-21st century. *Id*., Chapter 4, Climate of Texas.

The Texas Water Development Board defines "needs" as projected water demands in excess of existing supplies that would be legally and physically available during a drought of record. *Id*. at 176. In the event of severe drought conditions, the state faces an immediate "need" in this defined sense for additional water supplies of 3.6 million acre-feet per year. *Id*., Chapter 6, Water Supply Needs. Even without drought conditions, Texans are projected to need 8.3 million acre-feet per year of additional water supply by 2060 if the state collectively does not implement new water supply projects or management strategies. The scale of these numbers should resonate with water professionals when a single new project yielding 50,000 acre-feet costs hundreds of millions of dollars and requires years to develop (*see* http://carlsbaddesal.com/).

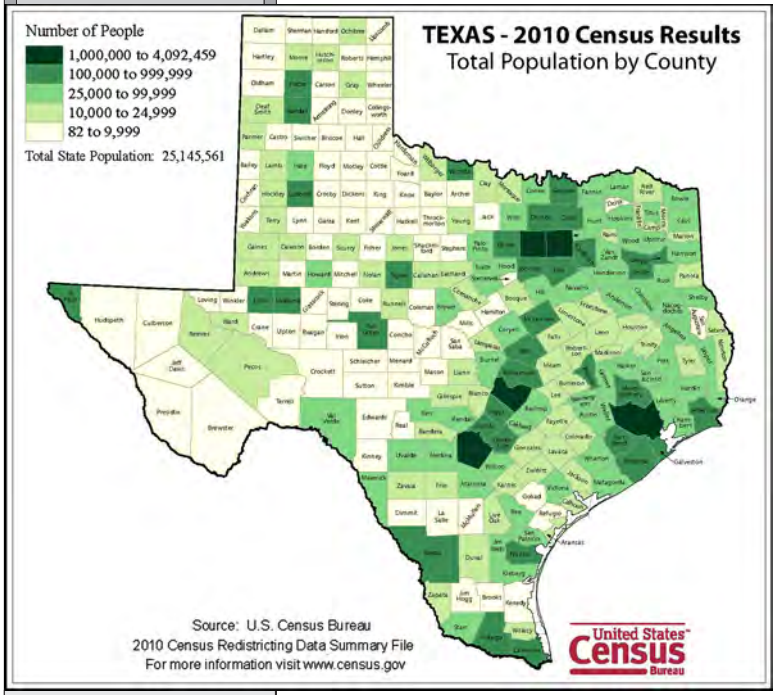
## Water Transfers

### Muni Needs

### Irrigation

The state's projected water needs are not evenly distributed by either geography or user groups. Municipal water use accounts for approximately nine percent of current needs, but that number is projected to grow to 41 percent (3.4 million acre-feet) by 2060. San Antonio and south central Texas are currently experiencing the greatest shortfall. However, by 2060, the majority of the municipal needs will occur in the Dallas-Fort Worth region (1,588,236 acre-feet), Houston (1,236,335 acre-feet), and the Lower Rio Grande Valley (609,906 acre-feet). The needs of the San Antonio region will grow to 436,751 acre-feet.

Irrigation accounts for 60 percent of the Texas' total current water demand and 86 percent of current water supply needs under drought conditions. However, by 2060 that share will decline to approximately 38 percent of total water demand and 45 percent of total water need due to the large increase in the volume of municipal needs over the next fifty years.




### DEMAND

By defining need in terms of demand rather than necessity, the State may be distorting perceptions of future market opportunities. The presumption of "demand" for a limited, shared, life-sustaining resource in the midst of explosive population growth reflects a hubris which may not be sustainable in western and southwestern environments. This presumption may be altered by education, conservation, and market reality. As the expense of developing and transporting new water supplies increases dramatically, water utility rates and irrigation costs must also increase dramatically from their historically artificial lows. As the cost of water increases, consumers may re-evaluate how much water they demand, with related impact on projections of need.

Investment in expensive fixed water supply infrastructure constructed to serve artificial predictions of need may generate an inflationary rate-spiral as per capita water use declines in response to higher rates — requiring further increases in rates to meet fixed expenses and thereby encouraging further reduction in use. (*See* Marty Toohey and Asher Price; "*Decline in Water Use Could Force Rate Hikes*"; Austin American Statesman, February 25, 2014). However, without a dramatic change in social attitudes towards water usage, immediate investment in expensive infrastructure is required if water utilities are to meet the future water needs of twenty-three million new people in fifty years. Real or perceived water shortages may generate their own destructive economic spiral for local communities. Moreover, water shortages affecting public health and safety should be unthinkable in our society. To the extent education, conservation and the market do not sufficiently conform human water usage and water availability, government regulators and the courts will be compelled to do so through mandatory restrictions. (*See* for example: Edwards Aquifer Authority Act at: www.edwardsaquifer.org/eaa; and California "Water Rights Enforcement" at: www.swrcb.ca.gov/waterrights/water_issues/programs/enforcement/compliance/index.shtml). Public utility managers and their customers must collectively determine how much new water is enough, with an informed understanding of its future cost.

Accurately predicting water availability, population growth and customer demand fifty years in the future is a major challenge for public utilities. The challenge is further complicated by competing policy and financial interests in promoting the conservation of water, with attendant loss of revenue, or the sale of water, with attendant need for expensive new supplies. In this setting, the distinction between true need and need premised upon elastic demand becomes a critical factor in planning success. This challenge of securing enough new water supply for the future without imposing debilitating financial hardship on the water utility may soon be shared by private investors as water markets expand and water transfers become more commonplace.

### WATER TRANSFERS

The dramatic changes in water needs reflected in Texas' State Water Plan suggest that future water transfers in Texas, if they occur at all, will involve transportation of water on a large scale across long distances. The current 2012 State Water Plan reflects 44 recommended groundwater and surface water conveyance and transfer projects (*Water for Texas,* p. 192). Many, many more projects will be required to meet future municipal needs as other recommended water management strategies fall by the wayside. Some of the currently planned transfer projects involve conveyance over distances up to 150 miles. With few exceptions, these projects would move water from rural to urban areas. (State Water Plan available at: www.twdb.texas.gov/waterplanning/swp/).

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## Water Transfers

**State Ownership**

**Rio Grande Adjudication**

**Correlative Rights**

**"Rule of Capture"**

**Diverse Geography**

### Obstacles to Water Transfers

**Background Law**

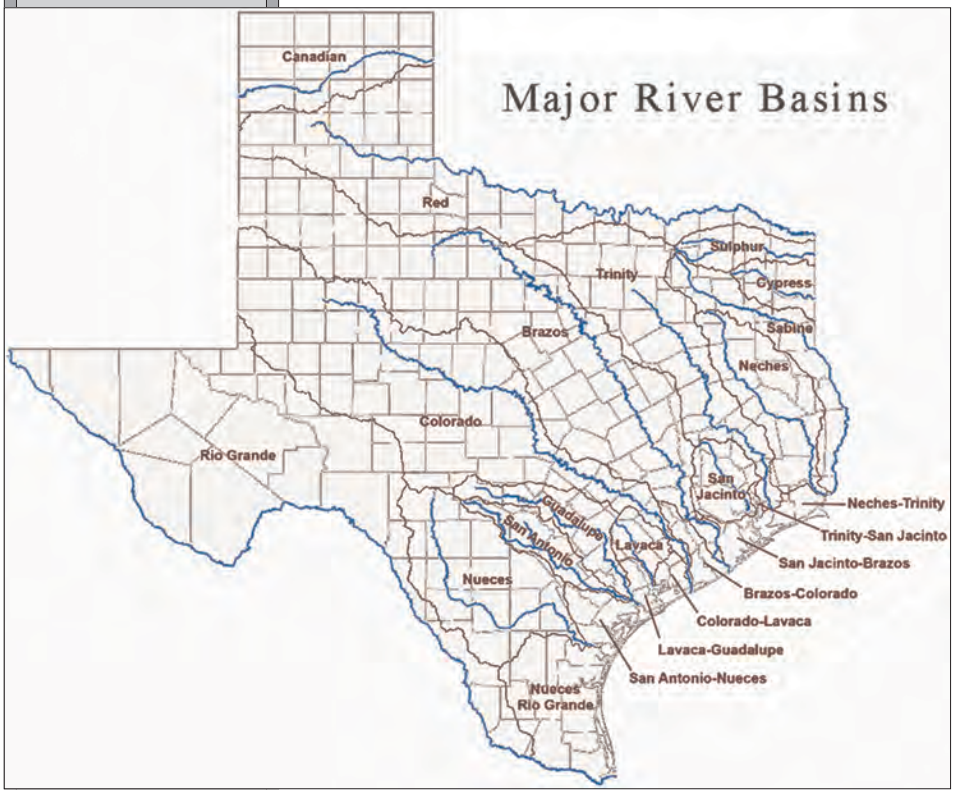
Texas water law is the unique product of a rich history under many national flags. The law governing surface water evolved from the law of Spain and Mexico. Surface water in Texas is owned by the state, with use authorized by permits issued by a state agency, currently the Texas Commission on Environmental Quality. For comprehensive background information about Texas water law and issues, *see Essentials of Texas Water Resources*, Third Edition, Mary K. Sahs, Editor, State Bar of Texas 2014.

The Rio Grande River basin on the 800-mile border with Mexico was the subject of the state's first major water rights adjudication. Water rights in the basin are subject to a management plan ensuring that two major reservoirs on the river are operated as a single system. Allotments for municipal, industrial and domestic uses are prioritized over agriculture and other uses. These other uses are apportioned based on the water right holder's total acreage. Because the rights are from a common water storage pool, they are reduced proportionately during periods of shortage. Reduction is not based on seniority. This system of correlative rights is unique in Texas surface water management, and has created an active market for water rights from the Rio Grande River. The remainder of Texas surface water is managed under the Prior Appropriation Doctrine, with water rights enjoying priority based on "first-in-time, first-in-right." The water rights can be severed from land and transfered subject to restrictions. Because Texas was a sovereign country when it joined the United States, there is little federally-owned water in the state.

Texas law governing groundwater reflects the English common law "rule of capture," now refined by the courts and the Texas Legislature (Legislature) to definitively recognize that groundwater is owned in place by the owner of the surface estate. *Edwards Aquifer Authority v. Day*, 369 S.W.3d 814 (Tex. 2012); Tex. Water Code § 36.002. The Legislature determined in 1949 that groundwater should be managed, if at all, on a local-option basis by groundwater conservation districts with locally-elected governance and locally-adopted rules. *Now* Tex. Water Code § 36.0015. These districts, however, are often created without regard for aquifer boundaries. Their governing boards have no statutory mandate to manage groundwater within their jurisdiction for the benefit of the state as a whole. The Edwards Aquifer Authority, discussed later, is a notable exception to this model.

**Physical Challenges**

The State of Texas is large and geographically diverse. Elevation rises and rainfall decreases from the Gulf of Mexico in the east to the mountains and high plains of the west. There is water abundance in the upper Gulf coast and rich northeastern forests bordering Louisiana and Arkansas, and water scarcity in the Chihuahuan Desert bordering New Mexico. The high plains of the Panhandle share the Ogallala Aquifer and a rich agricultural economy with Midwestern farm-belt states. Population is congregating in urban corridors defined by two interstate highways, which essentially quadrisect the state into starkly different climatic and geographic zones.




There are 23 major river basins in Texas, generally running in broad geographic swaths from the dry, high plains in the northwest to the Gulf of Mexico in the southeast. Eight of the 23 river basins are also coastal basins, meaning basins located near the Texas coast with a smaller drainage basin. Thus, these river basins are ill-suited to serve as natural conduits for the movement of water to locations of need. Neither the state nor the federal government has invested in the kind of massive transportation infrastructure found in other western states for the intra-state movement of water. The absence of large-scale conveyance infrastructure poses a major obstacle to the development of an active state-wide water market. Construction of such infrastructure will require capital investment on a scale to which many water utilities are not accustomed. This investment will require dramatic increases in artificially low water rates that may alter the market which the infrastructure is intended to serve.

## Water Transfers

### Interbasin Transfer

### "Junior Rights Restriction"

### Impacts on Transfers

### Supply Strategy

### Disincentive

**Legal and Regulatory Challenges - Surface Water**

An interbasin transfer is the withdrawal of water from one basin and transfer to another for beneficial use. Tex. Water Code § 11.085. Interbasin transfers were an integral part of Texas water development for almost 100 years and facilitated the growth of Dallas and Houston. Prior to 1997, such transfers were a common practice subject to regulation by the state to ensure a reasonable balance of benefits to the basin of use and protection for the basin of origin.

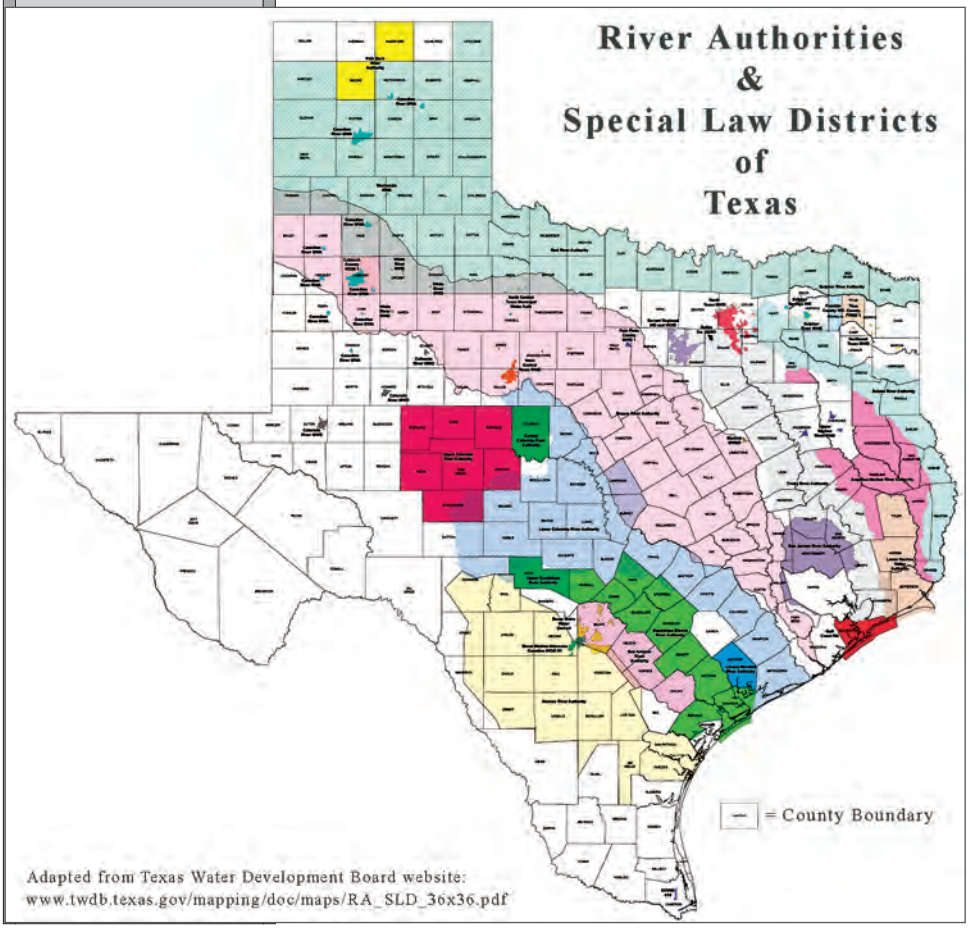
The Legislature adopted a new state water planning process in 1997. Act of June 1, 1997, 75th Leg., R.S., ch. 1010, 1997 Tex. Gen. Laws 3610, eff. Sept. 1, 1997; Tex. Water Code chapter 16, subchapter C. That process focused attention on local water shortages and prompted concern for the protection of available surface water supplies. As part of the evolution of the planning legislation, a so-called "junior rights restriction" was added to the many other regulatory requirements for an interbasin transfer:

> Any proposed transfer of all or a portion of a water right under this section is junior in priority to water rights granted before the time application for transfer is granted.

Texas Water Code § 11.085(s).

The impact of this restriction has been to effectively preclude transfers between basins of the most senior and, therefore, most valuable surface water rights because they will become the most junior and least available for the receiving basin once the transfer occurs. For further analysis of the history of interbasin transfers, *see* Todd Votteler, Kathy Alexander and Joe Moore, *The Evolution of Surface Water Interbasin Transfer Policy in Texas: Viable Options for Future Water, Water Grabs, or Just Pipe Dreams?* State Bar of Texas Environmental Law Journal Vol. 36 No. 3 (Spring 2007).

State water planning in Texas is a cyclical five-year bottom-up process that begins with the development of regional water plans by 16 regional water planning groups (Tex. Water Code § 16.051 et seq.). These plans are reviewed and consolidated by the Texas Water Development Board into a State Water Plan. The plans consist of water supply strategies advanced by major local water purveyors to meet future demands. Although the state plan ultimately includes hundreds of strategies, each strategy is critical to its local sponsor. A water supply strategy must be recommended in the plan in order to be eligible for state loans and grants, surface water permits, and some groundwater permits. The 2012 State Water Plan notes that any impediments to obtaining interbasin transfer permits will severely impact the implementation of the projects included in the Plan. It includes 15 recommended water management strategies which rely on an interbasin transfer and will require a permit to be granted.




Another significant impediment to surface water transfers has been institutionalized with creation by the Legislature of 17 river authorities and a comparable number of special law districts that function like river authorities. These entities are charged with the management and development of water within their jurisdiction, including the construction and operation of reservoirs. They often generate revenue and political power by supplying electricity, water, wastewater, and other community services within their jurisdiction. They have accrued water rights, sometimes in large blocks, and dominate water transactions within their basins, and thus have little incentive to accommodate transfers elsewhere.

Ecological concerns add another layer of complexity. The health of the state's rivers, bays, and estuaries historically was largely ignored in the development and diversion of water for municipal, industrial, and agricultural use. The notion of leaving water in the rivers for environmental flow purposes, or in the ground to support natural springs, was alien to the Texas ethos of unfettered growth. The Texas Legislature charted

**Water Transfers**

**Environmental Flows**

a new course for protecting environmental flows in 2007 by mandating a series of basin-wide studies to determine baseline environmental water needs. Act of June 16, 2007, 80th Leg., R.S., ch. 1430, § 1.13, eff. Sept. 1, 2007. The legislation relies on set-asides from new and amended surface water permits to meet the needs ascertained by the studies. However, because the state's rivers are for the most part already fully appropriated, more aggressive measures to secure environmental flows will be required in the future, leading to further stress on existing supplies. Texas Instream Flow Program available at: www.twdb.texas.gov/surfacewater/flows/instream/index.asp.

**Managing Groundwater**

**Legal and Regulatory Challenges - Groundwater**

An unintended consequence of the junior priority surface water restriction has been unprecedented focus by urban water utilities on the development of new groundwater supplies. This focus has in turn led to a proliferation of new local groundwater conservation districts and new impediments for groundwater development and transportation. The Legislature first determined in 1949 that local groundwater conservation districts would be the state's preferred method of managing groundwater resources. Approximately 50 districts were created in the next 50 years. Another 50 districts have been created in the 18 years that have passed since the adoption of the new planning legislation in 1997.

**Local Control**

Groundwater district regulations now pose a major challenge for the large-scale development of new water supplies necessary to meet Texas' needs. Districts are created and administered pursuant to a body of law that grows more and more convoluted with each biennial legislative session. Tex. Water Code Chapter 36. Locally elected groundwater district boards determine who will receive permits to produce groundwater and transport it out of the local district. The permits may be issued for terms as short as one year. The approval of the boards may again be required for renewal. These permits are issued or denied on the basis of rules that can be changed on very short notice.

**Political Issues**

Without the permits, infrastructure costing hundreds of millions of dollars cannot be financed or used. District board members often run for office in emotionally-charged political environments where they must answer to local constituencies, and protection of local groundwater resources is the most important issue for voters. Having assumed office on platforms of local control, the same board members are then expected to set aside political considerations and put on a quasi-judicial hat to impartially judge the merits of applications to produce and transport large volumes of groundwater for distant municipal use. Their decisions are largely exempt from meaningful judicial or agency review.

**Production Limits**

Permits issued by these districts are generally specific to user, location, and purpose, and are not transferrable in a manner that will create a ready market for the right to produce water. The permits frequently limit production on the basis of either surface ownership or well spacing. Project developers must purchase or lease water rights from contiguous landowners and assemble those rights in whatever amount is necessary to support the planned production of the project.

## WATER MARKETS

**Market Concepts**

The notion of a water market suggests: the active buying and selling of water with common characteristics; trade in water; and a region in which water can be bought and sold. These concepts are generally inconsistent with historic retail water delivery by a governmental or quasi-governmental monopoly with ready access to a plentiful, inexpensive supply. Texas municipalities were historically able to meet their water needs either by drilling new wells on small plots of land to access unregulated groundwater, or pumping surface water directly from nearby rivers or from reservoirs built half a century ago following the state's last great drought. No market was involved. The groundwater was free and the surface water was generally inexpensive and available from a single state-owned source dictated by proximity and geography.

### Obstacles to Water Markets

**Priority**

**Surface Water Challenges**

Surface water in Texas is now for the most part fully appropriated, thus creating a market of sorts for the purchase of existing water rights. The state's system of water rights priority, based on seniority of historic use, makes some water rights more valuable than others. Some of the state's most senior water rights are held by irrigators who were the foundation of the state's early economy. Those rights will be most desirable for municipal and industrial buyers, but their transfer in the marketplace will have implications for the state's agricultural economy and environmental interests. However, the market for surface water rights will be substantially impaired by the state's junior priority restriction on interbasin transfers (cited above), by river authorities and special law districts, and by potential regulatory restrictions associated with changed location and purpose of use.

## Water Transfers

**Private Property**

**Uncertainty**

**Groundwater Challenges**

Because of the many limitations on transfer of surface water, Texas municipal water utilities are increasingly turning their attention to groundwater to meet future needs. As noted above, groundwater in Texas is now definitively recognized as private property owned in place by the owner of the surface estate. *Edwards Aquifer Authority v. Day*, 369 S.W.3d 814 (Tex. 2012); Tex. Water Code § 36.002. In theory at least, this has created a vast inventory of water potentially available for sale by landowners in a statewide marketplace to willing buyers.

In reality, of course, the inventory is dispersed and segmented by aquifers and subdivisions of aquifers, and reduced further by aquifer characteristics such as water quality. The inventory is randomly managed, if at all, by 100 different local regulatory authorities. Each of these districts is governed by locally elected officials with local rules that vary widely from jurisdiction to jurisdiction (meaning, in most cases, county by county). Local residents who object to the loss of local water generally outnumber local landowners who might benefit from the water's sale. The inventory, once purchased, must be transported across long distances to the buyer's distribution system at the location of need. Buyers of water must be prepared to finance expensive production and transportation infrastructure with long-term debt in the face of vast regulatory uncertainty as to whether or not planned production will be authorized after infrastructure is complete. These factors of variable location, quantity, quality, and regulation create widely disparate water value and cost.

**Pricing Disparity**

**Water Pricing**

The price of a pint of water sold in a plastic bottle at a convenience store may be ten or more times the price paid by an average water utility customer for 100 gallons of potable water delivered to the tap in her home. How has this pricing disparity evolved? Water utility rates are generally subject to approval by elected or appointed public officials at some level, and reflect a variety of political constraints. Rates could be maintained at low levels when the water was obtained for free and the source was close to home. In fact, revenues from water utilities have often provided a reliable financial supplement to revenue from local taxes. A history of free inventory and low rates has encouraged use which has in turn generated demand for new supplies. Paying for these new supplies will require substantial increases in historic rates for many customers, while minimal lifeline rates are maintained for basic water needs.

**Contractual Issues**

**Sovereign Immunity**

The Texas Supreme Court concluded in 1997 that a governmental entity in Texas does not waive its sovereign immunity from a breach-of-contract suit by entering into a contract. Rather, immunity must be clearly waived by the Legislature. *Federal Sign v. Tex. State Univ*., 951 S.W.2d 401 (Tex. 1997). The decision has been consistently reaffirmed by the Texas Supreme Court in a variety of contract settings. *Texas. Natural Res. Conservation Comm'n. v. IT-Davy*, 74 S.W.3d 849 (Tex. 2002); *Tooke v. City of Mexia*, 197 S.W.3d 325 (Tex. 2006) and others. Predictable consternation by the community of government vendors prompted the Legislature in 1999 to establish an administrative process that is the exclusive method for resolving contract claims against the state (Tex. Gov't. Code Chapter 2260).

**Government Immunity**

In 2005, the legislature adopted a limited waiver of sovereign immunity for local government contract disputes. The waiver extends to "amounts due and owing" under a contract "for providing goods and services." (*see* Tex. Local Gov't. Code chapter 271, subchapter I). The legislature has also directed that "a statute shall not be construed as a waiver of sovereign immunity unless the waiver is effected by clear and unambiguous language." Tex. Gov't Code § 311.034. Whether a contract is a contract for "providing goods and services," and interpretation of the meaning of "amounts due and owing," have been rich fodder for the courts in a wide variety of *other* contract settings. *See Kirby Clear Lake Development, Ltd. V. Clear lake City Water Authority*, 320 S.W.3d 829 (Tex. 2010); *Ben Bolt-Palito Blanco Consolidated Independent School District v. Texas Political Subdivisions Property/Casualty Joint Self-Insurance Fund*, 212 S.W.3d 320 (Tex. 2006); *Zachry Construction Corporation. v. Port of Houston Authority of Harris County*, 449 S.W.3d 98 (Tex. 2014). However, the specific question of whether a contract for the sale of water or water rights constitutes a contract for providing goods and services has not been directly addressed by the Texas Supreme Court. Vendor concern about government immunity from litigation on a contract has not brought government contracting to a halt, but the issue adds uncertainty and complexity to the long-term financial commitments required for construction of large-scale water conveyance infrastructure. This uncertainty will grow with the size of transactions and will presumably be reflected in market participation, interest rates, and cost.

**Undecided Issue**

**Debt Provisions**

**Long-Term Debt**

The Texas Constitution generally prohibits local governments from entering into long-term debt without concomitant provision for payment. Tex. Const. Art. 11, § 5 and § 7. These provisions and interpretive case law are beyond the scope of this article. It is enough to note that they require careful analysis and structuring of any multi-year purchase commitment by a local government to a private vendor, and may be a factor in the development of a vibrant water market in the state.

## Water Transfers

**Rio Grande Valley**

**Leasing Restriction**

**Corpus Christi Purchases**

**Change Implications**

**Evolving Water Markets**

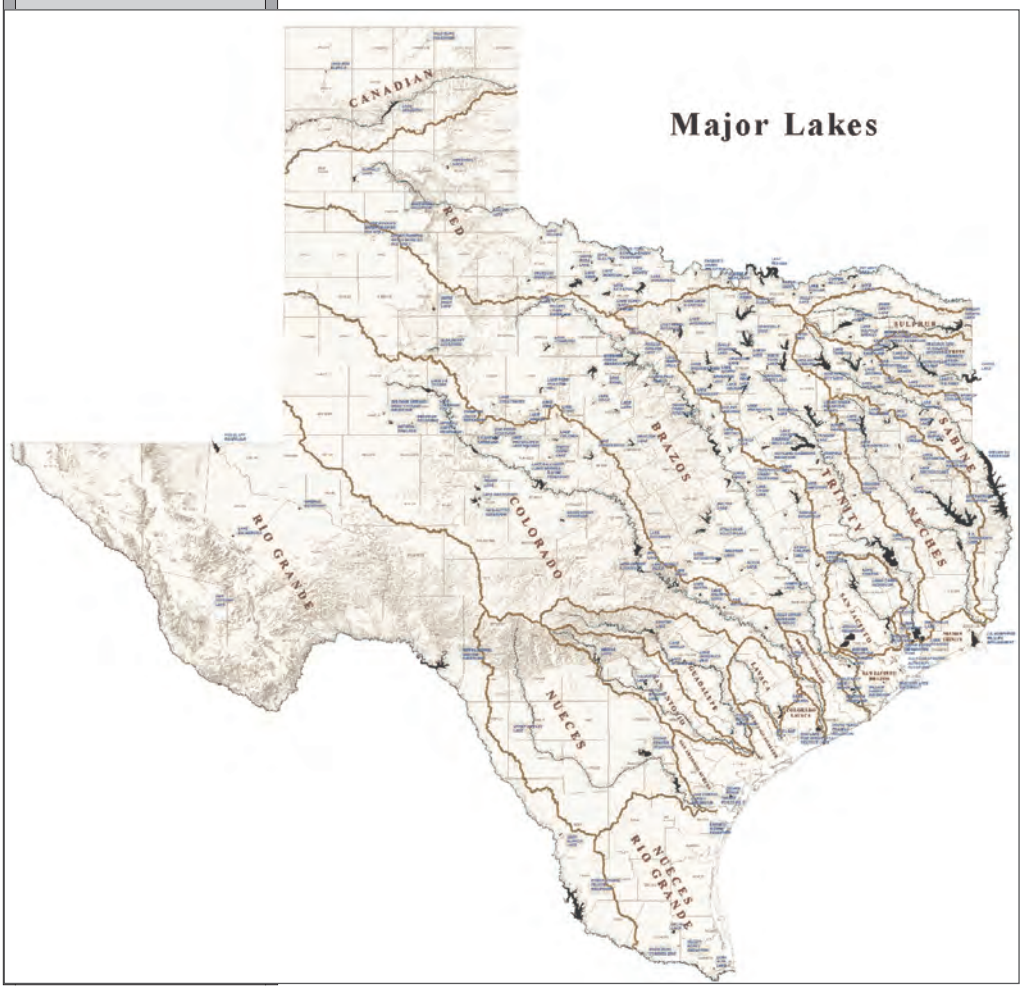
**Surface Water**

The most mature Texas surface water market has developed for water from the Rio Grande River in what is known as the Rio Grande Valley in the southernmost part of the state. The Valley encompasses the portion of the river between Amistad Reservoir and the Gulf of Mexico. The river and two associated international reservoirs support extensive irrigated agriculture and rapidly-growing urban populations in several cities on both sides of the United States/Mexico border. As noted above, water rights have been fully adjudicated and are supported by annually allocated flows from two major reservoirs. There is a well-established regulatory system that facilitates relatively easy transfer of water rights, active enforcement of water usage, and no river authority. Water rights can be bought, sold, or leased, subject to a preference for urban uses that creates a restriction on leasing between irrigators and municipalities.

Surface water markets in the rest of the state are relatively immature and inactive. The regulatory restrictions discussed above, coupled with the absence of interbasin conveyance infrastructure and inadequate enforcement of water usage, have largely limited surface water marketing to a few transactions involving large blocks of water rights.

In the late 1990's, the Lower Colorado River Authority (LCRA) and the City of Corpus Christi each acquired a large portion of the most senior water right on the Colorado River, the state's second largest river, from the privately-held Garwood Irrigation Company (a company founded in the 19th century to support rice farming on the Texas coast). The purchase of up to 35,000 acre-feet of water from the Colorado River by the City of Corpus Christi required an interbasin transfer to the city, but preceded the legislature's 1997 restrictions on such transfers. LCRA purchased the irrigator's remaining 133,000 acre-feet of water rights in 1998, and entered into a subsequent agreement with the City of Austin upstream within the Colorado River basin to lease the rights. In 2000, LCRA purchased 18,000 acre-feet of senior Colorado River rights from the Pierce Ranch, another historic irrigation user.

All of these transactions reflect the implications of changing water usage from irrigation to municipal purposes. In addition to the obvious impact of the change on the agricultural economy, potential impact on the environment is profound. These water rights were historically only partially utilized at the mouth of the river for rice-farming and other agricultural purposes, with only marginal impact on instream flows to the rich bays and estuaries of the Texas coast. The water rights will now be fully utilized to meet upstream urban and industrial needs, and will be unavailable to the environment except in the reduced form of return flows.




Uncertainty about future state regulatory initiatives to address instream and environmental flow requirements may pose another hurdle for the evolution of an active surface water market. This issue was highlighted in a lawsuit brought under the Endangered Species Act for alleged taking of rare whooping cranes by the State of Texas through its water management policies. (*See* Whooping Crane case: *The Aransas Project v. Texas Comm'n on Environmental Quality, et alia*., 756 F.3d 801 (June 30, 2015); Moon, *TWR* #131 and Water Briefs, *TWR* #137 for additional information; and *The Aransas Project v. Shaw et al*, 775 F.3d 641 (5th Cir. 2014), petition for writ of certiorari filed March 18, 2015.

## Water Transfers

### Regulatory Impact

### Regional Market Edwards Aquifer

### Capped Production

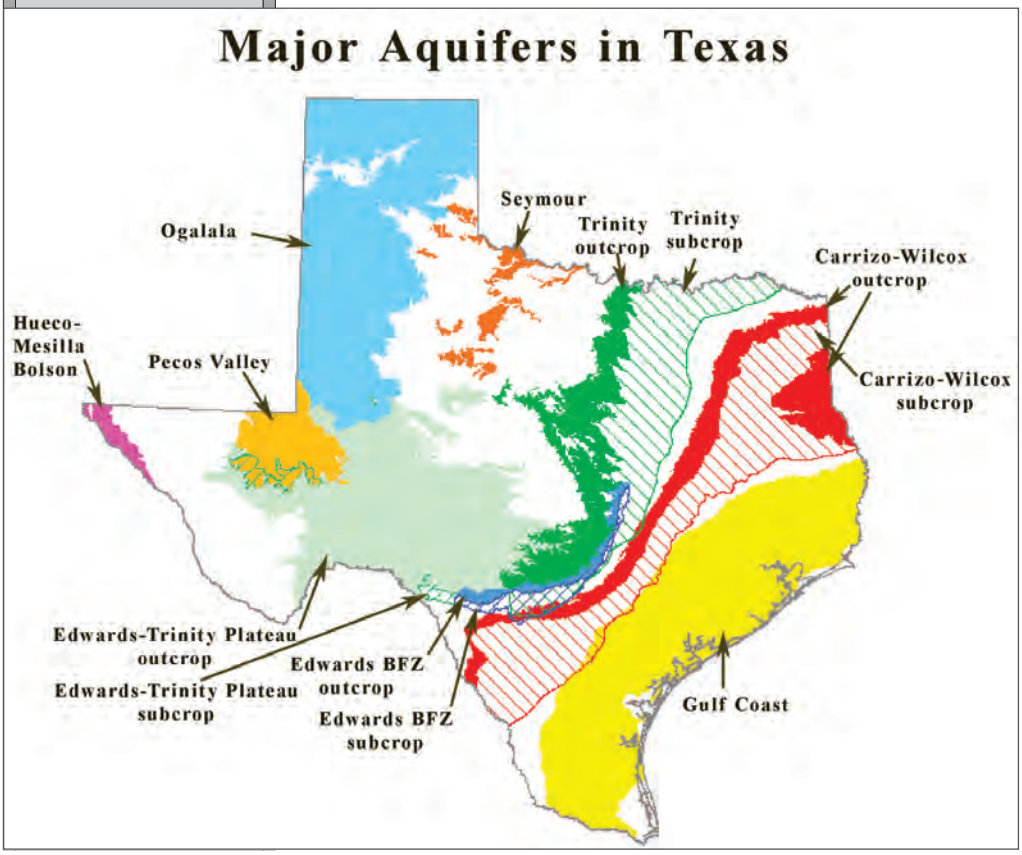
### Transferrable Rights

**Groundwater**

Notwithstanding the many challenges, a groundwater market is beginning to develop in parts of Texas. A distinction should be drawn between a market for actual water and a market for groundwater rights — although the distinction is often blurred and one may generate the other. The importance of the distinction is driven by the nature of the applicable groundwater regulatory system where the source water will be produced. In the absence of regulation, a single landowner might produce unlimited quantities of water for sale to one or more buyers. In this environment, all landowners with property overlying the water source may constitute a competing market for the buyers. If, by contrast, local regulation limits production based on surface acreage or spacing, multiple landowners must consolidate water rights through a common enterprise, which might then seek buyers for water produced from the consolidated tract. In this scenario, a competitive market may exist for consolidation of the water rights, in addition to the market for sale of the water.

A very unique regional market for water rights was created by the Texas Legislature in 1993 with adoption of the Edwards Aquifer Authority Act. (*See* Act of May 30, 1993, 73rd Leg., R.S., ch. 626, 1993 Tex. Gen. Laws 2350; as amended; Act available at: www.edwardsaquifer.org/eaa). The Edwards Aquifer is a remarkable recharging limestone karst aquifer that underlies all or parts of nine counties in south central Texas. It was the primary source of water for the City of San Antonio and farmers to the west for almost one hundred years. It is also the source for springs, which are a major source of supply for the Guadalupe, Blanco, and San Marcos Rivers, and habitat for several threatened or endangered species. The legislature's action was prompted by endangered species litigation leading to a threatened federal court takeover of aquifer pumping. When the Legislature created the Edwards Aquifer Authority it capped annual production from the aquifer at a level sufficient to maintain springflow. The Legislature directed issuance of transferable water withdrawal rights allocated to historic users within the cap, after exempting basic domestic and livestock use. The aquifer's unique hydrology makes it possible to pump water interchangeably from different locations with relatively benign impact on the springs. Thus an active market has developed for the purchase of water withdrawal rights that can be produced from existing wells without construction of expensive transportation infrastructure. The San Antonio Water System has spent almost $250 million to purchase water withdrawal rights, with most of these rights originating from agricultural property. (*See* Frownfelter, *TWR* #1, for information regarding the Edwards Aquifer Authority).

In a spectacular example of water marketing with a uniquely Texas flair, the Canadian River Municipal Water Authority in 2011 paid $103 million to oil and gas entrepreneur T. Boone Pickens for water rights associated with 211,000 acres of land in the northeast Texas panhandle. The rights are expected to yield up to four trillion gallons of water, largely for the benefit of the City of Amarillo. Mr. Pickens' decade-long effort to market the water associated with these rights to larger, more distant Texas cities such as San Antonio and Dallas foundered on transportation and political issues. The City of El Paso purchased ranch property 100 miles east of the city to acquire rights to groundwater and is actively studying the purchase of additional ranches at greater distances. These transactions were constrained by the availability of only one or two potential buyers and one or two sellers, although the seller in the Amarillo transaction held rights consolidated from a number of individual landowners.




Perhaps the first real groundwater marketplace in Texas is now evolving in the central part

## Water Transfers

### Groundwater Speculation

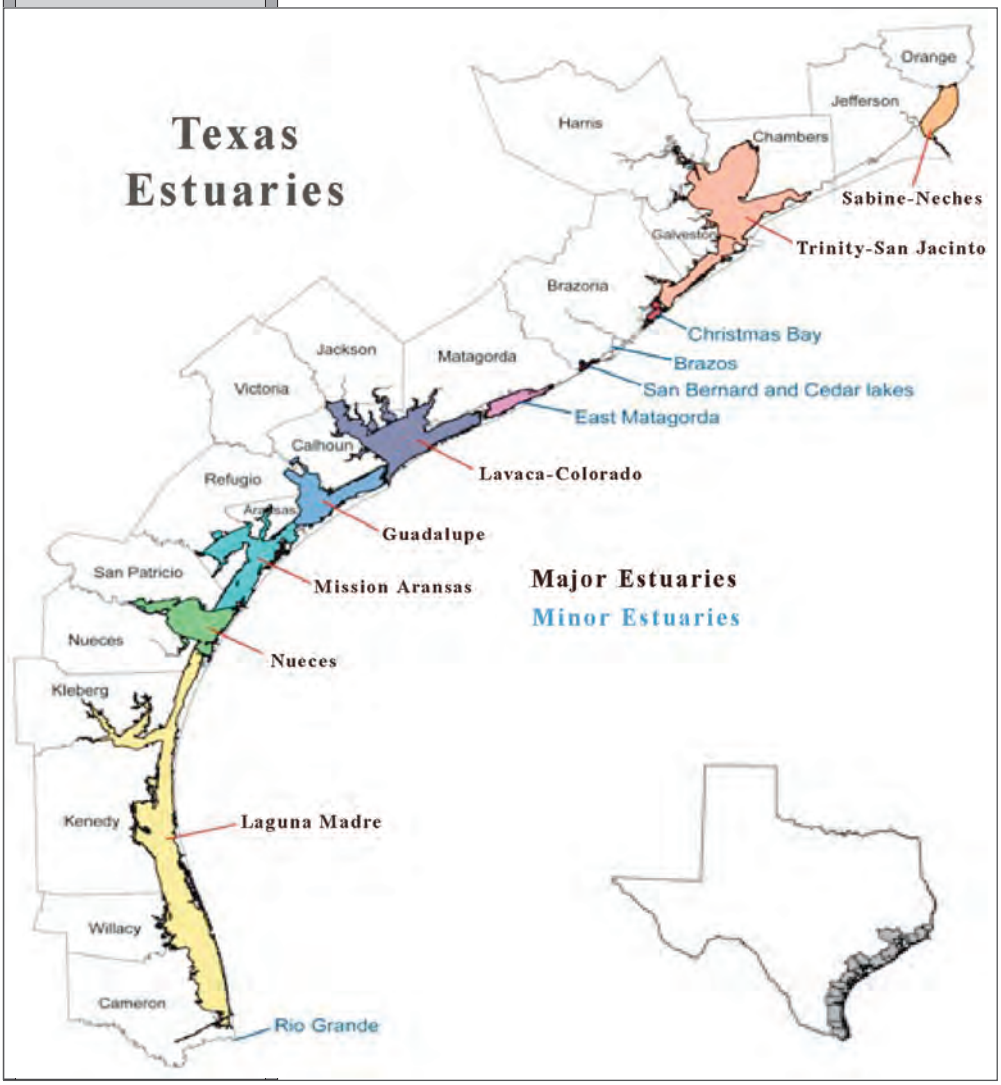
### San Antonio Contract

### Innovative Solicitation (Risk)

of the state in connection with a particularly prolific portion of the Carrizo Aquifer, which stretches across Texas from the Mexico border in the southwest to the Louisiana border in the northeast. Water rights were acquired in Gonzales County by several public and private entities, and water is now being produced and transported to the San Antonio region approximately 80 miles away. At least four private entities have compiled large blocks of groundwater rights from hundreds of landowners in Burleson, Milam, and Lee Counties on a speculative basis. They seek to market water produced with those rights to urban water utilities in the explosively high-growth IH 35 corridor between San Antonio, Austin, and Waco. The corridor includes not only these major cities, but also many other smaller municipalities and water districts.

The City of San Antonio, Texas, acting by and through the San Antonio Water System Board of Trustees (the System) recently entered into a long-term contract for the purchase of up to 50,000 acre-feet of groundwater from one of these water vendors, Blue Water Systems, acting in consortium with Abengoa, S.A., a major international water company. The contract will require construction of a 140-mile long pipeline and other infrastructure at a cost in excess of $800 million. Some of this water may be off-loaded to other buyers, or those buyers might seek water directly from other sellers. Ultimately, the amount of water that can be sold and transferred from the region will be determined by local regulatory authorities (within the constraints of state law governing their actions), and state and federal constitutional limitations on taking of private property without compensation. *See* Tex. Water Code Ch. 36; Tex. Const. art. I, § 17; U. S. Const. amend. V.

The Abengoa, S.A., contract is the result of an innovative competitive solicitation process. The process was undertaken by the System with the express goal of exploring market interest in providing a major water supply to the City of San Antonio. A key element of the solicitation was the requirement that the vendor agree to retain all legal and regulatory risk. The System requested proposals for up to 50,000 acre-feet of potable water treated to the System's standards and delivered to the System's distribution infrastructure. The System agreed to pay for acceptable water delivered, whether or not taken, but all risk of delivery was to be retained by the vendor.




Twelve public and private vendors submitted proposals, with five of those proposals ultimately considered. The proposals called for delivery of water from a wide variety of fresh and brackish groundwater sources at distances ranging from 80 to 140 miles in all directions from San Antonio. There were no surface water proposals. Staff considered the proposals as an alternative to expansion of the System's 33 million gallons-per-day brackish groundwater desalination project, which is currently under development as a more traditional System-owned project. The System's Board of Trustees elected to negotiate with the Abengoa/Blue Water Systems consortium. Those negotiations led to a contract signed on November 4, 2014. The System's drafting team for the nearly 200-page contract document was led by Eric Petersen and Angela Jinn of Hawkins Delafield in New York; Abengoa's drafting team was led by Frank Ruttenberg of the San Antonio office of Haynes and Boone. The contract contemplates a 30 month development and financing period prior to financial closing, after which construction would begin.

## Water Transfers

**Steve Kosub** is Senior Water Resources Counsel for the San Antonio Water System. His work encompasses a diverse array of current Texas water law issues, including water rights, water management, water markets, water delivery, planning, reclaimed water, environmental flows, and the legal challenges imposed by competing demands for water resources. Mr. Kosub received his B.A. in Political Science from Texas A&M University in 1974 and his J.D. from the University of Texas School of Law in 1977. He served in the United States Air Force from 1978 to 1982. Mr. Kosub is certified in administrative law by the Texas Board of Legal Specialization. He is a past chairman of the Environmental and Natural Resources Law Section of the State Bar of Texas, and is a frequent writer and speaker on water law and regulatory takings.

### CONCLUSION

Texas faces explosive growth in urban population and diminishing supplies of readily available water. The state's legal system has recognized vested private rights in the use of surface water and definitively determined that groundwater is the private property of landowners. Thus, the stage is set for transfer and marketing of water on an unprecedented scale.

Water transferred in a demand-driven Texas market will inevitably follow money, and inevitably involve movement of water from rural to urban areas. Such a market would be facilitated by a network of water conveyance infrastructure not unlike the electrical grid. It would be further facilitated by management of aquifers within hydrological boundaries that would allow transfers of water rights from a common source without physical movement of water across long distances. Finally, it would be facilitated by the management of both groundwater and surface water on the basis of diverse state interests rather than solely local turf considerations. *See Changing Water Management in Texas*, Texas Water Law – San Antonio (2015), CLE International, Sydney Falk (Bickerstaff Heath Delgado Acosta LLP); Thomas G. Mason; Mary K. Sahs (Sahs & Associates, P.C.); and Andrew Sansom (Executive Director of the Meadows Center for Water and the Environment at Texas State University).

However, water is life. It is not just another market commodity. Individuals and communities that historically embraced the sale of oil, gas, and other natural resources for economic gain may viscerally resist the sale and transfer of water. The marketing and transfer of water poses scientific, political, and emotional challenges that must be addressed with strong regulatory protection for societal, environmental, and economic interests not otherwise protected by market exchanges. The price of water at the retail level must be adjusted to better reflect true cost and value while still ensuring availability for all essential needs. Achieving the proper balance of water accessibility, regulatory protection, and respect for private property rights will require thoughtful legal minds, astute utility management, and bold political leadership. When that balance is achieved, water markets and water transfers may find the predictability and certainty they require to function in a meaningful way.

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*The viewpoints and opinions expressed herein are solely those of the author and do not necessarily reflect the positions of the San Antonio Water System.*

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*The Water Report* thanks the ABA for its permission to print this article.



 

EPA & Innovation

Program Update

Technology & Innovation

Experts' Report

Net Energy Producers

*Utility of the Future*

# EPA & WATER SECTOR INNOVATIONS

AN INTERVIEW WITH JEFFREY LAPE,

DEPUTY DIRECTOR OF THE US ENVIRONMENTAL PROTECTION AGENCY OFFICE OF SCIENCE AND TECHNOLOGY

Conducted by Jakob Wiley (Student Intern, *The Water Report*)

**Editor's Introduction:** Jeffrey Lape serves as Deputy Director of the Office of Science and Technology, US Environmental Protection Agency (EPA) Office of Water (Washington DC), where he helps lead water quality criteria development, water quality standards implementation, and development of technology-based standards. Jeff also leads in EPA's efforts to promote technology innovation for clean and safe water.

Previously with EPA, Jeff served as Director of the Chesapeake Bay Program. He has supported water resource protection efforts with the Washington Suburban Sanitary Commission, NYS Department of Environmental Conservation, and three private sector firms.

In April, 2014, EPA issued *Promoting Technology Innovation for Clean and Safe Water* [www2.epa.gov/innovation/water-technology-innovation-blueprints] which outlined the business case for investment in new tools in the ten most promising market opportunities for the water quality sector. *See* Richardson, *TWR* #132. In July 2015, EPA issued an update: *Promoting Innovation for a Sustainable Water Future – A Progress Report* [www2.epa.gov/innovation/promoting-innovation-sustainable-water-future].

In September 2015, Mr. Lape graciously agreed to be interviewed concerning EPA's ongoing efforts supporting innovation in the water sector and other matters. The interview was conducted by *TWR*'s student intern, Jakob Wiley.

**What aspects of *Promoting Innovation for a Sustainable Water Future — A Progress Report* do you think might be of particular importance for readers of *The Water Report*?**

First, I'd like to acknowledge the two water technology and innovation blueprints issued by the EPA [available at: www2.epa.gov/innovation/water-technology-innovation-blueprints]. We saw them as important statements about how EPA sees the water sector changing, and how technology and innovation can be powerful drivers to achieving clean and safe water, faster, cheaper, and using less energy. EPA issued the first blueprint in 2013 and the second in 2014. In 2015, we decided to issue the Progress Report.

There are four things readers of *The Water Report* should really know about [from the Progress Report]. First, there is a short message from Ken Kopocis, our Deputy Assistant Administrator on the first page and one from EPA Administrator Gina McCarthy on the back page. Both of those messages are key because they show that senior leadership at the EPA really understands the importance of the water sector innovating into the future.

Second, the Progress Report identifies some examples of experts' reports that make a compelling case for water innovation. These are many really smart people who are making the business case for water innovation and sustainability.

Third, we provide more examples of water innovators. When you look at the collection of examples in the 2014 Blueprint and the 2015 Progress Report, you can begin to see some significant emerging trends in water technology and innovation. A few short years ago, no municipal wastewater treatment plant was a net energy producer. East Bay MUD [Municipal Utility District] lays claim to being the first. We highlight the City of Gresham, Oregon in our Progress Report, who claim to be the second. Utilities across the Nation are embracing the concept of "water resource recovery facility" and "utility of the future"!

Lastly, the Progress Report highlights some of the things EPA and its partners are doing to support innovation and sustainability. But I would like to say, it is the water sector as whole that is driving much of this change.

**Who and what would you include when speaking of the "Water Sector?"**

When I say water sector, I mean it in the broadest sense. That certainly includes all of the water utilities, both drinking water and wastewater utilities; the consulting and engineering community that supports these utilities; academia that conducts research and often creates the early ideas; the water industry and equipment folks who are creating new technology; local and state regulatory agencies who play a role in encouraging and enabling innovative solutions; and the water advocacy groups are really important, too. These include the Water Environment Federation, the National Association of Clean Water Agencies. The National Association of Clean Water Agencies produced the report on the *Utility of the Future* [available at: www.nacwa.org/images/stories/public/2013-01-31waterresourcesutilityofthefuture-final.pdf]. This is

 

## EPA & Innovation

a great example of a utility group that is saying the future is different. The Water Environment Federation is probably the largest representative of the water industry. As an example, they have banned the term "wastewater" from their nomenclature, because they think wastewater is simply water that is wasted. That is another example of the water sector demonstrating a real shift in thinking.

**The Progress Report mentions the need for urgent infrastructure upgrades and resilience building. What are some specific ways EPA proposes to move forward to meet the need for infrastructure upgrades?**

First and foremost, it is the utilities that own the infrastructure who are on the front lines and are in the best position to understand what infrastructure upgrades and resilience means to them. I like to contrast different geographies. When you are on the east coast in cities like Boston, Philadelphia, and DC, they are dealing with infrastructure that can be 100 or more years old. Constant upgrade, repair, and replacement are an urgent need. Superstorm Sandy showed us that resilience is important for those utilities that were very vulnerable to storm surge and damage. Switching to the west coast where we have drought conditions, resilience means something altogether different. It is resilience in achieving sustainable water supplies. The City of Los Angeles is rethinking their approach to the Los Angeles River and all of the stormwater that flows past them in rain events and figuring out how they can capture that — how can we make a better use of that resource. Our Progress Report helps identify how different communities are thinking about water sustainability.

In terms of a couple things we are doing, we have created some tools. One of them is called Climate Resilience Evaluation & Awareness Tool (or CREAT) [available at: http://water.epa.gov/infrastructure/watersecurity/climate/creat.cfm]. It is designed to help these utilities to assess the risks from extreme events. We have also prepared a variety of other guidance, tools, information, and resources to help utilities [www2.epa.gov/waterriskassessment]. These are examples of when we have tried to put some meaningful tools in the hands of utilities. Another example is the growing emphasis on infrastructure finance, and helping people figure out if there are innovative approaches to bring more resources to the table. We are setting up a water infrastructure and resiliency finance center. [*See*: http://water.epa.gov/infrastructure/waterfinancecenter.cfm]. We want to try to promote innovative financing to address some of the infrastructure and resiliency challenges.

**Could you explain the concept of "One Water" and how that applies to common water uses in the West: irrigation, municipalities, hydropower, and environmental flows?**

Lot's of folks use the term "One Water." I think it is about the fact that water is a finite resource and at the end of the day, the various distinctions we make (e.g. wastewater, stormwater, drinking water) are becoming less relevant. It's one resource. One Water takes us down the path of thinking about integrated water resources management. Again, this is where utilities are on the front lines. Two examples in the Progress Report are Big Spring and Wichita Falls, Texas. They are probably two of the most recent examples of folks who have implemented direct potable reuse projects to augment their drinking water supplies. They did this out of sheer necessity. It is also worth taking a look at the US Water Alliance [*see*: http://uswateralliance.org/owl-summit/2015-2/]. They have done a great job championing the notion of One Water. They just had a conference in San Francisco last week called the One Water Leadership Conference. If you look at the speakers and the nature of their discussions, you can see excellent examples where cities are really taking the leadership role of advocating One Water, the importance of looking at water as a holistic resource, and the imperative to give a broader sustainable understanding to how we manage water.

**Do you believe that reused wastewater as a source for drinking water is becoming more acceptable in the minds of the public?**

There is a general lack of awareness by most folks about the finite nature of water and how it is already reused quite extensively. Here in the Washington DC area, a portion of Fairfax County, Virginia has had indirect potable reuse, a drinking water reservoir with major wastewater treatment plant discharging to it, augmenting the flow to the reservoir. It has been in place for forty years. But if you ask people, "Did you know that there was a wastewater treatment plant augmenting the flows to your drinking water reservoir," they would say "Nah, that's not possible!" Just today, I saw a map of early examples of direct and indirect potable reuse. This proliferation of water reuse projects is largely being driven by drought conditions. The positive aspect of this drought is that it is helping people better appreciate water and how it can be better used and reused.

# EPA & Innovation

**Highlighted Projects from "EPA issued *Promoting Technology Innovation for Clean and Safe Water*"**

www2.epa.gov/innovation/water-technology-innovation-blueprints

The online PDF document includes weblinks to all highlighted projects.




 

## EPA & Innovation

### Water Supply Vulnerability

**Progress Report quote: "Although they have been highly effective to date, the country's water supply systems are now on the cusp of new challenges that they are not prepared to meet."**
**What are the water supply challenges that the country's systems are not prepared to meet? What are EPA's plans to meet the challenges?**

The Stanford Woods Institute is one of several important groups that are highlighting the critical state of water resources and advocating significant changes in how we view and manage water resources. Based in California, they are very much focused on drought and the vulnerability of water supplies. Our Technology Innovation Blueprints and the recent Progress Report highlights the varied water resource challenges across the US and provides examples of how new thinking, technology, and innovation can help solve water resource sustainability issues. These documents highlight examples of tools, approaches, and support that EPA is providing to assess, support, and advocate for technology and innovation in the water sector.

### Showcase Innovations

**Is EPA involving itself directly with instituting water technology, compliance, and management innovations at particular locations or venues? If so, what are some representative examples?**

There are a few things that are happening. By virtue of our Blueprints and Progress Report, we are trying to showcase some of the innovations as a way to help indicate that people are doing some cool stuff. That creates some wonderful and positive peer support among utilities. As an example of supporting technology development, you can see in the Progress Report that there is a reference to a Leaders Innovation Forum for Technology ("LIFT") [*see:* www.werf.org/lift] run by the Water Environment Research Foundation (WERF) and Water Environment Federation (WEF). EPA has provided support for the development of the LIFT program. That's a place where EPA was a positive catalyst to have other folks evaluate the performance of new technologies. Another example is EPA's Office of Research and Development, who leads a robust research program to support safe and sustainable water resources [*see*: www2.epa.gov/aboutepa/about-safe-and-sustainable-water-resources-research-program].

### New Technology Marketplace

**If a water practitioner has an innovation they want EPA's assistance in instituting, what avenue of approach to EPA should they utilize to obtain that assistance?**

I would encourage any practitioner, frankly, not to come to EPA. They should go to the utilities and the consulting community and say "Hey, here is my mousetrap, a better mousetrap, and here is the performance data." There is a wonderful series of mechanisms in place where folks pitch their technologies to the water community. WEF is holding its annual conference and exhibition (WEFTEC 2015) in late September in Chicago. There will be about 20,000 water professionals there. It has every imaginable piece of water technology out there. There will be whole sessions devoted to people pitching new technologies. WEF even has an "innovation pavilion" showcasing new technologies. That's why I say it's more important for people to network with the existing water sector marketplace, as opposed to running to EPA to say "Hey, look at my new thing." It is really important that they be tested and proven in the marketplace.

### Drought Resilience

**Has the recent drought in the West prompted any changes at the EPA?**

Yes, the EPA and other federal agencies are actively involved in the National Drought Resilience Partnership (NDRP) that was announced as part of President Obama's Climate Action Plan. The NDRP is designed to identify areas where the federal family can be the most supportive of locally developed and locally led drought resilience planning and implementation. For EPA, many of our programs have a significant benefit to water quantity even though the program's main focus is water quality. For example, EPA's green infrastructure initiative fosters stormwater capture and reuse and recycling, and EPA's WaterSense program promotes the use of water-efficient products, new homes, and services, both of which provide significant water quantity and drought resilience benefits. Finally, EPA Region 8 is leading an NDRP demonstration in the Upper Missouri River Watershed in Montana showing how the federal family can work collaboratively in support of locally developed drought resilience planning. [Readers should look into the National Drought Resilience Partnership, additional Information at: www.drought.gov/drought/content/ndrp].

### Land Subsidence

***The Water Report* #139 had a Water Brief concerning land subsidence in California, caused by over-pumping of the groundwater aquifers. How does EPA see this situation in regard to "infrastructure needs" and "resilience building" in water systems?**

Land subsidence is just one of the symptoms and problems associated with the extensive reliance on and over-pumping of groundwater. The need for communities to secure safe and sustainable water supplies is a critical consideration of their infrastructure needs and to assure that they consider resilience

## EPA & Innovation

### Groundwater Replenishment

### Geographic Sustainability

### Sustainable Use

### Climate Change

### Green Infrastructure

### Flood Resilience

to all threats, including extreme weather and climate. A good example from 2014 Blueprint of how a community is addressing resilience and infrastructure needs is Orange County California's groundwater replenishment system. They are now up to recharging about 100 million gallons per day into the aquifer. This is a great example of a utility recognizing that they can't pump groundwater indefinitely without serious consequences. Their groundwater replenishment system is designed to replicate a natural process of replenishment.

**How does EPA define "Sustainability" for water resources — now and in the future?**

Perhaps "water resources sustainability" is about considering the full spectrum of risks to water resources and assure that actions are in place to meet our long-term water resource needs including, for example: ecosystem protection, safe and adequate water supply for all uses, and climate resiliency. The specific issues of water resource sustainability are often best described in the context of a community or a specific geography. If you are in Big Spring or Wichita Falls, Texas, they would define sustainability in water resources as simply having any water. In Toledo, Ohio, sustainability means their source for drinking water is free from harmful algal blooms. If you were in Charleston, West Virginia, following a train derailment a year and a half ago, you would say water sustainability is making sure that our water supply is secure. In the Pacific Northwest, concerns about water flow and rising temperature are raising issues about the water ecosystem and effects on aquatic life such as salmon. Perhaps these examples illustrate that water risks and water sustainability are best geographically defined and addressed. The many examples of water technology and innovation in EPA's Blueprints and Progress Report help to demonstrate this.

**When can we say we have achieved sustainable water use?**

Sustainable water use might be achieved when we can look out 50 to 100 years and demonstrate that we are maintaining the full spectrum of water resource needs and uses: ecological integrity, adequate quality and quantity for all the range of uses, energy, agriculture, consumption and recreation. It also means that that our water utility systems are resilient and strong and will stay that way for the long-term because we have built them, or rebuilt them, in ways that meet our water resource goals. Green infrastructure is a great example of where we are rethinking how we build our infrastructure. Concrete served us well for a while, but we recognize there are better ways to build that infrastructure that supports other community resource goals, such as urban heat island reduction, energy savings, flood protection, groundwater recharge, enhanced property values, complete safe streets, and enhanced aquatic and wildlife habitats.

**How has climate change entered into water management planning at EPA?**

Climate change is a game changer, plain and simple. Hardly a day goes by where Administrator Gina McCarthy doesn't talk about the significant impacts of climate change. In the water program, we have an *Office of Water, Climate Change Adaptation Implementation Plan* [available at: http://epa.gov/climatechange/Downloads/OW-climate-change-adaptation-plan.pdf], where we articulate the threats of climate change to water resources, and the kinds of tools and actions that EPA is promoting. We are trying to take the notion of climate change and integrate that thinking into all of our programs: how we think and how we implement those programs.

**Are there any other areas of water sector innovation you would like to emphasize?**

One is certainly the green infrastructure arena. We see an opportunity for green infrastructure to not only encourage better use of the water resources we have, but also to build stronger communities that are more resilient to climate change impacts. Extreme storm events are projected to occur more frequently. EPA has developed tools that have integrated future climate change scenarios for planning of green infrastructure projects with the: National Stormwater Calculator [*see*: www2.epa.gov/water-research/national-stormwater-calculator]; the Stormwater Management Model [*see*: www2.epa.gov/water-research/storm-water-management-model-swmm]; CREAT [*see*: http://water.epa.gov/infrastructure/watersecurity/climate/creat.cfm] and a Storm Surge Inundation Map [*see*: http://water.epa.gov/infrastructure/watersecurity/climate/stormsurge.cfm]. We have also realized the importance of wetlands restoration and preservation: Hurricane Katrina showed us that wetlands provide tremendous buffers to the impacts of storm surge and sea level rise. Flood resilience planning that considers the use of green infrastructure for communities potentially impacted by urban flooding has been supported with EPA's Flood Resilience Checklist [*see*: www2.epa.gov/sites/production/files/2014-07/documents/flood-resilience-checklist.pdf]. The National Drought Resilience Partnership mentioned earlier is really about figuring out how climate change is impacting our communities and how the entire federal sector can support communities.

 

## EPA & Innovation

### Market Opportunities

### Water Reuse

**What are a few of the biggest unexplored (or under-explored) opportunities for technology to improve water sustainability? What are some examples of technology you wished utilities would adopt?**

That question goes to the heart of why EPA issued the Water Technology and Innovation Blueprints. We described ten "market opportunities" where we think technology and innovation can fundamentally move us toward water resource sustainability. The first market opportunity is conserving and recovering energy. The 15,000 wastewater treatment plants in this country — altogether they consume about two percent of the nation's electricity. Earlier we highlighted that East Bay MUD and Gresham, Oregon have gone energy positive. Imagine if every wastewater utility in the country could go energy positive! Another market opportunity is number four: conserving and eventually reusing water. Communities have taken great strides to use less water, but the real leap is reusing water. Many coastal cities discharge their clean water into the ocean. Imagine if you could recapture and reuse all that water. EPA's Blueprint framed ten of these market opportunities with the expectation that the water sector will rise to the challenge of bringing new technology, along with economic growth and opportunity, to solve our water resource challenges and achieve long term water resource sustainability.

**For Additional Information:**
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EPA Water Innovation and Technology website:
www2.epa.gov/innovation/water-innovation-and-technology

**Jakob Wiley** is a law student at the University of Oregon School of Law and a Water Resources Policy and Management graduate student at Oregon State University. Before going to law school, Jakob was attended Gettysburg College, where he studied German and chemistry. His legal studies focus on water law, water conflict management, sustainable natural resource development, energy law, land use, and agriculture law. Jakob worked for ***The Water Report*** as a student intern in the summer of 2015.

## Fire & Rain

# FIRE & RAIN

ISSUES AND CONCERNS FOLLOWING THE INCIDENCE OF FIRES IN THE WESTERN UNITED STATES

by Michael V. Harding, CPESC, Geosyntec Consultants, Inc. (San Diego, CA)

**California Wildfires 2003 - 2014**

2003 - 974,000 acres
2004 - 265,000 acres
2005 - 222,500 acres
2006 - 736,000 acres
2007 - 1,054,000 acres
2008 - 1,525,000 acres
2009 - 422,127 acres
2010 - 48,824 acres
2011 - 168,545 acres
2012 - 609,178 acres
2013 - 546,298 acres
2014 - 535,318 acres
Twelve Year Average: 592,000 acres

Source: California Department of Forestry and Fire Protection (Figures based on fires greater than 200 acres)

## INTRODUCTION

### TRENDS OF WESTERN WILDFIRES

Wildfires are becoming an evermore common occurrence in the Western United States. Once considered largely seasonal perturbations, they now increasingly occur throughout the year. In the West, lightning strikes, accidents, and the inevitable incidents of arson are occurring in a drought-ridden tinderbox, creating fires very difficult to bring under control and often resulting in devastating loss of property and life.

In Southern California, hot, dry winds blow from the desert in a phenomenon known as Santa Ana conditions. Strong, shifting and westward blowing, Santa Ana winds — when combined with high temperatures, low humidity, and drought — create the perfect condition for fast spreading, uncontrollable fires. In California alone, the number of large wildfires is projected to increase by 12-53 percent by the end of the century, depending on the climate model scenario (Research Paper No. 08102801, *California Climate Risk and Response*, Fredrich Kahrl and David Roland-Holst, November 2008).

While the substantial initial damage of wildfires is generally widely reported upon, less so are the ongoing consequences. These fires cause very significant loss of vegetation and increase the potential for erosion, debris flows, runoff, and flooding hazards — a "secondary disaster" which well-warrants bearing in mind.

The occurrence of wildfires throughout history has resulted in an extensive body of experience and knowledge concerning the effects of fire on natural ecosystems. This article provides a brief overview of major aspects of the perspective this knowledge provides. That is followed by a discussion of applying, and the impediments to applying, this understanding when responding to western wildfires.

## Fire & Rain

**WILDFIRE AFTERMATH**

CONTRIBUTING FACTORS TO A SECONDARY DISASTER

**Wildfire Issues**

Some of the potential issues following wildfire are: a short-lived increase in flooding; hill slope and channel erosion; debris flows and off-site sediment discharge downslope; and infrastructure impacts — such as washed out roads and plugged culverts.

Some of the documented short-term effects of wildfire are:

- Loss of protective vegetative cover which causes a temporary increase in runoff, erosion, and sedimentation due to the actions of wind and water
- Temporary changes in the chemical, physical, and biological nature of the fire-affected area — in particular, the hydrophobic conditions in the soil
- Disability of a watershed to recover to its pre-burn condition — depending on the severity of the burn

**Loss of Protective Vegetative Cover Results in Increased Soil Erosion**

**Soil Erosion Factors**

The major factors affecting soil erosion are utilized in the "Universal Soil Loss Equation" (USLE) (Wischmeier, et al., 1965), where:

A (the annual rate of erosion in tons per acre ) = R x K x LS x C x P

- R = Rainfall
- K = Soil erodibility
- L = Slope length
- S = Slope steepness
- C = Cover management practices
- P = Support conservation practices

Variables in the USLE that are not directly altered as a result of wildfire are:

- Rainfall (R), which is a climatological factor independent of site conditions
- Conservation practices (P) implemented immediately following the incident
- Slope gradients (LS), which geologically remained constant

**Fire-Affected Erosion Factors**

The major erosion factors of the USLE affected by the incidence of wildfire are thus:

- The soil erodibility factor (K) which can increase as a result of burn severity that can affect the chemical, physical, and biological characteristics of soil
- The cover factor (C), which is initially reduced by the loss of vegetation by burning, and appears to recover over time based on burn severity

**The Effects of Burn Severity**

**Cover Impacts**

Burn severity plays an important role in the propensity for soil to erode. Where burn severity is severe, natural re-vegetation/regeneration abilities of the watershed areas are also greatly impacted. The severity of a fire cannot be expressed by a single quantitative measure that relates to a resource impact, such as erosion (DeBano, et al., 1998). A general fire severity classification system has been developed to relate burn severity to soil resource response (Wells, et al., 1979).

## Fire & Rain

### Fire Severity

GENERAL FIRE SEVERITY CLASSIFICATIONS ARE:

- LOW SEVERITY: Low soil heating or light soil char. The surface is mostly black in a shrub land or grassland ecosystem. Soil temperatures at one centimeter are less than 50 degrees Celsius (122 degrees Fahrenheit). Less than two percent of the area being severely burned; less than 15% moderately burned; and the remainder of the area experiencing a low severity burn.
- MODERATE SEVERITY: Moderate soil heating, or moderate ground char. Light colored ash present. Soil temperatures at the one centimeter depth can reach 100-200 degrees Celsius (212-392 degrees Fahrenheit). Less than 10% of the area is severely burned; over 15% is moderately burned; and the remainder is burned at low intensity or unburned.
- HIGH SEVERITY: High soil heating, or deep ground char. Duff completely consumed and visible mineral soil is reddish or orange. White ash. Charring can extend to a depth of ten centimeters. Soil temperatures at one centimeter are 250 Celsius or greater (482 degrees Fahrenheit).

**Figure 2: The Effect of Burn Severity on Streamflow Following the Incidence of Wildfire (After DeBano, 1998)**

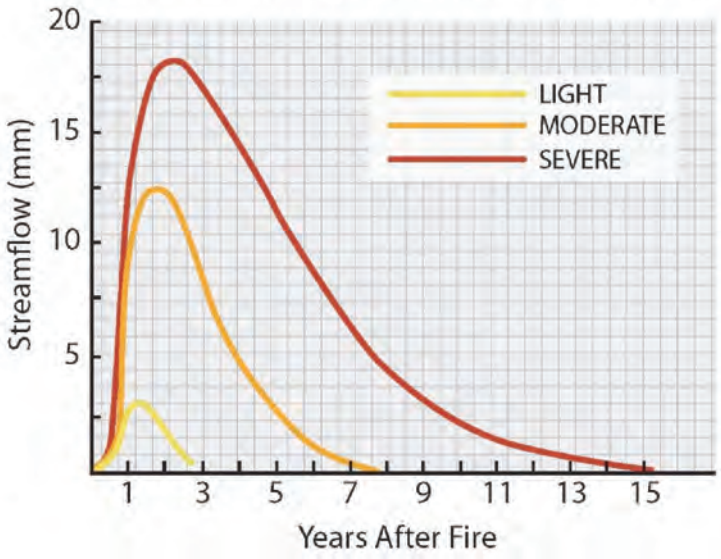
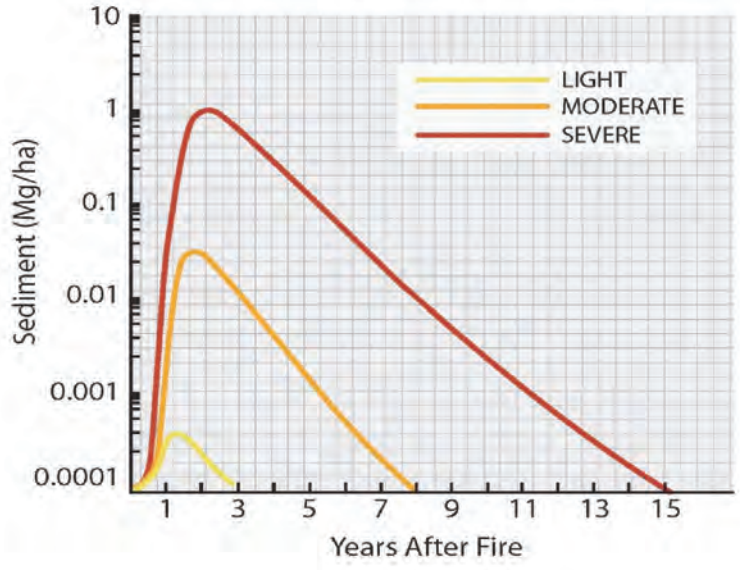



**Figure 3: The Effect of Burn Severity on Soil Erosion Following the Incidence of Wildfire (After Debano, 1998)**




Based on research, the effects of burn severity on streamflow are illustrated in Figure 2. As can be seen in this figure, recovery of a watershed — if ascribed to the characteristics of streamflow — appears to be directly related to burn intensity: the higher the burn intensity, the longer it will take for a watershed to recover. The effects of burn severity on soil erosion are illustrated in Figure 3. Again, this figure indicates that soil erosion peaks initially after a fire, but reduces over time depending on burn intensity, as a watershed recovers and stabilizing vegetation is reestablished.

**Soil Hydrophobicity**

During wildfires, heat produced by combustion of litter vaporizes organic substances. These gases condense under the surface to coat and bond to soil mineral particles, resulting in the formation of a water-repellant or "hydrophobic" layer, which decreases infiltration and increases runoff. In general, increased burn severity results in increased water repellency and runoff. To some degree, the color of ash resulting from a wildfire can be an indication to professionals as to how a watershed will react to rainfall events and how it will recover over time, thereby informing remediation efforts.

Black ash is generally an outcome from fires of low to moderate burn severity. These fires result in relatively low to moderate runoff and erosion and the absence of hydrophobic conditions. Seed and plant material remain viable and watershed recovery is short — from three-to-five years, depending on the ecosystem.

White ash (Figure 4) is generally an indicator of high burn severity and the development of hydrophobic soil conditions. This "hydrophobicity" results in increased runoff and erosion. There is also little to no viable plant material and any re-vegetation strategy will require an augmentation strategy (i.e., direct seeding) of the watershed to return it to pre-burn conditions. Recovery is relatively longer -— from five-to-fifteen years, depending on the ecosystem.

The good news for hydrophobic soils formed by high burn severity is that the condition is largely discontinuous over Western landscapes, with the exception of large stands of mature timber. The bad news is that white ash is an indicator that no viable seed or plant root remains. Re-vegetation — through augmentation — is thus required for soil stabilization.

## Fire & Rain

**Fire Impacts**

**Immediate Concerns**

**Phased Approach**

**White Ash**

**WILDFIRE RESPONSE**

Research has identified a number of critical parameters that immediately follow the incidence of wildfire in the Western United States.

IMMEDIATE FIRE IMPACTS INCLUDE:

- Runoff volume can increase by 30-40%
- Runoff rates can double
- Erosion rates can increase by an order of magnitude
- Sediment loads can increase by an order of magnitude

Following wildfires — particularly in an urban interface — these immediate impacts are of immediate concern for public safety. Steps may be necessary for the protection of private property and public infrastructure from the effects of flooding, hillslope erosion and sediment deposition, or mud and debris flows. In remote, undeveloped watersheds that contribute to water supply, there is additional concern as water quantity and quality are impacted.

**Responses Implemented**

State and local governments generally implement a phased approach to post-fire hazard assessment and mitigation to stabilize fire-affected areas, which includes the following actions:

RESOURCE REVIEW AND ASSESSMENTS

Utilization of aerial photographs, GIS data, topographic maps that include: geologic features; vegetation types; hydrologic information; watershed boundaries; burn areas; soil types and stormwater conveyance features; and any **b**urned **a**rea **e**valuation **r**eports (BAER) are included.

IDENTIFYING HIGH PRIORITY AREAS

Field teams perform field reconnaissance to: identify potential hazards and impacts such as flooding, erosion, landslide or rock fall hazards that threaten life and property; refine estimates of burn severity and watershed response; assess site condition of riparian areas, soils, vegetation, and structures drainage facilities; and to further refine site prioritization.

Figure 4: The presence of white ash following a wildfire is indicative of a high burn severity. Such areas usually have hydrophobic soil conditions and are more susceptible to erosion and slower to re-vegetate. Scripps Ranch, CA. October 2003.

## Fire & Rain

### Response Plan

PREPARING A POST-FIRE RESPONSE PLAN

A Post-Fire Response Plan is prepared that identifies sites that have a high potential to experience problems during storm events. The plan should include hazard mitigation measures, where they should be deployed, and by whom.

### Follow-Up Inspections

OVERSIGHT OF IMPLEMENTATION OF MEASURES

The Post-Fire Response Plan should include details on the supervision of post-fire remediation work, field crews must be trained to properly and safely install sediment and debris control structures, and contractors directed in the efficient application of specified hydraulic mixtures based on site conditions (see Figure 5).

POST-IMPLEMENTATION INSPECTIONS

Conducting follow-up is important, with as-built inspections to ensure that post-fire remediation practices are installed and functioning as designed. Field auditing is necessary to quantify the materials used for erosion and sediment control as well as the amount of labor expended to accomplish hazard mitigation objectives. The accuracy and timeliness of data collection is crucial for reimbursement from State and Federal emergency management agencies.

### Hydraulic Application

Figure 5. Aerial photo of the application of an hydraulic matrix following the 2007 Witch Creek Fire in San Diego, CA 2007.

## Fire & Rain

### RESPONDING TO WESTERN WILDFIRES

To summarize, wildfires in the Western United States are becoming more frequent, occurring at all times of the year, and are becoming increasingly severe in their intensity. Wildfires cause significant loss of vegetation, thereby increasing the potential for erosion, debris flows, runoff and flooding hazards, which are of particular concern in an urban interface. Vegetation and climatic conditions exacerbate wildfire potential due to high temperatures, low humidity, and drought — setting the table for fast spreading, uncontrollable fires.

**Hazards Wind or Water Based**

The differences in post-wildfire fire hazards — from an erosion control perspective — are either wind- or water-based. When wildfires occur in the drier part of the year, the hazards are primarily issues of fugitive dust and ash whereas during the wetter parts of the year, the issues are flooding, mudflows, and sedimentation. It follows that any remediation plan to ameliorate the post-fire environment and its impact on human health and safety and the environment needs **b**est **m**anagement **p**ractices (BMPs) adapted to the particular site and climatological conditions.

**"Dry-Season" Evolution**

**Dry-Season Fires**

Due to prolonged drought in the Western United States and particularly in Southern California so-called "dry-season" fires will probably become more of the norm in the future — that is, we will be addressing a year-round incidence of wildfires. These fires may occur more frequently than autumn fires and may be more widely dispersed geographically. Under this scenario, the number of fires will probably increase but the affected acreages for each may be smaller.

**Limited Options**

After fires occur in the drier times of the year, water-based erosion and sediment control issues are generally not an immediate issue, except for the occasional summer runoff-producing thunderstorm. However, wind-borne dust and ash and its effect on public health is of immediate concern. While there are many alternative BMPs for water-based erosion control, the options to immediately address dry-season fire dust control issues appear to be fairly limited. Remedial actions — primarily the hydraulic application of liquid soil stabilizers — may be locally applied, e.g. within a defined canyon or on a slope in close proximity to homes and businesses. However, in order to be completely effective, actions additional to ground-based application of dust palliatives on the accessible perimeters of burned areas are warranted. Remote and steep terrain inaccessible to ground-based equipment will have to be treated by aerial applications using fixed wing and/or rotary aircraft. This is because, unlike water based erosion and sedimentation (which generally occurs within a defined hydrologic unit), the wind-borne impacts from fugitive dust and ash are wide ranging.

**Dust Control Focus**

Immediate action BMPs should focus almost exclusively on source (dust) control, as opposed to a combination of the "normal" treatment train of drainage, erosion, and sediment control BMPs. These BMPs will be largely hydraulic applications that can be done quickly, e.g. hydromulchers or aircraft applying a dilute mixture of organic tackifier/trace mulch without having to wait on installation of check structures like sand bags or straw wattles. Using these BMPs, there will probably be no need for placing workers on burned areas before application of the source control. The soil stabilization methods should be expected to last a maximum of three to four months and photo- or biologically-degrade prior to the fall rainy season. These "Stage One" measures must be followed up by a "Stage Two" program of comprehensive BMPs that address rainfall-based erosion and sedimentation prior to the rainy season.

State and local agencies that are responsible for emergency response may have some reluctance to implement a "two-stage" program of post-fire remediation, especially if Federal funding and reimbursement becomes an issue. This could be the most likely response in southern California, where post-fire problems are usually associated with the autumn rains.

**"Two-Stage" Remediation**

IMPEDIMENTS CONFRONTING "TWO-STAGE" POST-FIRE REMEDIATION INCLUDE:

- An immediate action plan to address fugitive dust that in turn leads to an autumn, water-based, remediation strategy doesn't fit conveniently into the current Federal Emergency Management Agency (FEMA) Emergency Watershed Protection Program funding mechanism, including the 120 day-after-incident completion schedule.
- There is difficulty in predicting wind direction and velocity — and thereby which areas are directly impacted — as opposed to standard hydrologic predictions which are used to guide water-based BMP actions.
- The benefits to public health and safety from dust/ash remediation following wildfires are unquantified, largely unknown, and require monitoring.
- In order to be effective, nearly 100% of the burned areas would have to be stabilized. However, winds stirring up ash and affecting downwind populated areas may produce air quality

## Fire & Rain

### Assessments Use

### Rainy Season

**Michael Harding** is and environmental scientist and one of the leading technical experts in the erosion control industry. A graduate of Purdue University, Michael has over 40 years of experience in erosion and sediment control, resource management, mined land reclamation, wildlife habitat development, and nonpoint source pollution control both in the United States and overseas. He designed and supervised the construction of the San Diego State University Soil Erosion Research laboratory and was its Director from 1999-2002. He has contributed significantly to the body of knowledge related to the effectiveness of alternative approaches to erosion control through field and laboratory testing programs. Michael played a key role in the emergency soil stabilization efforts following the 1991 Oakland firestorm, 1993 Southern California fires, the 2003, 2007, 2012 and 2014 San Diego County/City Fires. Nationally, his efforts on over fifty emergency response plans have focused on leadership, financial assistance and technical guidance in the form of post-fire hazard assessment, design of mitigation strategies, and oversight of extensive mitigation implementation efforts before the onset of winter rains. He developed and teaches the course "Fire & Rain: Post-Fire Hazard Remediation." Michael is the former President of the International Erosion Control Association (IECA) and Chief of Council (COC) for that organization's International Regional Council (IRC).

(health) as well as social and political impacts, forcing a decision by emergency responders to take immediate action. Regardless, there is a need for pilot studies to evaluate air-borne particulates generated from post-burn areas and to evaluate the quick and simple measures to inhibit ash and dust entrainment.

Finally, although wind-borne BMP implementation will most likely be relatively inexpensive compared to water-based erosion and sediment control, cumulatively, a two-stage approach would probably cost more than the typical one-stage, autumn approach. However, information obtained from "Stage One" assessments can be used to help guide a "Stage Two" action plan prior to the fall rainy season; e.g., major drainage features that will require sediment retention structures should be able to be identified in the initial "Stage One" assessments.

**Rainy Season Fires**

It has long been accepted that the greatest potential for wildfires in Southern California occurs in the fall of the year, just prior to the rainy season. In this scenario, water-based erosion issues are an immediate issue of concern and immediate action plans are developed to address flooding, mudflow, and sediment control. Dust and ash control is generally addressed when hydraulic mulches are applied to burned areas as one of many rainfall-based erosion and sediment control measures.

A comprehensive suite — or "treatment train" — of drainage, erosion, and sediment control BMPs is generally applied on slopes above homes, businesses, and infrastructure. These BMPs are primarily comprised of hydraulic applications for source control — straw wattles (for slopes), and gravel/burlap bags for check structures to control drainage and sediment. These methods generally last through the rainy season (maximum of four to six months) or until natural regeneration of vegetation produces an erosion control effective coverage.

The anticipated results of rainfall-based BMPs are mostly predictable and lie within a defined drainage area or watershed. In the past twenty years of large fires in California, only one-to-two percent of the burn area has been treated with this type of comprehensive approach. A system that identifies hazards versus impacts has allowed emergency responders to set priorities based on needs, funding, and economic defensibility of their decisions. Finally, autumn post-fire remediation fits into the current funding mechanisms of FEMA, Federal Highway administration, and the federal Natural Resources Conservation Service (NRCS) Emergency Watershed Protection Program.

## CONCLUSION

There may not be many options to immediately address the dry-season fire dust control issues if wind conditions create air quality issues downwind of burned areas. Even so, as previously mentioned, there are some limitations to a two-stage approach. State and local emergency agencies may be reluctant to implement dust and ash control measures because of the extent to which the soil stabilizers would have to be applied to be effective. Second, a two-stage, stop gap implementation does not fit conveniently into the current FEMA Emergency Watershed Protection Program funding mechanism, including the 120 day-after-incident completion schedule. Third, although Stage One BMP implementation will most likely be relatively inexpensive compared to Stage Two cumulatively, the two stages will cost more than a one-stage, autumn approach.

Finally, the benefits to public health and safety from dust/ash remediation following wildfires are unquantified, largely unknown, and require monitoring. There is an opportunity to consider pilot studies to evaluate air-borne particulates generated from post-burn areas and assessment of simple measures to inhibit ash and dust entrainment.

**For Additional Information:**
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Debano, L.F., Neary, D. G., Folliott, P. F. 1998. Fire's Effects on Ecosystems. John Wiley Sons, New York.

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Wischmeier, W.H., Smith, D.D. 1965. Predicting Rainfall-Erosion Losses from Cropland East of the Rocky Mountains. Agricultural Handbook No. 282. United States Department of Agriculture - Agricultural Research Service.

 

## WATER BRIEFS

### SUSTAINABLE WATER USE NE

#### HISTORIC PURCHASE TO PRESERVE BASIN INTEGRITY

The Niobrara River extends across northern Nebraska from its narrow beginnings 50 miles inside eastern Wyoming. It empties into the Missouri River 486 miles later between the village of Niobrara and Niobrara State Park. The main sources of inflow are tributaries and Sandhills groundwater. In 1991, a 76-mile stretch of the Niobrara was designated a National Scenic River to preserve unique biological features.

An historic agreement was signed on September 16th to preserve the future of the Niobrara River Basin between the Niobrara River Alliance (NRBA), the Nebraska Game & Parks Commission (Commission) and the Nebraska Public Power District (NPPD). A Memorandum of Understanding (MOU) was reached by the parties "for the purposes of ensuring sustainable water use in the Niobrara River Basin ('Basin') for multiple purposes" and to "craft a comprehensive plan to protect the long-term integrity of the Basin… ." MOU, page 1. Under the MOU, NPPD would close its hydropower facility and sell its Niobrara River water rights, Spencer Dam, and approximately 230 acres to the Commission and NRBA for $12 million.

Under the MOU, the Commission and the five **n**atural **r**esources **d**istricts (NRDs) that comprise NRBA will work with NPPD to take steps towards transfer of assets, including NPPD's water rights on the Niobrara River, Spencer Hydro Facility (Facility), and the lands and easements associated with the dam.

The parties will seek legislative authority to permanently convert NPPD's water rights to a multi-use water right, part of which will be conserved for recreation and fish and wildlife needs, and part of which will be conserved for integrated water management in the Niobrara River basin. The MOU stated that such "legislation will recognize that the appropriations will maintain their original preference of manufacturing for purposes of surface water administration, and maintain their original priority dates." MOU at 3. In addition to accepting the transfer of NPPD's assets, the Commission and NRBA plan to seek an instream flow for the 39-mile stretch of the river below the dam to the confluence of the Niobrara and Missouri rivers. This stretch of river is used by several endangered species, including pallid sturgeon, interior least tern, piping plover and whooping crane.

The NRBA includes the Upper Niobrara White NRD, Middle Niobrara NRD, Lower Niobrara NRD, Upper Elkhorn NRD and Upper Loup NRD, which are responsible for the management of groundwater resources within the Niobara River Basin. The NRBA has been working together to ensure the long-term sustainability of sufficient water in the Niobrara River basin to safeguard future economic activity, agriculture, other water users, fish and wildlife, and recreation activities along the Niobrara for generations to come.

NPPD established the value of the Spencer Facility and water rights at $12 million. NRBA agreed to contribute $4 million and the Commission and NRBA "shall apply for a Nebraska Environmental Trust Grant in the amount of not less than $1,500,000.00." NPPD will provide an in-kind contribution of $3 million. The Commission, NRBA and NPPD plan to jointly seek funding from the Water Sustainability Fund, the Nebraska Environmental Trust, and other sources to raise the additional $3.5 million. The next steps for the group include securing funding and seeking legislative authority to convert NPPD's water rights to multi-use water rights. NPPD will continue to own and operate the facility to generate power until it is able to transfer assets to NRBA and the Commission. The transfer is expected to take two years to complete.

The MOU grew out of litigation that began in 2007, following a "call" of the river by NPPD for its hydropower water rights. NPPD's Spencer Hydro Facility (Facility) is located on the Niobrara River near Spencer, Nebraska, downstream from the irrigators place of use. The Facility has produced hydroelectric power using the flows of the Niobrara River. NPPD holds three water appropriations that total 2,035 cubic feet per second of water. NPPD's water rights were challenged in the litigation after the Nebraska Natural Resources Department ordered irrigators to shut down to satisfy the senior right of NPPD. The irrigators argued abandonment based on NPPD's failure to call the river and assert its senior rights prior to 2007, but eventually NPPD prevailed in Nebraska's Supreme Court and its rights were upheld. *2007 Administration of the Appropriations of the Waters of the Niobrara River*, 288 Neb. 497, 851 N.W.2d 640 (2014). Faced with water shut-offs when NPPD called for its senior water rights near the downstream end of the Niobrara River, the irrigators began looking into a settlement to address the situation.

*The Water Report* plans to publish a major article by Don Blankenau (attorney for NRBA) to explore the details of the settlement agreement and litigation leading up to it in a future issue of *TWR*.

**For info:**
NPPD website at: www.nppd.com/
Commission website on the Niobrara River at:
http://outdoornebraska.ne.gov/conservation/InstreamFlow/index.asp#Niobrara
Don Blankenau, Blankenau & Wilmoth, 402/ 475-7081 or don@aqualawyers.com

## WATER BRIEFS

### PHASE II MS4 REVISION US

#### SETTLEMENT REQUIRES EPA TO REVISE PHASE II MS4 PERMIT & REVIEW FOREST ROAD RUNOFF REGULATION

A settlement filed with the US Court of Appeals for the Ninth Circuit will require the US Environmental Protection Agency (EPA) to revise its 1999 Phase II Municipal Separate Storm Sewer System (MS4) permits for small communities with populations fewer than 100,000.

EPA reached a settlement with the Natural Resources Defense Council (NRDC) and the Environmental Defense Center Inc. (EDC). Under the settlement, EPA is required to propose a revised rule by Dec. 17, 2015, and issue a final rule by Nov. 17, 2016. Additionally, is required to determine, by May 26, 2016, if it will regulate stormwater runoff from forest roads.

The groups signed the proposed settlement August 26th. The associated Proposed Order was issued September 14th.

Because of the settlement, the petitioners have agreed to withdraw a December 2014 lawsuit against EPA. This lawsuit claimed thatEPA did not follow through on requirements of a 2003 Ninth Circuit court ruling on Phase II MS4 permits and forest road stormwater runoff. The 2003 ruling required EPA to address procedural issues within the Phase II rule related to issuing Notices of Intent under the small MS4 General Permit option. According to the 2003 case, without public review and approval of permits, the rule lacked assurance that regulated communities would reduce stormwater pollution to the maximum extent practicable as required by the federal Clean Water Act.

"This settlement puts an end to more than a decade of foot-dragging on a huge water pollution problem," said NRDC Senior Attorney Larry Levine. "We welcome the Administration's commitment to act, and we will work to ensure EPA develops new rules that reflect a more modern, green technology approach to protecting the waters where we fish, swim, and drink."

In a 2003 case brought by NRDC and EDC, *Environmental Defense Center v. EPA*, a federal court ordered EPA to correct and strengthen urban runoff rules for communities with populations under 100,000. The 2003 ruling also ordered the EPA to make a science-based determination of whether polluted runoff from forest roads is so severe that national pollution control standards are necessary. In response to a new lawsuit NRDC and EDC filed last December with the US Court of Appeals for the Ninth Circuit in San Francisco, EPA conceded that it had failed to implement the earlier court order. EPA agreed to strict deadlines to comply.

The settlement does not address the substance of regulations but sets timelines for EPA to take action on two types of stormwater pollution that pose a significant threat to public health, fish and wildlife, and recreation.

The two types of stormwater pollution covered by the settlement are:

"**Urban Runoff**" is the dirty water that runs off roads, parking lots and other hard surfaces in cities and suburbs after rainstorms and snowmelt, carrying toxic metals, pesticides, excess nutrients and harmful bacteria into waters nationwide. It causes beach closings around the country every year, and fouls tens of thousands of miles of streams and hundreds of thousands of acres of lakes, ponds, and reservoirs. NRDC and EDC believe that improved EPA regulations should drive greater use of green infrastructure solutions — like porous pavement, green roofs, parks, roadside plantings and rain gardens — to stop rain where it falls, before it can wash pollution from dirty streets to rivers and beaches. NRDC and EDC believe that EPA's current rules allow most communities to set their own pollution control standards without meaningful oversight — resulting in lax pollution control measures that the National Research Council has deemed a failure. The court order requires EPA to update its stormwater permitting rules with a proposed rule by Dec. 17, 2015 and a final rule by Nov. 17, 2016.

"**Forest Road Runoff**" is the sediment-laden runoff from forest roads that threatens drinking water supplies and kills fish and other aquatic life. Road construction and road use are the main sources of this pollution on forested lands. EPA has identified many effective pollution control measures to solve this problem — such as identifying special areas for protection including wetlands and streamside vegetation, limiting forestry activities to certain times of the year, and designing roads, construction and maintenance to reduce and control sediment in runoff. However, EPA does not currently require that any of them be used. The court order requires EPA to decide by May 2016 whether regulation of forest road runoff is necessary to protect water quality. If EPA determines forest road runoff must be regulated, the Clean Water Act requires that EPA proceed to develop appropriate pollution control rules.

**For info:**
Environmental Defense Center website: www.edcnet.org/ ("News")
Settlement (8/26/2015) at: http://stormwater.wef.org/wp-content/uploads/2015/09/Ninthcircuitpetition.pdf
Proposed Order (9/14/2015) at:
http://wg.convio.net/site/DocServer/NRDC_EDC_v._EPA_order_Sept_2015.pdf?docID=16604

## WATER BRIEFS

### SANTA FE BASIN NM

**STUDY PROJECTS WATER SHORTFALL**

On September 10th, the federal Bureau of Reclamation (Reclamation) released a study of the Santa Fe Basin that found that the water supply for Santa Fe, absent implementation of new strategies, is not adequate to meet future demands even without the influence of climate change.

The Santa Fe Basin Study identifies shortages in the water supply and potential adaptation strategies to meet the water needs described in the basin's 40-year water demand projections. The area's population is expected to increase about 80 percent by 2055 and, unless action is taken, would be expected to result in a shortfall of about 5,155 acre-feet of water per year, the amount of water that provides for more than 20,000 people. When different climate change scenarios were incorporated into the study, water shortfalls of between 6,342 acre-feet to 9,323 acre-feet per year were projected.

The Basin Study Program is part of Reclamation's WaterSMART Program.
**For info:** Peter Soeth, Reclamation, 303/ 445-3615 or psoeth@usbr.gov
WaterSMART webite: www.usbr.gov/WaterSMART.

### TRIBAL HYDRO MT

**SALISH AND KOOTENAI TRIBES FIRST TRIBE-OWNED HYDRO PROJECT**

On September 5, 2015, the Confederated Salish and Kootenai Tribes of the Flathead Reservation (Tribes) located in Polson, Montana, became the first Native Indian Tribe to own and operate a hydroelectric project in the Nation — a milestone that has been more than 80 years in the making. The Salish and Kootenai Dam, formerly known as the Kerr Dam, was constructed on the Tribes' reservation in the 1930's. Now, the Tribes have realized the vision they created in 1985 when FERC relicensed the project to the Montana Power Company and the Tribes.

As part of the relicensing proceeding, the Tribes were given the option to become the sole licensee 30 years from the relicensing date, upon the payment of a "conveyance price." In early 2013 the "conveyance price" was set by an arbitration panel at $18.3 million. In early 2015, the Tribes filed notice with FERC that they would assume ownership of the project. On September 5, 2015, the Tribes held a community-wide event to celebrate the historic and culture significance of assuming ownership of the approximately 200 megawatt hydroelectric project. The dam is currently being operated by the Tribes' wholly-owned energy corporation, Energy Keepers, Inc. The law firm Van Ness Feldman assisted the Tribes in the arbitration and conveyance proceedings.

Three years ago, Energy Keepers, Inc. (EKI), a federally-chartered corporation of the Tribes, was created to manage the conveyance, and then subsequently operate, the Kerr Hydroelectric Project. EKI has been full steam ahead ever since this fall day in 2012.
**For Info:** EKI website: www.charkoosta.com/2015/2015_08_27/We_are_ready-Kerr_Acquisition_Project.html

### GREEN INFRASTRUCTURE US

**EPA LAUNCHES NEW TOOL**

EPA has released a new web-based tool that helps local officials and other community members consider the benefits and uses of green infrastructure. The Green Infrastructure Wizard, or GIWiz, responds to growing community interest in using green infrastructure as a means of addressing water quality and a range of other local goals.
Users can find EPA tools and resources to:

- Learn the basics of green infrastructure
- Explore options for financing green infrastructure
- Visualize and design rain gardens, permeable pavement, and other types of green infrastructure
- Understand how other communities are using green infrastructure to revitalize neighborhoods and enhance land use
- Develop green infrastructure public education and outreach campaigns

EPA developed the Green Infrastructure Wizard with input from local, state and tribal partners. EPA is inviting additional input on this Beta version, with the goal of making continued improvements going forward.
**For info:** GIWiz website: www2.epa.gov/communityhealth/green-infrastructure-wizard

### MUNI-TO-FARM WATER CA

**NORTH VALLEY RECYCLING PROGRAM**

The Del Puerto Water District (DPWD) and the Cities of Turlock and Modesto (Cities) propose to implement a regional solution to address water supply shortages within DPWD's service area on the west side of the San Joaquin River in San Joaquin, Stanislaus, and Merced Counties, south of the Sacramento-San Joaquin River Delta (Delta). The project proposes to deliver up to 59,000 acre-feet per year of recycled water produced by the Cities via the Delta-Mendota Canal. Recycled water would be conveyed from Modesto and Turlock through pipelines from their wastewater treatment facilities, crossing the San Joaquin River, and ending at the Delta-Mendota Canal. The recycled water would then be conveyed directly to DPWD customers or to San Luis Reservoir for storage during low water demand periods. In addition to uses within DPWD's service area, this project also proposes to provide water to Central Valley Project Improvement Act (CVPIA)-designated Refuges located south of the Delta to meet their need for water supply.

A combination of increased limitations on pumping from the San Joaquin-Bay Delta and the unprecedented dry conditions throughout California has resulted in a significant reduction in water available for irrigation. These factors have contributed to the fallowing of highly productive farmland and lost jobs.

The North Valley Regional Recycled Water Program (NVRRWP) will provide a new source of water for agricultural customers in the DPWD, whose supplies have been severely impacted by drought and environmental restrictions on pumping from the Delta.

The Cities of Turlock and Modesto will provide treated recycled water to the Del Puerto Water District via a direct pipeline (or pipelines) to the Delta-Mendota Canal. The District will, in turn, distribute that water to the agricultural customers within its service area. As much as 30,600 acre-feet per year could be available as soon as 2018.
**For info:** Rain Emerson, Reclamation, 559/ 487-5196 or remerson@usbr.gov
Project website: www.nvr-recycledwater.org/

## WATER BRIEFS

**DELTA SETTLEMENT CA**

**STORMWATER SUIT SETTLED**

The Coalition for a Sustainable Delta has settled its lawsuit with the City of Stockton and San Joaquin County over toxic stormwater discharges into Delta waterways. The 2009 lawsuit, brought under both the Clean Water Act and Endangered Species Act, alleged that discharges from the City and County's storm sewer system violated Clean Water Act requirements and degraded water quality to a degree that harmed endangered species in the Delta.

The settlement requires the City and County to:

- Implement an Enhanced Water Quality Monitoring and Investigation Program
- Upgrade the Illicit Discharge Detection Program, including the capability to ensure 24-hour response
- Improve training of municipal staff to identify and prevent illicit discharges and other water quality violations and issues
- Require additional labeling and posting ("No Dumping") on storm drains that flow directly into rivers and streams
- Establish a GIS database to track the inspection and cleaning of City-owned catch basins
- Develop a business outreach program targeting restaurants, food service and other high-risk business establishments
- Incorporate integrated pest management practices to reduce municipal pesticide use and the potential for contamination
- Develop outreach and education materials to facilitate appropriate boating waste disposal
- Increase municipal expenditures earmarked for stormwater quality activities
- Improve pollution prevention at municipal facilities and utilize Best Management Practices and pollution source control measures to reduce contaminants in stormwater discharges

"The Settlement puts in place a much improved and comprehensive pollution and toxic discharge monitoring and prevention program ensuring the City and County do all they can to reduce harm to the estuary caused by stormwater discharges. We are hopeful that Stockton and the County of San Joaquin will develop and implement a stormwater program that will be a model for other communities that discharge into the sensitive Delta ecosystem," stated Michael Boccadoro, spokesperson for the Coalition.

**For info:** Coalition for a Sustainable Delta website: www.sustainabledelta.com/features/stormwater-pollution-suit-settled.html

**GROUNDWATER ID/OR/WA**

**USGS COLUMBIA PLATEAU AQUIFER STUDY**

Groundwater levels have declined in a quarter of the Columbia Plateau Aquifer system because of intensive irrigation, according to a US Geological Survey (USGS) assessment.

The Columbia Plateau, a volcanic basin between the Cascades and the Rockies, produces $US 6 billion in farm output per year. Groundwater levels have declined over more than 10,000 square miles (about 23 percent of the Plateau's aquifer system) due to pumping at rates that exceed groundwater recharge. Areas with large and widespread declines are located in the central northern part of the study area (referred to as the Odessa Subarea), in parts of the Yakima River basin in Washington, in the Pullman-Moscow area in Washington and Idaho, and in parts of the Umatilla River basin in Oregon. These declines are in areas known to rely heavily on groundwater for irrigation and other uses. In contrast, about five percent of the Plateau's aquifer system has experienced groundwater level rises due to the delivery and application of surface water for irrigation within the large federal Bureau of Reclamation irrigation projects.

Groundwater levels were measured in 1,752 wells during spring 2009 by the USGS and 10 other Federal, State, Tribal, and local agencies. This information was used to map the generalized groundwater elevations for the Plateau's aquifer system and to provide information on regional groundwater flow directions. Groundwater levels measured in 2009 in 470 wells also were compared to groundwater levels measured 25 years earlier in spring 1984. Water levels declined in 83 percent of the measured wells, and declines greater than 25 feet were measured in 29 percent of the wells.

A digital 3-dimensional geologic model was constructed for the Plateau's aquifer system to define the general aquifer system geometry for use in the regional numerical groundwater-flow model. Data for 13,226 wells were used to construct digital surfaces that represent upper and lower subsurface unit boundaries. A web interface tool was developed to allow users to explore the 3D geologic framework of the Plateau's aquifer system by drawing diagrams of "well logs" at any site, or by developing geologic cross sections between multiple sites (http://or.water.usgs.gov/proj/cpras/index.html).

A new Simplified Surface Energy Balance (SSEB) method that uses satellite data was developed to estimate monthly evapotranspiration (ET). ET is a large component of the water budget; it can account for 100 percent of the annual precipitation in the arid areas and 45–70 percent in the more humid uplands, and historically, had not been estimated.

A spatially distributed soil-water balance model was developed to use relations among climate, soils, land cover, and irrigation data to compute monthly irrigation requirements and surplus moisture available for groundwater recharge in irrigated areas. Estimates of groundwater pumpage and surface-water diversions needed for irrigation and groundwater recharge resulting from irrigation were then calculated with ET from the SSEB driving the calculations.

Groundwater availability is critical to managing water resources in the Plateau's aquifer system because of the high water demand for agriculture, economic development, and ecological needs and the great competition for the limited resource.

Water-resource issues include:

- Widespread water-level declines associated with development of groundwater resources for irrigation and other uses;
- Decrease in base flow to rivers and associated effects on water temperature and quality;
- Limited availability of non-appropriated surface water;
- Potential capture of surface water, which was appropriated through

## WATER BRIEFS

senior water rights by pumpage of groundwater, which was appropriated through junior water rights; and
- Current and projected effects of climate change and variability on increasing pumping demand, groundwater recharge, base flow in rivers, and ultimately, sustainable groundwater yields.

Ongoing activities in the region for enhancement of fisheries and obtaining additional water for agricultural, municipal, and domestic use may be affected by groundwater withdrawals and rules implemented under the Endangered Species Act for numerous stocks of salmonids. The study addressed some of these groundwater availability issues by improving the understanding of the hydrogeologic system, the status and trends of the groundwater system, the general relation between groundwater and surface waters, current water use, and the water budget for the Plateau's aquifer system.
**For info:** Study available at: http://pubs.er.usgs.gov/publication/pp1817? Project website: http://wa.water.usgs.gov/projects/cpgw/

**WATER BANK NV/CA**
**BANKING & STORAGE AGREEMENT**

On September 17, the Southern Nevada Water Authority (SNWA) approved an agreement with the Metropolitan Water District of Southern California (MWD) that allows Nevada to bank up to 150,000 acre-feet (AF) of unused water in California this year to temporarily supplement California's drought-stressed water supplies to meet demands. The agreement, approved by MWD's Board of Directors on September 22, allows MWD to boost available supplies and reduce draws on the Southland's water reserves. In return, SNWA will receive nearly $45 million, which will be added to the agency's Rate Stabilization Fund to help defer or reduce the impact of future water rate increases. "This latest program fashions an innovative way for the agencies to share water supply and cash flow, which serve the needs of both agencies today and into the future," MWD General Manager Jeffrey Kightlinger said.

An MWD press release stated, "[W]ith this water supply increase, MWD this year will deliver a full Colorado River Aqueduct of 1.2 million acre-feet, the most in ten years. Metropolitan will return the water when Nevada needs it, which is likely to be at least a decade from now." MWD also noted that "[I]n future years, upon Southern Nevada's request, Metropolitan will return up to 125,000 acre-feet, with SNWA reimbursing Metropolitan for the costs paid by the Southern California agency."

For more than a decade, SNWA has banked unused Colorado River water within Arizona, California, Lake Mead, and the Las Vegas Valley groundwater basin (*see* www.snwa.com/ws/future_banking.html). Like a financial savings account, these banked water resources provide a reserve supply that SNWA may tap into if needed. Combined, SNWA has stored more than 1.5 million acre-feet of water (equal to approximately seven years of current water demands) within the Las Vegas Valley and through various banking arrangements with its Colorado River partners.

In addition, SNWA has some ability to store water within Lake Mead. The water stored in Lake Mead depreciates over time as it is subject to annual evaporation losses from the lake. It is estimated that at least 30% of SNWA's temporary water supplies stored in Lake Mead will be lost to evaporation before they are needed. Furthermore, if a shortage is declared for the Colorado River Basin — which could occur as early as 2017 — SNWA's stored water supplies within the lake will not be available for use. While water stored in Lake Mead will not be available under shortage conditions, water banked through interstate agreements such as this one remains accessible to SNWA.

In California, SNWA has recently banked approximately 75,000 AF of water annually — the Colorado River water is apportioned but not used by SNWA. The new banking arrangement allows SNWA to increase this storage volume by an additional 75,000 AF and receive compensation from California's MWD for that water. Should this water be needed by Nevada in the future, provisions in the agreement allow SNWA to return the funds and recover the water. The initial cooperative storage and interstate release agreement allowing water banking between MWD and SNWA was entered into in 2004.

According to SNWA, this cooperative partnership will not impact SNWA's ability to meet water demands in the future. The SNWA's long-range water resource plans reveal that banked water reserves will not be needed by Nevada within the next decade or more. Nearly 30,000 AF of reserve water is created annually by SNWA, ensuring that sufficient reserve supplies will continue to be available if they are needed by Nevada in the future.
**For info:** SNWA Water Banking website: www.snwa.com/ws/future_banking.html; Bob Muir, MWD, 213/217-6930 or www.mwdh2o.com

**"WATERS OF THE US" US INJUNCTION LIMITED**

As reported in our last issue (Moon, *TWR* #139), North Dakota federal Judge Ralph Erickson issued a preliminary injunction stopping implementation of the new "Waters of the US" definition that governs Clean Water Act jurisdiction. A remaining issue was the extent of his injunction ruling and its application to 16 other states, beyond the plaintiff states before his court. The other 16 states are involved in cases that were consolidated into one lawsuit before the 6th Circuit Court of Appeals in Cincinnati, Ohio. EPA took the position that Judge Erickson's order was limited to the 13 states before his court, and announced that EPA would implement the new rule in the other states.

On September 4, 2015, Judge Erickson of the federal district court declined to extend the injunction beyond the 13 plaintiff states. Judge Erickson noted that a court might decline to act "out of respect for the decision making authority of the other courts who have ruled on this issue" or "out of respect for the states who desire the implementation of the [WOTUS Rule] as currently proposed… .". *North Dakota, et al. v. EPA, et al*., No. 3:15-cv-00059 (D. N. Dak.), Order of Sept. 4, 2015, pages 1-2. He also mentioned that the "record before this court" might not be "sufficiently complete to justify a broader application." *Id*. at 2. "Under these circumstances, the court declines to extend its decision beyond the entities that are actually parties in this litigation." *Id*. at 4.

Thus, at this point Alaska, Arizona, Arkansas, Colorado, Idaho, Missouri, Montana, Nebraska, Nevada, New Mexico, North Dakota, South Dakota, and Wyoming are not subject to the new rule and will continue to be governed by the prior regulation. The rest of the 37 states must abide by the new "Waters of the US" rule, which became effective on August 28.

**For info:** EPA Clean Water Rule website: www2.epa.gov/cleanwaterrule; Sept. 4 Ruling available at: www.ag.nd.gov/NewsReleases/2015/WOTUSOrder9-4-15.pdf

**COLUMBIA RIVER NW**

**GOVERNANCE: TRIBAL PRISM**

In late June, the universities consortium on Columbia River Governance released their final report of *A Shared Responsibility: Governing the Use of Water and Related Resources in the International Columbia River Basin Through the Prism of Tribes and First Nations*. The report is particularly relevant given that the Columbia River Treaty, between the US and Canada, has reached the point where it can be terminated by either nation beginning in September 2024, provided that nation has provided at least ten years notice.

As noted in the Executive Summary of the report, in the fall of 2012, leaders from First Nations and Tribes in the international Columbia Basin participated, along with about 150 other people, in the 4th transboundary symposium convened by the Universities Consortium on Columbia River Governance. Participants explored the interests, rights, and roles of Tribes and First Nations in the basin. Following the symposium, members of the Universities Consortium continued to work with the Tribes and First Nations to explore the role of Tribes and First Nations in governing the use of water and related resources in the transboundary Columbia Basin.

From the summer of 2013 through the fall of 2014, representatives from the Tribes and First Nations worked side-by-side in a Steering Committee to guide this research project. The Steering Committee and research team met via conference calls and face-to-face workshops to shape the purpose and scope of the project, explore and examine preliminary findings, and to clarify options and conclusions. The project provided a unique opportunity for First Nations and Tribes on both sides of an international border to work together on issues of common concern.

The report includes basic information on the history and governance of the international Columbia Basin; a synthesis of the interests and aspirations of Tribes and First Nations in the basin; an overview of the legal framework that defines the role of indigenous peoples in international water governance; and a review of case studies throughout the world that might inform efforts to improve governance in the basin. The intent is to provide a compelling narrative that highlights and explains the past, present, and future role of Tribes and First Nations in governing the use of water and related resources in the international Columbia Basin. The narrative is grounded in the interests and aspirations of Tribes and First Nations, and informed by trends and lessons from the international water community.

**For info:** Report available at: www.columbiarivergovernance.org/A_Shared_Responsibility_2015_FINAL.pdf; Additional Treaty information at the Columbia River Inter-Tribal Fish Commission's website: www.critfc.org/tribal-treaty-fishing-rights/policy-support/columbia-river-treaty/

**PLASTIC "MICROBEADS" US**

**WASTEWATER PROBLEM**

An outright ban on the common use of plastic "microbeads" from products that enter wastewater is the best way to protect water quality, wildlife, and resources used by people, a group of conservation scientists suggest in a new analysis. These microbeads are one part of the microplastic problem in oceans, freshwater lakes and rivers, but are a special concern because in many products they are literally designed to be flushed down the drain. Even at conservative estimates, the collective total of microbeads being produced today is enormous.

In an article just published in the journal Environmental Science and Technology, scientists from seven institutions say that nontoxic and biodegradable alternatives exist for microbeads, which are used in hundreds of products as abrasive scrubbers, ranging from face washes to toothpaste. Around the size of a grain of sand, they can provide a gritty texture to products where that is needed. Stephanie Green, co-author of this report, stated, "Part of this problem can now start with brushing your teeth in the morning... Contaminants like these microbeads are not something our wastewater treatment plants were built to handle, and the overall amount of contamination is huge. The microbeads are very durable."

In this analysis, and using extremely conservative methodology, the researchers estimated that 8 trillion microbeads per day are being emitted into aquatic habitats in the US — enough to cover more than 300 tennis courts a day. But the other 99% of the microbeads — another 800 trillion — end up in sludge from sewage plants, which is often spread over areas of land. Many of those microbeads can then make their way into streams and oceans through runoff.

"We've demonstrated in previous studies that microplastic of the same type, size and shape as many microbeads can transfer contaminants to animals and cause toxic effects," Chelsea Rochman, lead author on the analysis said. "We argue that the scientific evidence regarding microplastic supports legislation calling for a removal of plastic microbeads from personal care products." If legislation is sought, "new wording should ensure that a material that is persistent, bioaccumulative, or toxic is not added to products designed to go down the drain," the report noted. "The probability of risk from microbead pollution is high, while the solution to this problem is simple."

**For info:** Article available at: http://pubs.acs.org/doi/pdfplus/10.1021/acs.est.5b03909

**GROUNDWATER REPORT CA**

**SUSTAINABLE MANAGEMENT**

The Union of Concerned Scientists (UCS) recently released a new report: *Measuring What Matters: Setting Measurable Objectives to Achieve Sustainable Groundwater Management in California (2015)*. Groundwater is a critical resource for California. It provides a crucial buffer against drought and the growing impacts of

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global warming, especially diminishing mountain snowpack that has historically been a linchpin of California's water supply. Over the last century, however, groundwater in California has been largely unregulated, leading to severe declines in groundwater levels in many places, particularly California's Central Valley.

In 2014, California's severe and ongoing drought helped spur the passage of the Sustainable Groundwater Management Act (SGMA), the first-ever statewide effort to comprehensively measure and manage groundwater. SGMA requires local groundwater sustainability agencies to develop groundwater sustainability plans by 2020, but does not define how to set measurable objectives. This report is designed to inform state regulators about how to measure sustainability so that we know when we are making progress and when we are off track. Measurement is key to achieving sustainable groundwater management, and this report provides a summary of best practices in setting effective measurable objectives and recommends a consistent framework for achieving sustainability across California.

The review indicates that effective measurable objectives do the following: define clear baselines; set quantitative thresholds; develop protective triggers; incorporate regular measurement and monitoring; account for uncertainty; and adapt to changing conditions and knowledge.

To inform California's approach to defining measurable objectives, the report outlines four major recommendation: develop a state framework; identify existing data sources for basin conditions; require consistent assumptions to develop sustainable yield; and develop common metrics and consistent data management and reporting protocols.

**For info:** Danielle Jordan, UCS, 510/ 809-1571 or djordan@ucsusa.org; Report available at: www.ucsusa.org/measuringwhatmatters

**DROUGHT MEASURES CA AGENCY ENFORCEMENT**

The California State Water Resources Control Board's (SWRCB's) Office of Enforcement has developed an enforcement strategy for the suppliers that are not meeting their conservation standard (California Code Regulations, title 23, section 865(c)(1)). As detailed on SWRCB's Water Conservation Portal Enforcement website, the enforcement strategy is based on four different levels of compliance, which determine what actions SWRCB will undertake to ensure compliance (website below).

All water suppliers that did not meet their July conservation standard were contacted following the release of the July data, and follow-up calls are being made to those suppliers who appear to have suffered declines in compliance during August. Many suppliers are required to provide information about their existing conservation programs and the steps they are taking to boost conservation.

Conservation orders are being issued to those water suppliers that are far behind and do not have the programs in place to meet their standard. The orders require those suppliers to take specific actions that other suppliers have already taken or face penalties. The Office of Enforcement is targeting its compliance efforts on those urban water suppliers furthest from meeting their conservation standard.

Since June, the Office of Enforcement has issued eight conservation orders, 92 information orders, and 66 warning letters to suppliers based on their monthly compliance priority. The Office of Enforcement is evaluating supplier responses to information orders and meeting with them, as needed, to discuss the circumstances preventing the supplier from achieving their conservation standard and the actions that can be taken to get them into compliance. It is anticipated that more conservation and information orders will be issued in the coming weeks.

To date, six alternate compliance orders have been issued to urban water suppliers in response to confirmed industrial water, and health and safety needs. Two alternate compliance orders are still pending. Conservation orders and alternate compliance orders are posted on the Water Boards' Water Conservation Portal.

**For info:** SWRCB website: www.waterboards.ca.gov/water_issues/programs/conservation_portal/enforcement.shtml

**ROUNDUP & CANCER CA/US CLASSIFIED "CARCINOGENIC"**

California's Environmental Protection Agency (CEPA) announced on September 5th that it will classify glyphosate — a widely used herbicide dangerous to people and linked to the dramatic decline of monarch butterflies — as a chemical known to cause cancer. Earlier this year the World Health Organization found that glyphosate, commonly known as Roundup, was a probable human carcinogen. The "notice of intent" by CEPA gives the public the opportunity to comment on the proposal to list glyphosate, along with three other chemicals, as "known to the state to cause cancer under the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65)" through October 20 (extended date). Comments must be received by 5 p.m. on that date.

Monsanto, the manufacturer of Roundup, continues to argue that the chemical is safe. Roundup is a widely-used herbicide in the United States.

Meanwhile, the EPA announced on June 23rd that it would be analyzing the impacts of glyphosate and atrazine — the two most commonly used pesticides in the US — on 1,500 endangered plants and animals in the US under the terms of a settlement reached with the Center for Biological Diversity (CBD). EPA committed to completing the assessments by June 2020.

According to CBD, EPA has never completed any endangered species assessments of glyphosate at any point over the lifetime of this chemical on the market. EPA last evaluated the general ecological impacts of glyphosate in 1993, when approximately 10 million pounds were applied annually, as opposed to more than 250 million pounds of glyphosate that CBD claims is currenly used in the US each year. The increase in use within the United States has come with the widespread adoption of herbicide-tolerant, genetically engineered crops such as corn and soy.

**For info:** Esther Barajas-Ochoa , 916/ 445-6900 or Esther.Barajas-ochoa@oehha.ca.gov; CEPA website: http://oehha.ca.gov/prop65/CRNR_notices/admin_listing/intent_to_list/090415LCset27.html; Brett Hartl, CBD, 202/ 817-8121 or bhartl@biologicaldiversity.org

## WATER BRIEFS

**REUSE & STORAGE OR CONSERVATION PROGRAM**

The Oregon Water Resources Department (OWRD) is soliciting public comments on applications for the Water Conservation, Reuse and Storage Grant program. The Grant Program, established by Senate Bill 1069 (2008), is designed to fund the qualifying costs of planning studies that evaluate the feasibility of developing water conservation, reuse or storage projects. OWRD solicited grant applications from May 4, 2015 through July 31, 2015. Eight applications were received that requested $705,405 for feasibility study funding. A multi-agency team reviewed and scored each application. The public is invited to review and comment on the applications and review team recommendations. Public comments will be accepted through November 2, 2015. OWRD will make final funding recommendations to the Water Resources Commission after reviewing public comments. The tentative date for the Commission to make its funding decision is November 19, 2015.

Applications and funding recommendations available at: www.oregon.gov/owrd/LAW/docs/FundStudy/Public_Comment_Opportunity.pdf

**For info:** Jon Unger, OWRD, 503/ 986-0869 or Jon.J.Unger@wrd.state.or.us

**PRIOR APPROPRIATION WEST REPORT SUPPORTS DOCTRINE**

On September 21, the Family Farm Alliance (FFA) — which represents irrigators in the 17 western states — released a report that underscores the importance of the water rights system based on the Prior Appropriation Doctrine in the modern water world. "*The Argument for the Prior Appropriation Doctrine to Allocate Water in the Western U.S.*" addresses arguments against the Doctrine by critics who claim that the western water rights system is outdated and hampering efforts to address the West's historic drought.

FFA's report explains why dismantling the doctrine of prior appropriation in the West would destroy the benefits associated with generational ownership of water rights and undermine considerable investments made based solely on the law of the land. Further, the certainty required by all water users would be erased. Finally, any public "taking" of water rights would violate the Fifth Amendment of the US Constitution, which directs the government to compensate the owner of any right if it is going to be taken away or restricted. Dan Keppen, the Executive Director of FFA, also argues that specific examples show "how the water rights system protects public trust resources, which further emphasizes that resolving environmental issues requires balance."

**For info:** Report available at FFA website: www.familyfarmalliance.org; Dan Keppen, 541/ 892-6244

**WATER MARKETS US PRICE INDEX**

WestWater Research recently announced the release of its 2014 Water Rights Price Index (WRPIx) results. Water right prices continued to build on a strong 2013 with another year of double digit gains in 2014. Driven by drought, increased real estate development, and continued economic recovery, water right prices soared to new highs.

This edition of the Water Market Insider contains detailed analysis of the WRPIx, including major market moving regions and market drivers contributing to the strong price appreciation. In addition, the current and historic performance of the WRPIx is compared with other leading indices.

**For info:** Report available at: www.waterexchange.com/market-insight/publications/

**STEAM ELECTRIC PLANTS US TOXIC POLLUTANTS LIMIT**

The US Environmental Protection Agency (EPA) on September 30th finalized a rule that will reduce the discharge of toxic pollutants into US waterways from steam electric power plants by 1.4 billion pounds annually, as well as reduce water withdrawal by 57 billion gallons per year, resulting in an estimated benefit of $463 million per year to Americans across the country. Toxic pollutants include mercury, arsenic, lead, and selenium, which can cause neurological damage in children, lead to cancer, and damage the circulatory system, kidneys, and liver.

According to EPA, the final Steam Electric Effluent Limitation Guidelines are strong but reasonable — based on technologies that are readily available and broadly used in the industry today, reinforcing the ongoing trend towards cleaner, more modern plants. The standards provide flexibility in implementation through a phased-in approach, allowing plant owners to pursue integrated strategies to meet these requirements.

EPA stated that each year, steam electric plants discharge: nearly 65,000 pounds of lead and 3,000 pounds of mercury; 79,200 pounds of arsenic; 225,000 lbs of toxic selenium; 30,400,000 pounds of nitrogen and 682,000 pounds of phosphorus. About 23,600 miles of rivers and streams are damaged by steam electric discharges, including arsenic, mercury, lead, boron, cadmium, selenium, chromium, nickel, thallium, vanadium, zinc, nitrogen, chlorides, bromides, iron, copper and aluminum. Steam electric power plant discharges occur upstream or close to 100 public drinking water intakes and in proximity to nearly 2,000 public wells across the nation.

Steam electric power plants account for about 30% of all toxic pollutants discharged into streams, rivers and lakes from permitted industrial facilities in the US. There are approximately 1,080 steam electric power plants in the US and EPA says that 134 plants will have to make new investments to meet the requirements of this rule. The new requirements do not apply to plants that are oil-fired or smaller than 50 megawatts.

**For info:** EPA website on 2015 Final Rule: www2.epa.gov/eg/steam-electric-power-generating-effluent-guidelines-2015-final-rule

# CALENDAR

**October 14-16 CO**
**Best Practices for Collaborative Water Decisions: Moving from Concept to Action Training, Palisade.** Wine Country Inn. Presented by CDR Assoc. & Colorado Water Institute. For info: http://cdrassociates.org/training-opportunities

**October 15-16 MT & WEB**
**15th Annual Montana Water Law Seminar, Helena.** Great Northern Hotel. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

**October 15-16 AZ**
**Arizona Riparian Council 28th Annual Meeting, Flagstaff.** High Country Conference Ctr. For info: www.riparian@asu.edu

**October 18-22 Jordan**
**Water Security for Sustainable Growth: Water & Development Congress & Exhibition, Dead Sea.** King Hussein bin Talal Convention Ctr. Organized by the International Water Ass'n. For info: www.iwa-network.org/WDCE2015/

**October 18-22 AR**
**17th Annual Stormwater Conference, Hot Springs.** Hot Springs Convention Ctr. Presented by EPA Region 6. For info: www.epa.gov/region/water/npdes/sw/ms4/2015conference/

**October 19 WA**
**Wetlands in Washington Seminar, Seattle.** Courtyard Marriott/Pioneer Square. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

**October 19-21 CA**
**2015 CASQA Eleventh Annual Conference, Monterey.** Hyatt Regency. Presented by California Stormwater Quality Ass'n. For info: www.casqa.org/events/annual-conference

**October 20 OH**
**Ohio Surface Water Conference, Columbus.** Renaissance Downtown. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

**October 20-21 CO**
**Scalable Solutions - American Water Summit, Denver.** Hyatt Regency Tech Center. For info: www.americanwatersummit.com/

**October 21 CA**
**Sustainable Groundwater Management Act Stakeholder Meeting, Valley Glenn.** Los Angeles Valley College Campus Center Bldg., Monach Hall, 5800 Fulton Avenue, 1-4pm Technical Sessions; 6-8 pm Public Forums. Presented by State Water Resources Control Board. For info: Kathryn Landau, 916/ 341-5588 or Katheryn.Landau@waterboards.ca.gov

**October 21-23 CA**
**Northern California Tour 2015, Sacramento.** Sacramento Int'l Airport. Sponsored by Water Education Foundation. For info: www.watereducation.org/tour/northern-california-tour-2015

**October 22 CA**
**Sustainable Groundwater Management Act Stakeholder Meeting, Visalia.** 210 Life Assembly Room, 210 W. Center Avenue, 1-4pm Technical Sessions; 6-8 pm Public Forums. Presented by State Water Resources Control Board. For info: Kathryn Landau, 916/ 341-5588 or Katheryn.Landau@waterboards.ca.gov

**October 22 WA**
**AWRA Washington State Conference: Impacts of Climate Change to Water Resources & Potential Strategies, Seattle.** Mountaineer's Event Center. Presented by American Water Resources Ass'n - WA Section. For info: http://waawra.org/event-1915439

**October 22-23 CA**
**Tribal Water Law Conference - 4th Annual, San Diego.** The Westin. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

**October 23 OR**
**Environmental Law: Year in Review CLE, Troutdale.** McMenamin's Edgefield Manor. Presented by Environmental & Natural Resources Section - OR State Bar. For info: www.osbar.org

**October 24 OR**
**One River, Ethics Matter - Conference on the Columbia River Treaty, Portland.** University of Portland. Presented by Center for Environmental Law & Policy. For info: RSVP contact: Belgin Inan, 03.943.8342, inanb@up.edu J48or www.celp.org/ethics-portland/

**October 26-29 CA**
**VERGE: Where Tech Meeets Sustainabiity Conference, San Jose.** The Fairmount Hotel. For info: www.greenbiz.com/events/verge/san-jose/2015?src=v15prtnrih2o

**October 26-29 NV**
**Solutions for a Changing World: American Water Works Ass'n (AWWA) California-Nevada Section Annual Fall Conference, Las Vegas.** Tropicana Resort. For info: http://ca-nv-awwa.org/canv/CNS/Events_Classes/AFC15/CNS/Annual_Fall_Conference/AFCHome.aspx

**October 27 CA & WEB**
**Sustainable Groundwater Management Act Stakeholder Meeting, Sacramento.** Joe Serna, Jr. - CalEPA Headquarters Bldg., 1001 I Street, 2nd Floor, 1-4pm Technical Sessions; 6-8 pm Public Forums. Presented by State Water Resources Control Board, Webcast available at: www.calepa.ca.gov/broadcast/. For info: Kathryn Landau, 916/ 341-5588 or Katheryn.Landau@waterboards.ca.gov

**October 28 WA**
**Permitting Strategies for Large, Controversial Projects in Washington State & the Northwest Seminar, Seattle.** Mayflower Park Hotel, 405 Olive Way. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

**October 29 AZ**
**Pumps, Pipelines & Property Rights: Legal & Political Challenges for Decentralized Groundwater Governance in Central Texas - Brownbag Seminar, Tucson.** Water Resources Research Ctr. Presen ted by WRRC. For info: http://wrrc.arizona.edu/events/brownbag

**October 29-30 CA**
**Groundwater Regulation in California Seminar, Los Angeles.** Millennium Biltmore Hotel. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

**November 2 WA**
**Washington's Energy Future Conference, Seattle.** Marriott Seattle Airport, 3201 S. 176th Street. Presented by Northwest Environmental Business Council. For info: www.nebc.org/EventDetail.aspx?Id=160

**November 2-3 CA**
**2015 Southwest Climate Summit, Sacramento.** Holiday Inn Capitol Plaza. Presented by SW Climate Science Ctr. For info: http://www.swcsc.arizona.edu

**November 3 CO**
**Innovative Water Management: New Tools for Securing Water for People & Nature: Lecture by Aaron Derwingson of The Nature Conservancy (Colorado River Program), Colorado Springs.** Colorado College, Palmer Hall (Gates Common Room). For info: www.colorado.edu/law/research/gwc/events

**November 3-5 NM**
**AWEA Wind Energy Fall Symposium 2015, Albuquerque.** Tamaya Resort & Spa. Presented by American Wind Energy Ass'n. For info: www.awea.org/events/event.aspx?eventid=30892&navItemNumber=7631&navItemNumber=7669

**November 4-5 CO**
**Endangered Species Act Institute, Westminster.** Denver Marriott Westminster. Presented by Rocky Mt. Mineral Law Foundation. For info: www.rmmlf.org/

**November 4-5 CA**
**California Bioresources Alliance Symposium - 10th Annual, Rancho Cordova.** Central Valley Regional Water Quality Control Board, 11020 Sun Center Drive. For info: UC Davis Extension, https://extension.ucdavis.edu/

**November 4-6 CO**
**NWRA Annual Conference, Denver.** Westin Denver Hotel. Presented by National Water Resources Ass'n. For info: www.nwra.org/upcoming-conferences-workshops.html

**November 5 CA**
**Sustainable Groundwater Management Act Stakeholder Meeting, Redding.** Redding City Hall, 777 Cypress Ave. Presented by State Water Resources Control Board. For info: Kathryn Landau, 916/ 341-5588 or Katheryn.Landau@waterboards.ca.gov

**November 5-6 WA & WEB**
**8th Annual Water Rights Transfers Seminar, Seattle.** Hilton Seattle. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

**November 5-6 CA**
**San Joaquin River Restoration Tour, Fresno.** Field Trip. Sponsored by Water Education Foundation. For info: www.watereducation.org/tour/san-joaquin-river-restoration-tour-2015

**November 6 OR**
**Natural Resources Damage Conference: Assessment & Restoration; Ecological Risk Assessment, Portland.** World Trade Center Two, 25 SW Salmon Street. For info: Environmental Law Education Center, 503/ 282-5220, hduncan@elecenter.com or www.elecenter.com

**November 6 HI**
**Climate Change & the Economic & Business Impact on Hawaii Seminar, Honolulu.** TBA. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

**November 7 OR**
**13th Annual Celebration of Oregon Rivers, Portland.** Tiffany Center. Presented by WaterWatch of Oregon. For info: www.waterwatch.org

**November 9-11 DC**
**Environmental Law Boot Camp, Washington.** Sidley Austin, 1501 K Street NW #600. For info: Environmental Law Institute, www.eli.org

**November 11-13 CA**
**California Water Ass'n 2015 Annual Conference, Monterey.** Monterey Plaza Hotel. For info: www.calwaterassn.com/upcoming-conferences/

**November 12 AZ**
**Conservation Loves A Crisis: Lessons From North America's Driest City - Brownbag Seminar, Tucson.** WRRC Sol Resnick Conference Rm, 350 N. Campbell Ave. Presented by Water Resources Research Ctr. For info: http://wrrc.arizona.edu/events/brownbag

**November 12 CO**
**2015 Schultz Lecture - Governor John Hickenlooper, Boulder.** Wolf Law Bldg., Wittemyer Courtroom. To Register: https://cuboulder.qualtrics.com/SE/?SID=SV_07Dx868e2Mlf8od&Q_JFE=0. For info: www.colorado.edu/law/research/gwc/events

**November 12-13 CA**
**Tribal Water in California Seminar, Valley Center.** Harrah's Resort Southern California. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

**November 12-13 OR & WEB**
**24th Annual Oregon Water Law Conference, Portland.** Hilton Executive Tower. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

 

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## CALENDAR

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**November 15-19 UT**
**American Water Works Association (AWWA) 2015 Water Quality Technology Conference & Exposition, Salt Lake City.** The Grand America Hotel. For info: www.awwa.org/conferences-education/conferences/water-quality-technology.aspx

**November 16-19 CO**
**AWRA 2015 Annual Water Resources Conference, Denver.** Grand Hyatt. Presented by American Water Resources Ass'n. For info: www.awra.org

**November 17 TX/WEB**
**Clean Water Initiatives Workshop: An Overview of Texas Land Trends, WEBINAR.** WEB. Presented by Houston-Galveston Area Council. For info: www.h-gac.com/community/water/cwi/

**November 17-18 England**
**Water 2015 Conference - UK's Premier Water Conference, London.** Radison Blu Portman. For info: www.marketforce.eu.com/events/water/water-2015-complex

**November 18 CO**
**The Great Divide: The Destiny of the West is Written in the Headwaters of the Colorado - Film & Discussion, Colorado Springs.** Colorado College, Palmer Hall (Gates Common Room). For info: www.colorado.edu/law/research/gwc/events

**November 18-20 UT**
**American Water Works Association (AWWA) Financial Management Seminar, Salt Lake City.** The Grand America Hotel. For info: www.awwa.org/store/productdetail_event.aspx?productId=52606069

**December 3 WA**
**Water Law & the Public Trust - CLE, Seattle.** 2100 Bldg.. Presented by Center for Environmental Law & Policy. For info: www.celp.org

**December 4 WA**
**Impacts of FEMA's Floodplain Remapping Seminar, Seattle.** TBA. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

**December 4 WA**
**Annual Water Law & the Public Trust CLE, Seattle.** TBA. Presented by The Center for Environmental Law & Policy. For info: www.celp.org

**December 7 WA**
**Source Control Conference: Preventing Environmental Contamination & Re-Contamination, Seattle.** Washington State Convention Ctr. For info: Environmental Law Education Center, 503/ 282-5220, hduncan@elecenter.com or www.elecenter.com

**December 8-9 OR**
**Northwest Environmental Conference & Trade Show, Portland.** Red Lion on the River, Jantzen Beach. Presented by Northwest Environmental Business Council. For info: www.nebc.org/EventDetail.aspx?Id=161

**December 10-11 CA**
**CEQA Conference - 11th Annual, San Francisco.** BASF Conference Ctr. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

**December 14 CA**
**Wine & Water Law Conference, San Francisco.** Hotel Nikko, 222 Mason Street. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

**December 14-15 NV**
**Applications of Groundwater Geochemistry Course, Las Vegas.** Westgate Resort. Presented by Nat'l Groundwater Ass'n. For info: www.ngwa.org/Events-Education/shortcourses/Pages/485dec15.aspx

**January 21-22 WA**
**23rd Annual Endangered Species Act Conference, Seattle & WEB.** Washington Athletic Club, 1325 6th Avenue. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net