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LONG-RANGE WATER PLANNING

COMPREHENSIVE PROCESS IN CENTRAL OREGON'S DESCHUTES BASIN

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INTRODUCTION

Clean, reliable water supply for agriculture, ecosystems and cities has long been a key issue in Central Oregon. Since in the 1960s, the US Bureau of Reclamation (Reclamation) has studied the potential of conservation and water use efficiency to improve the availability of water in the upper Deschutes Basin for multiple uses, including instream flows, reservoir recreation development, fishery resources, water quality, and water supply for municipal, industrial and domestic uses.

Water resource issues in the Deschutes Basin (Basin) have become critical in recent years as additional demands are placed on the resource base. Water storage and diversion by federal and private irrigation districts result in the dewatering of several reaches of the Deschutes River and its tributaries and the inclusion of some waterbodies as "water quality impaired" under the federal Clean Water Act §303(d) (i.e. the "303(d)list"). The US Environmntal Protection Agency (EPA) requirements drive the development of this list and of basin-wide water quality targets (Total Maximum Daily Loads or "TMDLs"). Federal Energy Regulatory Commission (FERC) relicensing of the Pelton-Round Butte Hydropower Complex will result in the reintroduction of anadromous fish above the Complex, likely resulting in a federal Endangered Species Act listing in Whychus Creek and the Lower Crooked River. At the same time, rapid growth and development has led to the need for a safe and reliable water supply to meet the future needs of the Basin's growing communities and the need to find a way to address the impacts of land use change on irrigation districts and the agricultural community. (See Griffiths, TWR #7).

With surface water rights fully allocated and federal Safe Drinking Water Act provisions in place new needs will often be met through groundwater development. In 2002, the State began implementing an innovative groundwater mitigation program in the upper Deschutes basin that effectively ties land development into the agriculture-ecosystem nexus — growing demand for groundwater from municipalities, resorts and irrigators will be met by converting existing water rights to instream flow as "groundwater mitigation."

Conflicts occurring in the Klamath Basin underscore the need for proactive and collaborative measures to respond to these needs. The rapid growth and subsequent water needs that the Deschutes Basin is experiencing has made water usage and availability a major topic in discussions among basin water suppliers, planners, business and the general public. Due to increased dialogue and awareness relative to water issues, regional urban water suppliers, irrigation districts and other private, government and individual water users now recognize their interdependency in the use, management and protection of Deschutes Basin water resources. This recognition and related dialogue have led major actors in water supply and demand to call for a common vision that commits energy and resources in a collaborative effort to respond to Basin water issues.

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Organization

In 2004 a diverse coalition of partners from the Deschutes applied for and received a grant from Reclamation's Water 2025 Program for a "Deschutes Water Alliance: Formation and Pilot Water Bank Project." The grant was received by the Central Oregon Irrigation District on behalf of:

- Deschutes Basin Board of Control: Seven Basin irrigation districts including Reclamation's Deschutes (North Unit Irrigation District) and Ochoco Projects
- Central Oregon Cities' Organization: Basin cities (e.g. Bend, Redmond, Madras, Prineville) and affiliated regional drinking water suppliers
- Deschutes River Conservancy: a 501(c)(3) non-profit corporation carrying out ecosystem restoration projects in the Basin (with federal authorization and representation Under PL106-270, Deschutes Resources Conservancy Reauthorization Act of 2000)
- Confederated Tribes of the Warm Springs Reservation: representing the Warm Springs, Paiute and Wasco Tribes

The Water 2025 grant consisted of three components: 1) the formation of an alliance; 2) the development of a series of plans and studies; and 3) the initiation of a pilot water bank.

Vision and Objectives

At an early meeting of the Alliance group, districts, cities, the Confederated Tribes and the Deschutes River Conservancy agreed on a vision for the future in which the uses of water resources in the Deschutes are "balanced to serve and sustain agriculture, urban and ecosystem needs." It was felt that it is possible to simultaneously meet new and existing demands for water in the Deschutes Basin whether they are for agriculture, cities, or rivers—thereby raising the productivity of water in the Basin. Ongoing efforts gave the participants the expectation that this could happen through cooperation and voluntary participation of the key water suppliers and users. The desire to balance uses and needs was further defined in terms of several diverse objectives.

Alliance objectives included:

- Move stream flows toward a more natural hydrograph while securing and maintaining improved instream flows and water quality to support fish and wildlife
- Secure and maintain a reliable and affordable supply of water to sustain agriculture
- Secure a safe, affordable, and high quality water supply for urban communities

These objectives form the basis for further development of measurable outcomes and subsequent efforts to evaluate the feasibility of realizing the vision.

Studies & Issue Papers

As part of the Water 2025 grant a number of issue papers identifying the long-range trends in demand and supply for water resources in Central Oregon were developed.

These include studies of:

- Groundwater Demand – assessment of the groundwater pumping and groundwater mitigation needs for resorts, municipal water suppliers, agriculture and other uses (Newton et al. 2006)
- Instream Demand – analysis of water needed to meet instream flow targets for fish and wildlife (Golden and Aylward 2006)
- Agricultural Surface Water Demand – inventory of amounts, patterns and rates of district water rights becoming surplus due to trends in growth, development and land use change (Aylward 2006)
- Supply from Water Efficiency – an evaluation and prioritization of opportunities to save water through piping and lining of canals, laterals and ditches, as well as through on-farm conservation technologies (Newton and Perle 2006)
- Supply from Reservoir Management – identifying and briefly assessing ways in which the use of storage can contribute to instream flows and improve reliability of agricultural water rights (Fitzpatrick et al. 2006)

Deschutes Water

Groundwater Recharge

Basin Demographics

The issue papers provide the measurable outcomes in terms of water demand, as well as identification and quantification of supply opportunities. This article uses the data and findings of these studies to examine the question of whether a long-term balance between demand and supply is possible and, if so, under what circumstances. Following an overview of the Basin, the article presents the data, methods and results from the analysis. Discussion of these results and emerging conclusions on water resource management in the Deschutes are then provided.

BACKGROUND

The Deschutes Basin is the second largest river basin in Oregon covering 10,700 square miles (see Figure 1). The counties of Crook, Deschutes, Jefferson, Sherman and Wasco make up a majority of the Basin. Central Oregon, which is comprised of Crook, Deschutes and Jefferson counties, constitutes 73% of the Basin (see Table 1). Central Oregon is roughly congruent with the upper Deschutes Basin, defined as the area above the confluence of the Metolius, Deschutes and Crooked Rivers and above the bulk of the immense groundwater recharge that happens above, in and just below the Pelton-Round Butte Complex. Total area for the upper Basin is just over 5,000 square miles. Another important hydrologic unit is the regional aquifer through which a large amount of the precipitation input passes on its way to discharge in the confluence area of the Deschutes, Crooked and Metolius rivers.

Land and Agriculture

For the Basin as a whole just 40% of the land area is in private hands, with the remainder under public or tribal control. The Confederated Tribes of the Warm Springs Reservation hold 641,000 acres or 7% of the Basin. Of land available for private uses in Central Oregon, 1.77 million acres is dedicated to farming and livestock according to the 2002 National Agricultural Census. The proportion of farm area that is irrigated is roughly one-tenth, or 180,000 acres, reflecting the predominance of dryland ranching in Crook and Jefferson counties. Central Oregon is the home of the family farm with over 92% of owners living on the farm. However, 60% of farm operators also work part-time off the farm and 40% effectively work full-time off the farm. Agriculture makes up around 10% of county income in Crook and Jefferson County and only 1% in Deschutes County. Jefferson County is home to large farms, with irrigation used largely for growing crops. Crook County is home to both smaller irrigated parcels growing crops and very large ranches with irrigated areas in the valley bottoms. Deschutes County is largely home to lifestyle or hobby farming, with just a few areas remaining of large commercial farms.

Table 1. Deschutes Basin: Land Area and Population

	Population					Land
	Total	Urban		Rural		Total
	(#)	(#)	(%)	(#)	%	(acres)
Administrative Units - Counties						
Crook	20,650	8,640	42%	12,010	58%	1,914,231
Deschutes	135,450	84,800	63%	50,650	37%	1,955,191
Jefferson	20,250	7,070	35%	13,180	65%	1,146,235
Subtotal - Central Oregon (3 counties)	176,350	100,510	57%	75,840	43%	5,015,656
Wasco	23,900	13,970	58%	9,930	42%	1,533,433
Sherman	1,900	1,140	60%	760	40%	531,838
Subtotal - Five counties	202,150	115,620	57%	86,530	43%	7,080,927
Drainage Unit - Watershed						
Deschutes Basin						6,847,968
Upper Deschutes Basin						5,004,800
Groundwater Unit - Aquifer						
Groundwater Study Area						2,879,987
Oregon	3,582,600	2,434,922	68%	1,147,678	32%	61,437,792

Source: Aylward (2006)

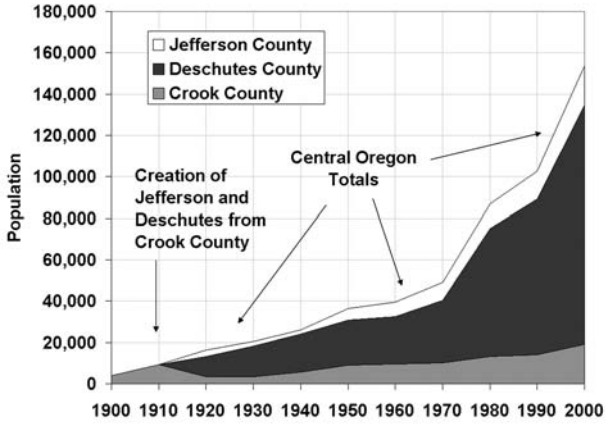

Figure 2. Central Oregon Counties Population 1910 to 2000
Source: Aylward (2006)

Growth and Development

As of 2004, the population of Central Oregon totaled 176,000, 57% of which live in incorporated areas. Central Oregon has gone through periods of explosive growth, notably in the 1970s and from 1990 onwards. Averaged over the last century, Central Oregon's population has grown at a rate of 44% every decade (see Figure 2). In comparison, Oregon's rate was 24% and for US as a whole it was 14%. The figure below shows that the bulk of the population gain in Central Oregon has been in Deschutes County. During the 1990s the population of Deschutes County increased by 50% from 75,000 to 115,000. Since 2000, Central Oregon continues to grow rapidly, recording a 20% increase in population in the last five years. Of this increase 27,000 comes in incorporated areas and 5,000 in unincorporated areas. While official population forecasts suggest a slowdown, there is little in the last 15 years' experience or current trends to suggest that rapid growth in both urban and rural areas will not continue.

Water Resources, Groundwater and Instream Flows

In Central Oregon, water that moves through the aquifer discharges into streams throughout the upper Deschutes Basin (Gannett et al. 2001). The groundwater flows through the permeable Deschutes Formation until it runs into the impermeable John Day Formation. Groundwater generally flows upwards and emerges as springs at the surface. In hydrologic units that drain to the Crooked River, however, soils and geology are largely of the impermeable John Day Formation. Little groundwater recharge occurs in these hydrologic units, and runoff patterns vary rapidly with precipitation.

Hydrology

Flow Regime

Assessment of water resources for the Groundwater Study area, which forms a significant portion of the upper Deschutes Basin, confirms that human activities in the upper Deschutes Basin have significantly altered the flow regime in the Basin, but on balance have led to the consumption of only a relatively small amount of available water resources and an even smaller portion of the annual turnover in groundwater in the Basin (Golden and Aylward 2006). The most dramatic modifications to the water resources regime are clearly seen in terms of low flows below irrigation district diversions in the upper Deschutes Basin.

Storage Impacts

Reservoir storage and releases for irrigation have highly altered flows in five of the seven water quality impaired reaches in the Basin. The upper Deschutes River reach does not often meet target flows in the winter due to upstream reservoir storage. Irrigation diversions have reduced summer flows in six of the seven water quality impaired reaches. Most reaches experience low summer flows due to irrigation diversions. Prior to current restoration efforts, sections of Whychus Creek and Tumalo Creek typically went dry during the irrigation season due to extensive diversion. The daily probability of reaching flow targets during each month is summarized in the table below.

Table 2. Probability of Meeting Instream Flow Targets

Historic Probability of Meeting Instream Flow Target*

Month	Little Deschutes River	Upper Deschutes River	Middle Deschutes River	Tumalo Creek	Whychus Creek	Metolius River	Lower Crooked River	Lower Deschutes River
Jan	Very High	Low	Very High	Very High	Very High	Very High	Very High	High
Feb	Very High	Low	Very High	Very High	Very High	Very High	Very High	High
Mar	Medium	Low	Very High	Low	Very High	Very High	High	Very High
Apr	High	High	Medium	Low	Low	Very High	High	High
May	Low	Very High	Very Low	Low	Medium	Very High	Low	High
Jun	Low	Very High	Very Low	High	Medium	Very High	Low	High
Jul	Medium	Very High	Very Low	Low	Very Low	Very High	Medium	High
Aug	High	Very High	Very Low	Very Low	Very Low	Very High	High	Very High
Sep	Very High	Very High	Very Low	Very Low	Very Low	Very High	Very High	Very High
Oct	Very High	High	Medium	Medium	Very Low	Very High	Very High	Very High
Nov	Very High	Very Low	Very High	Very High	Very High	Very High	Very High	Very High
Dec	Very High	Low	Very High	Very High	Very High	Very High	Very High	Very High

*period of record varies for each reach

Key to Table

Percent of Days Meeting Target	Historic Probability
80-100%	Very High
60-79%	High
40-59%	Medium
20-39%	Low
0-19%	Very Low

Source: Golden and Aylward (2006)

Regulation of Flows

Federal and state regulatory approaches all have the potential to affect instream flow allocation in the Deschutes Basin. Federal approaches include the Wild and Scenic Rivers Act, the Clean Water Act, and the Endangered Species Act. State approaches include the State Scenic Waterways Act and instream flow rights to support aquatic life. Voluntary, market-based approaches, enabled by the state and federal legal

Deschutes Water

Instream Options

Conflicting Needs

framework, however, provide the greatest opportunity for restoring instream flows in the Deschutes Basin. Tools available include: instream transfers; leases; storage leases; and allocation of conserved water. Deschutes River Conservancy, local irrigation districts and state and federal partners are working together to restore water to reaches by using these tools.

Irrigation Districts

Historically in Central Oregon, the bulk of water rights and water use has been by irrigated agriculture, particularly a number of large irrigation districts (see Table 3). The potential for conflict over water arises due to increasing demand for groundwater for municipalities and rural destination resorts and increasing recognition of the importance of restoring instream flow. In addition, as urban areas expand they move into irrigation district areas, threatening the continued delivery of water to patrons and the financial solvency of the district (through a decline in the assessment base). The Central Oregon Water Bank builds on early efforts by local irrigation districts to work with the Deschutes River Conservancy on instream leasing and represents an effort to make long-term and permanent reallocations in water rights in order to avoid future conflict over water in the Basin.

Table 3. District Water Right Acreages, Customers and Farm Size

District	Point of Diversion	Irrigation Rights (acres)	Total Rights (acres)	Customers[1]	Average Farm Size (acres)[1]
Swalley	Deschutes River at Bend	4,351	4,561	755	6
COID	Deschutes River at Bend	43,747	44,784	4,497	10
Lone Pine	Deschutes River at Bend	2,369	2,369	20	120
Arnold	Deschutes River above Bend	3,976	4,384	792	6
North Unit	Deschutes River at Bend and Crooked River above Smith Rock	58,868	58,868	850	69
Walker Basin	Little Deschutes above LaPine	1,534	1,534	10	153
Tumalo	Tumalo Creek and Middle Deschutes at Bend	7,367	7,381	632	12
Three Sisters	Whychus Creek above Sisters	7,568	7,651	129	59
Ochoco	Ochoco Creek and Crooked River above Prineville, McKay Creek below Prineville	20,150	20,332	745	27
Totals		149,924	151,878	8,897	17

Source: Aylward (2006) — Note: [1]Estimates only for some districts

Seepage Loss

Assessment of water delivery by irrigation districts in Central Oregon indicates that seepage loss potential is very high in some and very low in others with an average transmission loss of 37% (see Table 4). Further evaluation indicates seepage potential is correlated with geologic conditions in the district areas. Districts in Deschutes and Jefferson County that convey water across terrain underlain by the Deschutes Formation record very high seepage losses – in some cases approaching 60%. On-farm losses in these areas are also considerable. Seepage losses overall are significant, totaling almost 600,000 acre-feet (AF), thereby revealing significant opportunity to engage in water efficiency projects.

Table 4. District Delivery Systems

District	Canals (miles)	Laterals (miles)	Irrigation System Diversions (acre-feet)	On-Farm Losses (acre-feet)	Transmission Loss (acre-feet)	Delivery Efficiency
Swalley	11.60	16.80	42,410	8,990	23,140	45%
COID	76.50	129.70	351,510	137,550	91,250	74%
Lone Pine	40.10	5.40	14,560	580	9,080	38%
Arnold	15.50	24.50	38,400	8,420	20,520	47%
North Unit	65.00	83.90	221,770	7,890	87,530	61%
Tumalo	35.70	26.30	67,000	10,550	38,980	42%
Three Sisters	20.90	39.50	26,420	12,120		63%
Ochoco	33.90	37.50	20,490	20,490	7,580	63%
Totals	299.20	363.60	782,560	203,170	290,920	63%

Delivery Efficiency

Source: Reclamation (1997)

Deschutes Water

Transfers

Impacted Groundwater

Conjunctive Use Mitigation

Mitigation Credits

Supply Opportunities

Water Rights: A Closed Basin

Carey Act irrigation districts formed in Central Oregon at the turn of the last century. In 1913 the federal government reserved remaining waters in the main stem of the Deschutes for a future federal reclamation project. For all intents and purposes, creeks and rivers in the upper basin are closed to further appropriation of surface waters by the Oregon Water Resources Department (OWRD). However, water trading within irrigation districts and between districts and cities have a long history as a means of reallocation of surface water rights. In the 1930s and the 1950s, the City of Bend secured surface water rights to meet its future needs through transactions with Tumalo Irrigation District.

In the 1990s, growth and development in Central Oregon led municipalities, developers and small irrigators to turn to groundwater to supply new water needs. Growing demand for groundwater led to concern that the groundwater permitting process ignored the potential for impact of groundwater withdrawal on surface waters. A US Geological Survey and OWRD study released in 2001 confirmed that aquifer discharge provides much of the surface water to streams in the Deschutes Basin (Gannett et al. 2001). The results suggested the potential for groundwater withdrawals to impact surface water flows and cause injury to surface water rights holders, including junior instream rights. (USGS Study website: http://or.water.usgs.gov/projs_dir/deshutes_gw/index.html)

In 2002, following a multi-year collaborative process, OWRD put forward a market-based program intended to offset withdrawals on a long-term volumetric basis. The Oregon Water Resources Commission approved rules for the implementation of the Deschutes Groundwater Mitigation Program in September 2002 (Oregon Administrative Rules (OAR) 690-505). The program allows for water development while mitigating for the effects of groundwater withdrawals on surface water flows in the Basin through instream transfers, aquifer recharge, storage release and conserved water projects. Concerns regarding timing of mitigation (and other issues) led to a lawsuit by a number of protestants, including WaterWatch of Oregon, against the program's rules. The suit was decided in favor of the protestants in early 2005. Subsequently HB 3494 was passed by the Oregon legislature confirming that the existing rules provide "mitigation" and will govern the allocation of new groundwater permits in the Deschutes through 2014. (Rules on OWRD website: www.oregon.gov/OWRD/LAW/index.shtml)

Four years into the program only leases and transfers have been used to create mitigation credits. State-chartered groundwater mitigation banks may use temporary transfers to establish credits subject to holding an equal amount of credits in reserve (OAR 690-521). The groundwater mitigation bank operated by Deschutes River Conservancy uses demand from the mitigation credit to fund a portion of its instream leasing efforts. In 2006, the mitigation bank has 35 active accounts with groundwater applicants and new permit holders, providing funding for just less than 15% of the Deschutes River Conservancy's 2006 total lease of 6,200 acres (at the "2-acres leased" -to- "1-acre of credit" extended ratio).

Closed to further appropriation of surface water rights and with new groundwater rights effectively provided only upon mitigation for consumptive use, the upper Deschutes Basin is effectively closed to further appropriation for consumptive use. With the appropriation for consumptive use capped, new needs for surface water can only be met by trading surface water, while new needs for groundwater may be met by trading existing surface water or groundwater rights. As the Basin balances future demand and supply it should therefore yield important insight into voluntary, market-based approaches to conjunctive use management.

DEMAND & SUPPLY — DATA & PROJECTIONS

The Water 2025 funded Issues Papers identified the long-range trends in demand and supply for water resources in Central Oregon. The papers provide measurable outcomes in terms of water demand, as well as identification and quantification of supply opportunities. This analysis of long-range water management in Central Oregon builds a number of potential scenarios based on detailed data with respect to future trends in demand and supply identified in the Deschutes Water Alliance Issues Papers. (For access to the final draft reports, see website: http://www.swalley.com/summit.htm).

ON THE DEMAND SIDE, MEASURABLE OUTCOMES INCLUDE:

- FUTURE GROUNDWATER DEMAND based on data on population growth rates and resulting increases in municipal water demand from work undertaken by the Central Oregon Cities Organization, as well as data on pending and prospective groundwater permits from the Oregon Water Resources Department (see Table 5)
- INSTREAM FLOW NEEDS in five dewatered reaches in the upper Basin based on an assessment of current flows, natural flow levels, and fish and wildlife targets (see Table 6)

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Table 5. Future Groundwater Demand and Mitigation Obligations

Water Use	Estimate Annual Volume (acre-feet)	Volume of Consumptive Use (af)	Percent of Total Consumptive Use	Volume of Consumptive Use Subject to Mitigation (af)	Mitigation Obligation (acres)
Water Suppliers Inside UGBs	17,600	8,800	33.9%	2,768	1,538
Pending Groundwater Permits – Other Uses Outside UGBs	18,066	7,623	29.4 %	7,623	4,235
Prospective Uses for Resorts, etc – Outside UGBs	7,890	4,125	15.9 %	4,125	2,292
Exempt Wells	13,444	5,378	20.7 %	NA	NA
Grand Total	57,000	25,926	100	14,516	8,065

Source: Newton et al. (2006)

Table 6. Instream Flow Demand

Reach	Flow Targets Rate (cfs)	Needs to 2025 Rate (cfs)	Needs to 2025 Volume (acre-feet)
Upper Deschutes	300	146	62,000
Middle Deschutes	250	224	94,913
Lower Crooked	75	22	16,079
Tumalo	20	14	5,932
Whychus	20	14	5,932
Totals	665	421	184,856

Source: Golden and Aylward (2006)

Decreasing Farm Use

With respect to demand for water from irrigated agriculture the current trend is toward a lessening of demand due to continued growth, urbanization and land use change. This lessened demand also presents the opportunity for reallocation of these water rights to other uses. The analysis of irrigation water use is therefore both an analysis of demand and of supply. Information employed comes from Aylward (2006).

IRRIGATION DATA INCLUDES:

- Detailed information on eight irrigation districts in Central Oregon, including rate and duty calculations on 151,000 acres of appurtenant water rights, water available for conservation and transfer, district assessments, and exit policies
- GIS analysis locating current irrigation district water rights relative to urban and county boundaries to evaluate water rights at risk in urban areas and estimate resulting decrease in agricultural surface water demand from urban areas
- GIS analysis of water rights currently leased instream to identify decrease in agricultural surface water demand from rural areas

SUPPLY SIDE INFORMATION INCLUDES:

- Cost and water savings information on over thirty water efficiency and conservation projects across the irrigation districts (see Figure 3)
- Pricing data on leasing, purchase and exit fees for the districts (Aylward 2006)
- Different methods for making water available from reservoir management and storage reallocation, including a total of 21,000 AF from reservoir optimization, trading of water allocations and district water management projects made available for agricultural and instream use (Fitzpatrick et al. 2006)

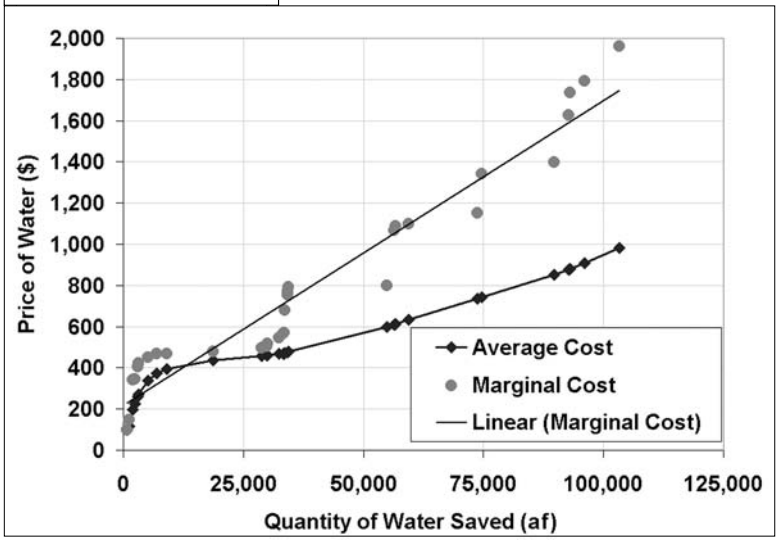


Figure 3. Price and Quantity for Water Efficiency Projects
Source: Based on data from Newton and Perle (2006)

Deschutes Water

Transfer Tools

Base Case

Low Growth

High Growth

Instream Flow Augmentation

Reservoir Management

Instream Demands

Future Scenarios

Three scenarios were used in this analysis: a base case scenario, and low and high growth scenarios. Water management tools employed in "moving" water and water rights from one use to another include:

- Instream Leasing (restoration only)
- Transfers for groundwater mitigation and for instream restoration
- Water efficiency projects for main canals and laterals
- On-Farm water efficiency projects
- Reservoir Management

THE BASE CASE SCENARIO is defined by the following assumptions and forecast trends for the twenty-year period from 2006 to 2025:

- All irrigation district water rights currently found within **u**rban **g**rowth **b**oundaries (UGBs) and **u**rban **r**eserve **a**reas (URAs) — a total of 9,773 acres — are transferred permanently instream
- Instream leasing of district and individual water rights on rural lands outside urban areas continues in line with current levels, i.e. just under 4,000 acres per year
- A few select high priority non-district rural water rights are included in the analysis to the extent that information on existing or proposed transactions is available – 800 acres of which are transferred instream
- Total groundwater demands by 2025 of 57,000 AF, with a consumptive use of 25,926 AF and a total groundwater mitigation obligation of 14,516 AF of credits, or 8,065 acres (see Table 5)

THE LOW GROWTH SCENARIO incorporated the following changes to reflect future conditions if lower than expected population growth and development pressure in Central Oregon occurs:

- Acres within URAs were not included in the acres transferred permanently instream, so that a total of only 5,256 acres was transferred from urban lands
- The prospective destination resorts included in the original groundwater demands were deleted leaving a total demand for groundwater mitigation of 6,123 acres

THE HIGH GROWTH SCENARIO involved the following change to approximate an assumption of a higher than projected growth rate in Central Oregon:

- The assumption that higher development pressure would further reduce the comparative financial benefits of keeping land in agriculture — leading to an across the board transfer of 5% of rural irrigation district properties to instream use

While simplistic, these scenarios serve to highlight the major issues driving water resource management in Central Oregon. A further necessary assumption was that public funding existed to provide the necessary supply from conservation projects to meet instream flow targets. In this sense the scenarios respond to the question of what level of investment in conservation is required to meet instream needs at different levels of growth and development pressure.

All calculations in the scenarios are carried out on an irrigation district and stream reach basis. Driving the scenarios is the rate of land use change and resulting availability of surface water rights to meet demand for groundwater mitigation and instream flow. Demands for groundwater are classified according to municipal water needs, destination resort needs, new agricultural needs and other needs (homeowner's associations, industrial, etc). Satisfaction of groundwater demand results in augmentation of instream flow through the State's Groundwater Mitigation Program that requires water rights to be transferred instream to mitigate for new groundwater pumping. Those water rights transferred and leased that are not required for groundwater mitigation are used for instream flow restoration.

Remaining demand for instream flow restoration must be met through improved reservoir management and water efficiency projects. A portion of reservoir management gains by 2025 are predetermined and another portion comes from reductions in demand due to leases, transfers and conservation. Conservation projects are ranked in order of reach priority and cost-effectiveness and then called on to meet the remaining demand for instream flow and provide flexibility in reservoir management.

Instream flow demands are then met on a reach-by-reach basis according to the following protocol based on physical connectivity and legal fungibility of water and water rights between the reaches and districts.

BY REACH THE PROTOCOLS INCLUDE:

WHYCHUS CREEK – flows met from transfers, leases and conservation projects in the reach

TUMALO CREEK – flows met from transfers, leases and conservation projects in the reach; water surplus to targets is "assigned" to the middle Deschutes as Tumalo Irrigation District has ability to source switch due to natural flow and storage rights held on the Deschutes by the district subject to the capacity of the Bend Feed Canal (which is now fully piped to the district's diversion from Tumalo

Deschutes Water

Protocols

Creek) [Editor's Note: "Source switch" occurs when a water user has the capability to change the source of water from a source used previously to a new source of water]

MIDDLE DESCHUTES – flows met from transfers, leases and conservation projects in the reach plus additional surplus water from Tumalo Creek; water surplus to targets is "assigned" to the Upper Deschutes as many of the districts diverting at Bend from the middle Deschutes also have storage rights in Wickiup and Crane Prairie reservoirs

UPPER DESCHUTES – instream flows and reliability of junior agricultural rights are met from optimization of reservoir allocations, conservation projects in districts holding storage and surplus water from the middle Deschutes reach, water surplus to flow targets is "assigned" to the Crooked River as North Unit Irrigation district has some ability to source switch between Deschutes storage and Crooked River rights (on the further assumption that pending North Unit Irrigation District legislation to expand its district and use Deschutes water on its Crooked River lands is approved)

CROOKED RIVER – instream flows and agricultural needs in North Unit are met from transfers, leases and surplus water from the Upper Deschutes (once agricultural needs are met in North Unit, Crooked River rights may be dedicated to instream use)

In the scenarios no binding constraint was placed on funding for groundwater mitigation needs, restoration transfers and leasing, reservoir management and conservation projects. In other words, one output of the scenarios is the calculation of the costs and funding needs over the twenty-year period. All funding needs are expressed as simple totals of costs over the twenty-year period (i.e. costs and funds are not discounted).

Results

Key results derived from developing the scenarios are summarized below in Table 7.

Needs Findings

FINDINGS CONSISTENT ACROSS THE SCENARIOS INCLUDE:

- Municipal water suppliers easily meet their groundwater mitigation water needs at a total cost of around $4 million over twenty years
- Rural needs on county lands – for resort and agricultural uses – form the bulk of groundwater mitigation demand
- Instream flow targets in the upper Basin are met in Tumalo Creek, Whychus Creek, the middle Deschutes River, Upper Deschutes River and lower Crooked River
- Reliability, delivery and cost of agricultural water is ensured as additional reservoir storage is made available to junior users

Source Switch

- North Unit Irrigation District switches supply for 10,000 acres from costly pumps on the Crooked River to gravity flow from the Deschutes River, and districts affected by growth and land use change buffer their members/landowners from increases in assessment fees through receipt of millions of dollars for their Operation & Maintenance (O&M) Endowment Funds. These potential funds would be available from the purchase price paid for water rights from members/landowners in the districts. Such funds would come from water rights buyers, including mitigators (i.e. municipalities, resorts, agriculture, etc.) and conservation buyers (i.e. public and private funds for flow restoration).

District Buffer

Efficiency Projects

- Water efficiency projects reduce district maintenance costs and liability issues by piping and lining canals and laterals, and provide large amounts of natural flow and stored water for redistribution to instream and agricultural uses

Table 7. Key Indicators for 2025 Scenarios

Key Indicators	Units	2025 Scenarios		
		Base Case	Slow Growth	Fast Growth
Instream Flow Restored	acre-feet	196,171	196,171	200,657
Municipal Demand Met	%	100%	99%	100%
Groundwater Demand Met	%	100%	99%	100%
Irrigated Land Change	%	-4%	-2%	-9%
District Revenues	$million	10	6	16
Landowner Revenue	$million	22	16	35
Saved Transmission Loss	%	31%	41%	21%
Total Expenditure	$million	135	170	115

Deschutes Water

Outcomes Vary

In terms of outcomes that vary between the scenarios, the largest differences are observed in terms of the net loss of irrigated land, the water efficiencies realized and the distribution of financial costs and benefits. In the Base Case Scenario, the net loss of irrigated acres is 4% (balancing a decrease in acres irrigated with surface water and an increase in acres irrigated with groundwater). Total transmission loss saved through water efficiency projects is 31% and the total cost of carrying out all the projects, transfers and leases is $135 million – of which $32 million goes to agriculture, split between districts ($10 million) and landowners ($22 million).

Trade-Offs

With the Base Case Scenario as an intermediate growth scenario in terms of these outcomes, it is possible to characterize the trade-offs between the three scenarios in terms of the level of growth.

GENERALLY LOWER GROWTH RATES:

- Reduce the amount of instream transfer water that is for restoration; in the Low Growth Scenario all transfer water is for mitigation and only the leased water is for restoration of instream flows
- Reduce the pressure on irrigation district lands
- Increase the proportion of instream flow coming from water efficiency projects
- Raise the cost of meeting instream and groundwater needs

CONVERSELY, HIGHER GROWTH RATES:

- Increase the amount of instream transfer water that is for river restoration (rather than groundwater mitigation)
- Increase the pressure on irrigation district lands
- Increase financial flows to irrigation districts and their members/landowners
- Decrease the need for the more costly water efficiency projects
- Lower the cost of meeting instream and groundwater needs

Analysis Limitations

Three limitations to the analysis should be noted – one related to an important outcome that the scenarios do not assess and two limitations inherent to the methods employed.

Ongoing Evaluation

First, the water management scenarios do not attempt to evaluate the impact of significant changes in current water management on groundwater recharge in the upper Basin. The effects of these changes and resulting changes to aquifer discharge at the confluence areas is likewise unevaluated, as is how these alterations will combine with impacted surface water flows to affect flows in the lower Deschutes River. To what degree increased flows in the Upper Deschutes (wintertime) and Middle Deschutes (summertime) will affect the Lower Deschutes — once the long-term effects on groundwater recharge of increased groundwater pumping and decreased recharge from transmission loss and on-farm use in irrigation are included in the analysis – is an open question. This highlights the importance of continued investment in developing a suite of models that can answer the question. At present the US Geological Survey (USGS), Reclamation, OWRD and the Confederated Tribes of the Warm Springs Reservation and their consultants are engaged in a cooperative modeling effort that seeks to deploy the already existing USGS Modflow groundwater model and re-develop prior "MODSIMs" surface water distribution models to this end (Gannett and Lite 2004; LaMarche 2001).

Costing Efficiency

Two factors influencing the costing of the scenarios are not well developed and their potential impacts on the large disparity between the costs of the three scenarios needs to be noted. Most importantly, the water efficiency projects identified and costed by the study team are insufficient to meet the need for saved water in a low growth scenario (where more water is needed from water efficiency projects to compensate for lower amounts of water from transfers). In the absence of information on what additional projects would cost it was assumed that large amounts of additional saved water could be generated at the cost of the last (i.e. marginal) project in the project rankings. It may well be that less expensive efficiency projects do exist but have simply not been uncovered by the study team to this point in time. The average cost of the projects that were costed is just under $1,000/acre-foot whereas the marginal project cost is $1,700/acre-foot. This factor probably tends to overstate the difference in costs between the scenarios.

Market Price Response

The second factor that the model does not adequately treat is the price response in the market for water. In the Low Growth Scenario, the availability of water rights to meet mitigation needs is reduced and thus there might be upward pressure on price. In the High Growth Scenario, water rights are made surplus at a rapid rate. In the Base Case Scenario, mitigation demand is already satisfied and river restoration is the marginal source of demand to acquire these rights. With an even larger amount of acres as surplus and for sale, market conditions can be expected to worsen for sellers with downward pressure on purchase price and district exit fees. This factor would tend to exacerbate the difference in costs between the scenarios, making restoration less expensive in the high growth setting and more expensive in the low growth setting.

Deschutes Water

Net Consumptive Use

Streamflow Restoration

Reservoir Authorization

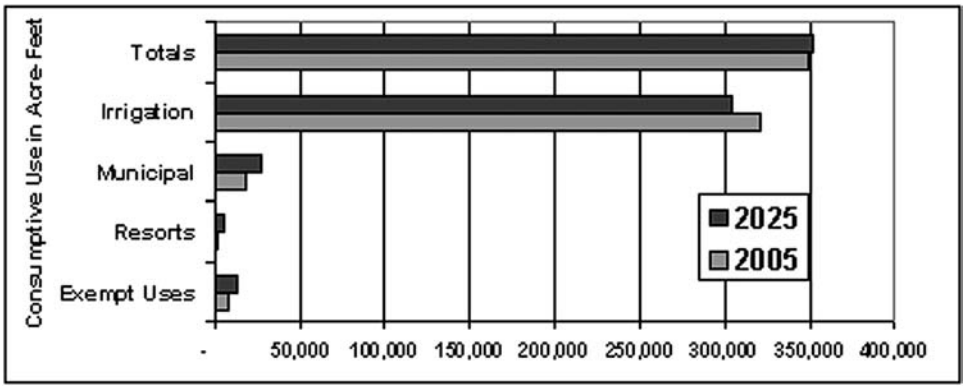
Agency Funding

ISSUES

Mitigation Program Leakage

With respect to Oregon's Groundwater Mitigation Program a cursory examination of projections for 2025 suggests that there is some "leakage" from the program. In other words, due to the variance between projected pumping volumes and legal requirements for mitigation for new permits it is clear from Table 5 that municipalities will be required to mitigate for only a portion of their incremental pumping. Meanwhile, exempt groundwater uses (in Oregon) are completely unregulated. Thus, there are sources of leakage from the implicit cap placed on conjunctive use. With scenarios projecting water demand and supply out twenty years it is possible to calculate current and future consumptive use based on direct human uses, i.e. for domestic, industrial, commercial and irrigation. The results (shown in Figure 4) are necessarily imprecise, but they suggest that when the before and after uses are totalled there is a fairly imperceptible increase in net consumptive use in the upper Basin. This can be explained in terms of the decrease in consumptive use associated with the portion of retired irrigation rights which are placed instream for restoration, rather than explicitly used for groundwater mitigation.

Figure 4. Comparison of Total Direct Human Consumption of Water (including irrigation) 2005 to 2026



Transactional Feasibility

An important question is the degree to which water can "move" in the manner envisioned by the scenarios. In this regard, existing collaborative efforts in the Basin and the legal framework provided by Oregon law as administered by OWRD provide for cautious optimism. The Deschutes River Conservancy (DRC) received Congressional authorization and federal funding beginning in 1996 to implement streamflow restoration projects in the Deschutes Basin. Partnerships between the DRC, landowners and irrigation districts on water efficiency projects and instream leasing have already resulted in over 20 **c**ubic **f**eet per **s**econd (cfs) of conserved water and 80 cfs of leased water protected instream by OWRD. Initial transfers of district and non-district water rights for groundwater mitigation and flow restoration have also been completed successfully. The DRC groundwater mitigation bank is also providing crucial temporary liquidity to the nascent groundwater mitigation market. Pilot efforts to develop a Central Oregon Water Bank to integrate both temporary and permanent reallocation to ensure an orderly transition are also underway between irrigation districts, the DRC and municipalities.

Still, some actions contemplated over the long run in the scenarios are not yet feasible legally. Already mentioned is the issue of the mobility of federal project water. Arriving at agreements and procedures for improving reservoir management is still a discussion in the early stages, although a pilot project is underway for 2006/2007.

Perhaps the most critical need is to resolve the issue of limited capacity at OWRD to support these voluntary, transactional approaches. The number of water rights transactions is increasing at a rapid pace. For example, DRC and its partners in the upper Basin have submitted 12 conserved water applications since DRC was created, but fully half of these were submitted in the last year alone. These transactions require time from OWRD's Salem and Bend office staff not only for processing, but monitoring and enforcement. At the same time as the transactional volume is increasing, OWRD's budget (derived wholly from general funds) is flat or declining. Action needs to be taken to either reverse this funding trend or devolve more administrative authority to the Basin. Otherwise, collaborative efforts may be for naught in the face of an administrative logjam.

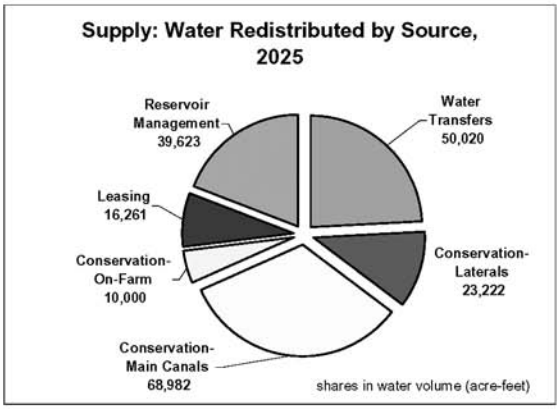
Deschutes Water

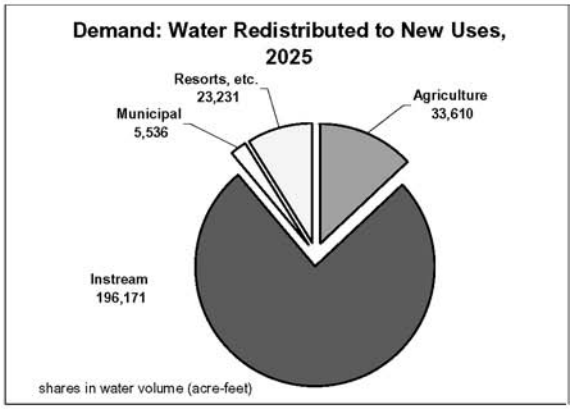
Base Case Water Management Scenario, 2006 to 2025

DESCHUTES WATER ALLIANCE
WATER MANAGEMENT SCENARIO: 2006 to 2025
SCENARIO 1: BASE CASE

WATER REDISTRIBUTION: WHERE THE WATER COMES FROM AND WHERE IT GOES

Supply & Demand

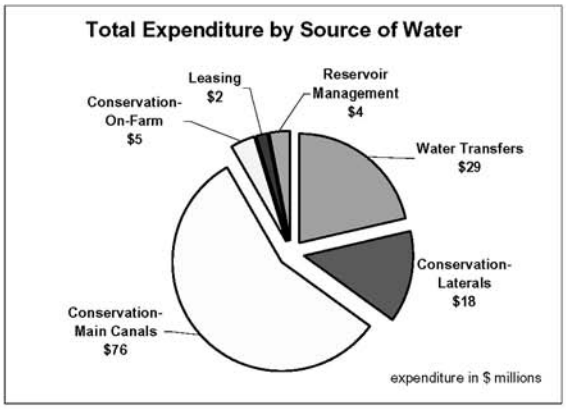


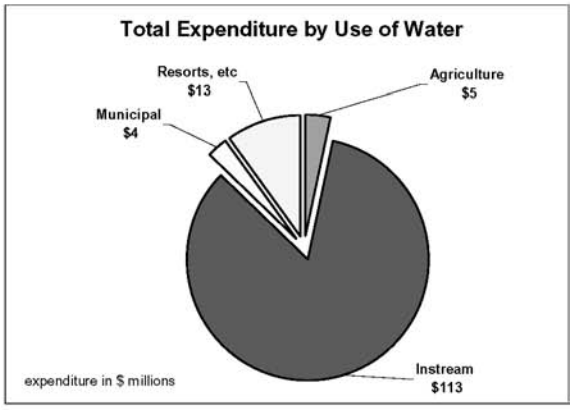


*Redistribution through conservation or groundwater mitigation enables existing water uses to serve multiple uses making water more productive
In this scenario the total volume (in acre-feet) of water from existing uses is 208,108 final volume in productive use is 258,548

COST: WHAT IT COSTS TO REDISTRIBUTE WATER (BY SOURCE AND USE)

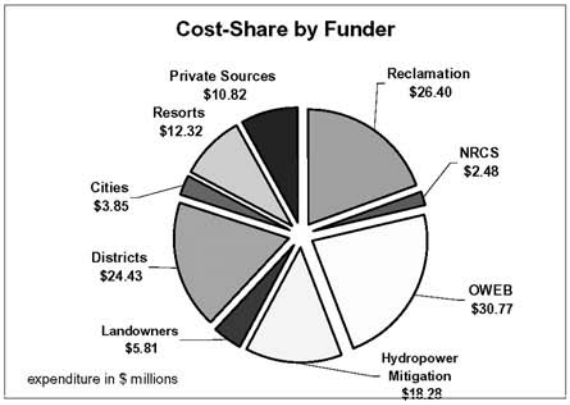
Costs

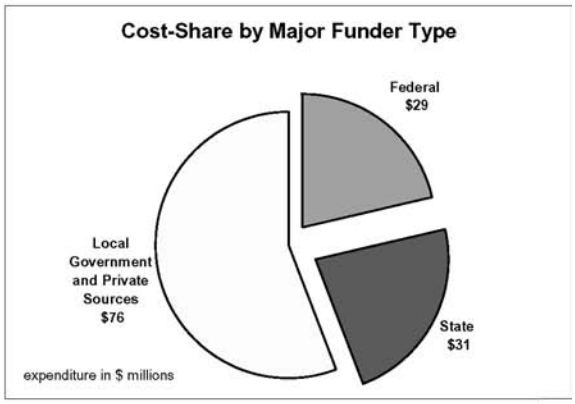




FUNDING: WHO PAYS AND HOW IS THE COST SHARED

Funding





Deschutes Water

Supply & Demand

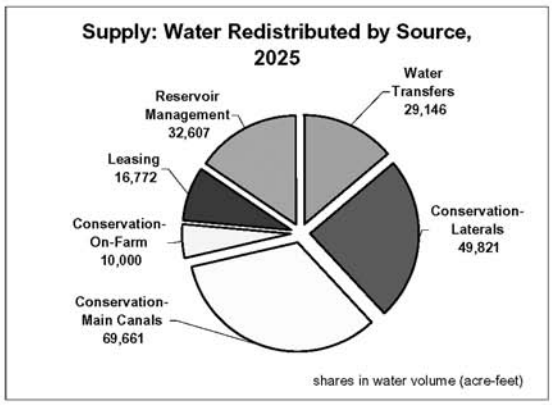
Costs

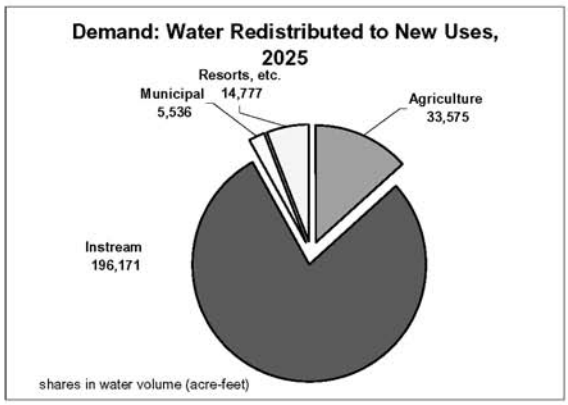
Funding

Low Growth Case Water Management Scenario, 2006 to 2025

DESCHUTES WATER ALLIANCE
WATER MANAGEMENT SCENARIO: 2006 to 2025
SCENARIO 2: LOW GROWTH CASE

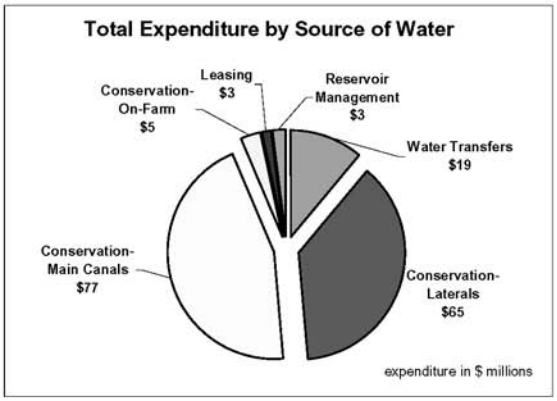
WATER REDISTRIBUTION: WHERE THE WATER COMES FROM AND WHERE IT GOES

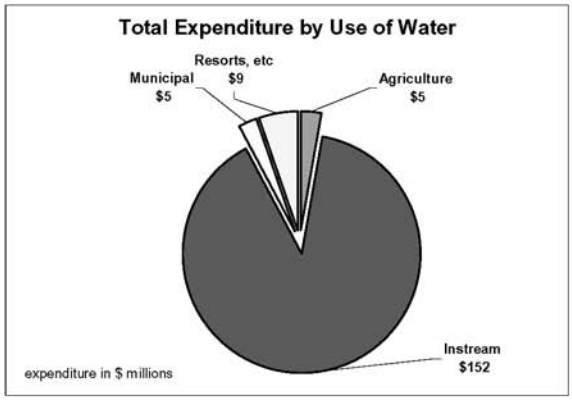




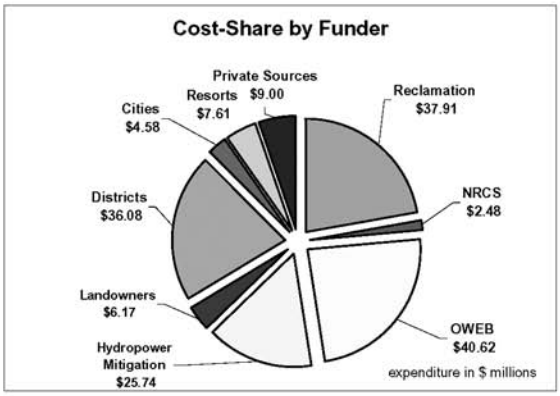
*Redistribution through conservation or groundwater mitigation enables existing water uses to serve multiple uses making water more productive
In this scenario the total volume (in acre-feet) of water from existing uses is 208,007 final volume in productive use is 250,059

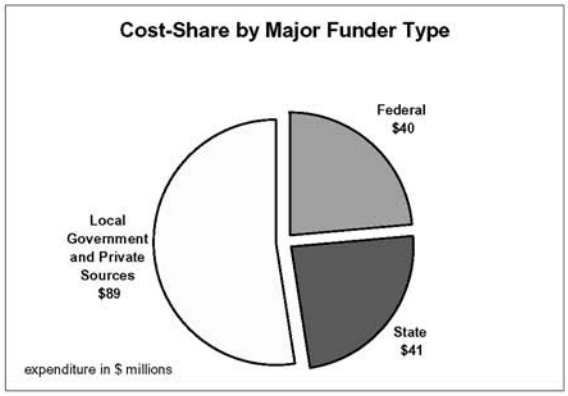
COST: WHAT IT COSTS TO REDISTRIBUTE WATER (BY SOURCE AND USE)





FUNDING: WHO PAYS AND HOW IS THE COST SHARED





Deschutes Water

Supply & Demand

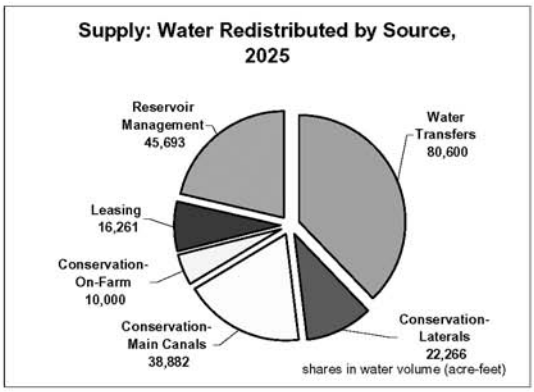
Costs

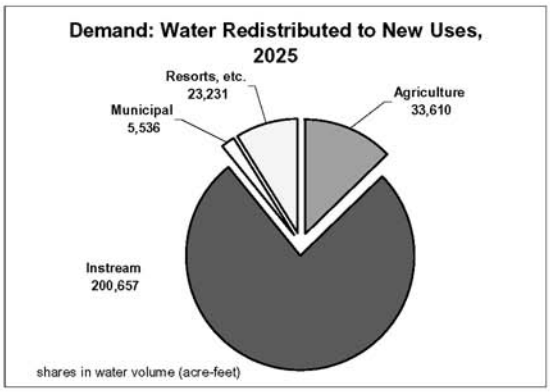
Funding

High Growth Water Management Scenario, 2006 to 2025

DESCHUTES WATER ALLIANCE
WATER MANAGEMENT SCENARIO: 2006 to 2025
SCENARIO 3: HIGH GROWTH CASE

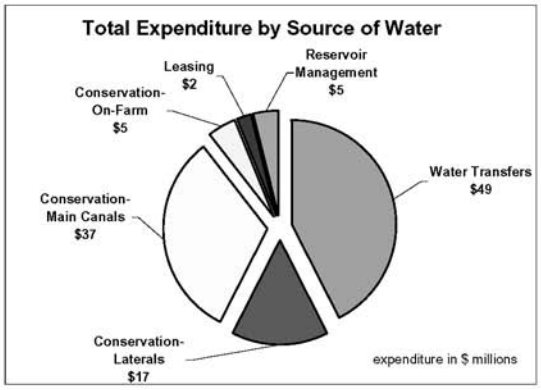
WATER REDISTRIBUTION: WHERE THE WATER COMES FROM AND WHERE IT GOES

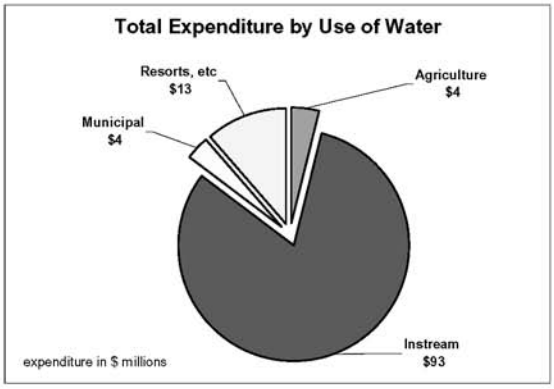




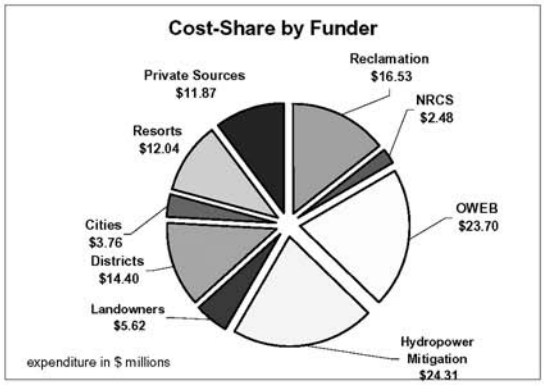
*Redistribution through conservation or groundwater mitigation enables existing water uses to serve multiple uses making water more productive
In this scenario the total volume (in acre-feet) of water from existing uses is 213,701 final volume in productive use is 263,034

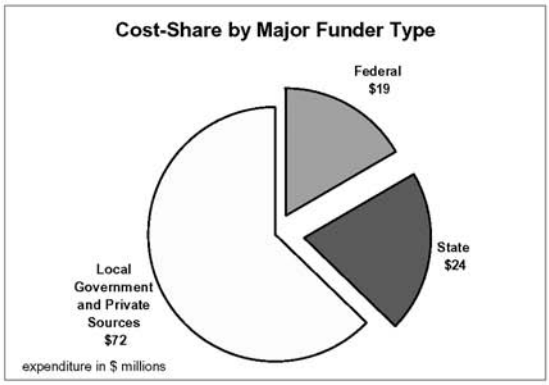
COST: WHAT IT COSTS TO REDISTRIBUTE WATER (BY SOURCE AND USE)





FUNDING: WHO PAYS AND HOW IS THE COST SHARED





Deschutes Water

Analysis Results

River Impacts

Water Availability

CONCLUSIONS

Results from a number of preliminary scenarios for managing water resources in the upper Deschutes Basin reveal the potential to meet future needs on the part of growing communities, agriculture, and upper Basin rivers and creeks.

SPECIFICALLY, ANALYSIS CONDUCTED THUS FAR SHOWS:

- Municipal water needs are easily provided for as the urbanization process releases irrigation water at a rate that exceeds new supply needs
- Reliability and delivery of agricultural water is ensured through an aggressive program of piping and lining major canals/laterals
- Cost of agricultural water and irrigation district finances are secured through a collaborative, non-profit Central Oregon Water Bank that acquires surplus water rights generated by land use change and growth, and reallocates such rights to new groundwater and surface water users, as well as to ecosystem needs
- Instream flow targets are met through conservation, leasing, transfers and improved reservoir management

A remaining consideration is to assess the impacts of these water management scenarios on groundwater and downstream reaches of the Crooked and Deschutes River, so as to ensure that the ecosystem and human values of these rivers are protected, or even improved.

In sum, new and non-traditional needs for water resources in Central Oregon can be met from existing sources and rights under a number of scenarios considered in these studies. This can largely be accomplished using currently available administrative regulations for the management of water rights in the Deschutes and Oregon. In order to close the loop and realize the instream flow targets—as well as meet community and irrigation needs—a key ingredient will be obtaining the financing for the necessary water efficiency projects. A further conclusion is that water availability is unlikely to constrain continued growth in Central Oregon. Growing subdivisions appear to require less water than growing alfalfa and significant amounts of water from rural lands are leased instream from year to year as lifestyle farming reduces the productive, commercial use of water for irrigation. As a result, legal requirements for providing groundwater mitigation can be met through permanent transfers and "renting" water from the groundwater mitigation bank.

However, this is not to say that land use and economic planning cannot be improved if planners and decision-makers take better account of the mechanics of water resources in the Basin – whether in terms of the legal, socio-economic, hydrologic or environmental aspects of these resources. Further development of water management scenarios and the application of existing surface water distribution and groundwater flow models to the Deschutes Basin should greatly assist ongoing efforts at integrated water resources management and attempts to better coordinate regional planning.

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David Newton is the principal owner of the firm of Newton Consultants, Inc. of Redmond, Oregon. He is a registered civil engineer, a registered engineering geologist, and a certified water right examiner. Mr. Newton received a degree in geological engineering from the University of Arizona. His specialties include water supply development, water resources, management planning for effective water use, and facilitation of solutions for water supply issues. Newton Consultants, Inc. managed the five planning studies under a Water 2025 grant that culminated in the Deschutes Scenarios paper.

Deschutes Water

Central Oregon Water: Long-Range Management in the Deschutes Basin

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NM Water Markets

NEW MEXICO WATER MARKETS

SEMINAR EXAMINES BUYING, SELLING, AND LEASING WATER RIGHTS

by John W. Shomaker, Ph.D. (John Shomaker & Associates, Albuquerque, NM)
and F. Lee Brown, Ph.D. (H_2O Economics, Albuquerque, NM)

INTRODUCTION

Transition

The structures within which water transactions take place in New Mexico are in transition, between the older paradigm that emphasized the role of the market in allocation of water and in which the State Engineer simply acted as a referee to keep order, and a new regime in which water shortage and growing claims on water have led the State to adopt an active role in water management. This is occurring at a time of rapidly increasing demand by water users, intense scrutiny of deliveries under interstate compacts, and new emphasis on the need for water to preserve environmental values—and with a decline in precipitation after an anomalous wet period during the last quarter of the Twentieth Century. Somewhat ironically, the market in water rights (and in bulk water) is becoming much more active at the same time the State of New Mexico is asserting more and more control over allocation.

Forum Purposes

A one-day water market seminar in Albuquerque on May 5, 2006, was organized by H_2O Economics and John Shomaker & Associates to bring appraisers, brokers, economists, and other interested parties together to share information. Part of the purpose was to assist the market, which has yet to be organized in any formal sense, to be somewhat more efficient by offering a forum for participants and professionals to meet and speak to each other. Other purposes were to describe the hydrologic concepts that underlie water rights transactions, to introduce the institutions and administrative procedures involved, to present economic and political perspectives, and to provide information about prices and market-related issues in several of New Mexico's basins.

Free Market Requirements

Scarcity of water can be dealt with in several ways, not necessarily involving the market, but the subject matter of the seminar presupposed the development of markets. Commoditization of water and rights to water is ongoing in much of the world, particularly in the American West, and experience seems to show that a free market is more efficient than the collective wisdom of planners and legislators in allocating water. Free markets depend on a sound statutory and regulatory system, certainty as to title and quantity, and (under the Prior Appropriation system) certainty as to priority of first use. (William M. Turner, WaterBank.com, Albuquerque).

TECHNICAL, LEGAL AND POLITICAL CONSIDERATIONS

Market Influences

The market is influenced by many forces beyond the simple interaction of buyer and seller in individual transactions. Other entities may intervene as protestants in State Engineer proceedings, express their views in the press, or assert their political influence. The State of New Mexico must meet obligations to deliver water under interstate compacts, and takes a very conservative position in approving transfers that might lead to greater depletion. Environmental interests exert pressure to reduce depletions in general, and particularly to maintain or increase streamflow. Acequia farmers (i.e., those still following Spanish traditional communal irrigation practices) oppose commoditization that would result in water transfers out of any of their systems. Business interests, on the other hand, encourage flexibility and efficiency in transfers to meet new demands. Tribes and Pueblos control very significant water rights in the Rio Grande and San Juan River Basins, although only parts of these rights are quantified. The sovereign status of Indian entities, and the seniority of their rights, gives them a unique position in the potential market (Eileen Grevey-Hillson, AguaVida Resources, Albuquerque).

Water Use

Water withdrawals in New Mexico in 2000 were about 4.23 million **a**cre-**f**eet (AF), of which about 1.86 million AF (44 percent) were from wells. Seventy-six percent of total withdrawals were for agriculture. The State Engineer provides comprehensive administration, nominally under the Prior Appropriation system, but of course it is constrained by Federal agency jurisdiction and the existence of senior Tribal rights. Stream adjudication has proceeded slowly since promulgation of the water code in 1907, and the Middle Rio Grande Basin, which supports the largest population, is yet to be adjudicated (V. Phillip Soice, Southwest Water Consultants, Santa Fe).

Consumptive Use Standard

The relationship between groundwater and surface water, and the as yet unrealized depletion of streamflow due to groundwater pumping, is profoundly important in administration. Each water right represents (either explicitly or by implication) the sum of annual volumes of consumptive use, and return flow to the stream or aquifer. In irrigation, the consumptive use portion of the total diversion from a stream, or pumping from a well, contemplated under the right is 40 to 70 percent of diversion, depending on climate, crop mix, and other variables. Some uses other than irrigation represent almost 100 percent consumptive use (a water-bottling operation, for example), and some have almost zero consumptive use (as with a pass-through fish hatchery). Values should generally be expressed in terms of dollars per acre-foot per year of consumptive use (AF/yr CU), to avoid misunderstanding (John Shomaker, Ph.D., John Shomaker & Assoc., Albuquerque).

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Transition Process

Variation

Appraisals

Sellers/Buyers

Conveyances of water rights are subject to the same drafting and recording requirements as conveyances of land, although rights are not appurtenant to land in every case. Transfer of rights is an intricate process, requiring public notice (and hearing if the application is protested), and technical investigation by the State Engineer staff. Transfers tend to be very slow. Because beneficial use of water must continue for the right to remain valid (thereby avoiding "non-use" forfeiture), some innovative transactions may be necessary if rights must be accumulated for some future purpose (Tessa Davidson, Davidson Law Firm, Corrales).

Valuation of water rights, and of bulk water obtained through water banking or leasing, takes two forms: 1) appraisal, based largely on examination of prior sales; and 2) economic analysis, which focuses on the nature and interaction of the supply and demand functions and their change over time. Of course the physical supply and its variation is a central consideration.

Most water right appraisals consider the sales comparison approach, and account for price trends. The income approach is applicable if enough information is available. Comparisons must generally be within the same basin or sub-basin, and take into account the time required for the transfer. The magnitude of the right affects the price, in that the transaction costs for a large transfer may be similar to that of a small one (Travis Engelage, MAI, SRA, Albuquerque). Due to high transaction costs, smaller proposals simply may not pencil out.

In New Mexico, sellers and buyers tend to be two distinct groups of people. Sellers generally are those who first established rights by putting water to use: farmers, and potentially the Tribes. Buyers are municipalities and mutual-domestic water suppliers, and industry. There are few inter-basin transfers, and basins tend to be independent in terms of price. Economic modeling at the University of New Mexico indicates that New Mexicans "can handle the cognitive complexity of trading in a complex water market that is subject to exogenous [i.e., originating outside the market] hydrodynamic forces." The University is exploring the possibilities of various forms of water markets in New Mexico and the influence of variables such as climate change (David Brookshire, Ph.D., Department of Economics, University of New Mexico; F. Lee Brown, Ph.D., H_2O Economics, Albuquerque).

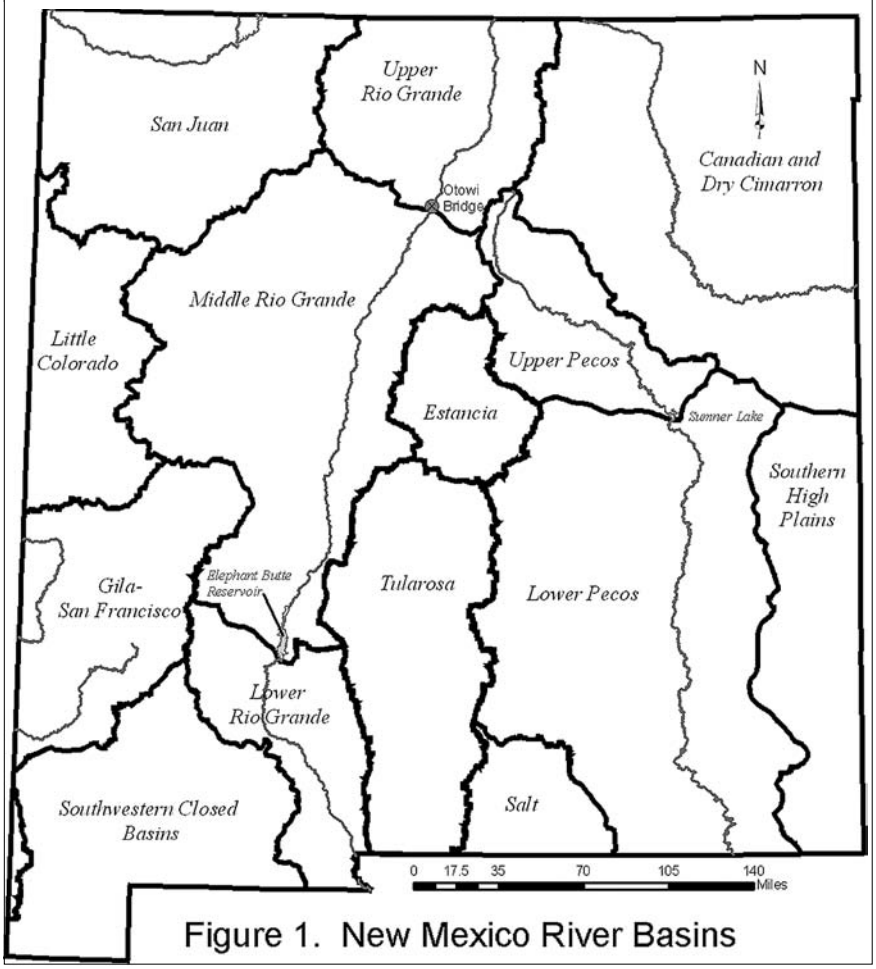

Figure 1. New Mexico River Basins

PRICE TRENDS & TRANSFER ISSUES RIO GRANDE, PECOS & ESTANCIA BASINS

The seminar included presentations focused on price trends and water right market issues in the Upper, Middle, and Lower Rio Grande Basins (as they are defined within New Mexico), the Upper and Lower Pecos Basins, and the Estancia Basin. These are the basins in which water right transactions appear to be the most frequent. The principal rivers, river basins, and closed topographic basins in New Mexico are shown in Figure 1. Surface water is fully appropriated in the Rio Grande and Pecos Basins, and new appropriations are not available in most of the Estancia Basin.

Upper Rio Grande (above the accounting gage at Otowi Bridge; see Fig. 1)

The most recent successful transfer in the Taos Valley was in 1997. Since then, moratoriums imposed by Taos County, and the negotiation of a settlement of the rights of Taos Pueblo (which was announced on May 30, 2006, and establishes a comprehensive water-management plan for the large water users in the area), have caused transfers to be deferred. Prices were rising before 1997, from about $3,000 per AF/yr CU in 1989 to about $5,600 per AF/yr CU in 1997. Now that transfers may again take place, administration will be much different than the procedures in 1997 (Mark Cowan, SRA, Mark Cowan & Assoc., Taos).

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Sttlement Conditions

The Taos Pueblo settlement specifies a numerical hydrologic model that will be used to calculate drawdown and streamflow-depletion effects that would result from a new transfer. The model will lead to requirements for offsetting rights different from those that would have been calculated under the former system. The settlement also sets out conditions under which some new appropriations of water may occur without protest from parties to the settlement (Taos Pueblo, the Town of Taos, the Taos Valley Acequia Association, and El Prado Water and Sanitation District). [Editor's Note: The Taos Pueblo settlement is still listed on the State Engineer's website as a "draft settlement" that is moving towards finalization; see the website for more details: www.ose.state.nm.us/ legal_ose_proposed_settlements_taos.html]

Santa Fe Policies

The City of Santa Fe has established new policies relating to water rights acquisition, and the relation of those policies to the current proposal for direct diversion of water from the Rio Grande (the Buckman Direct Diversion). Heretofore, except for some surface water diversion from the Santa Fe River, the City has used Rio Grande and tributary water rights only to offset the effects of pumping from wells and Rio Grande Compact compliance. The City and Santa Fe County jointly manage a contract for 5,605 AF/year of Colorado River Basin water imported through the San Juan-Chama Project. Even so, additional Rio Grande and tributary rights will continue to be needed, and the City is implementing an ordinance to require transfer of water rights to the City whenever certain applicants desire to add new demand to the City's water system (Kyle Harwood, Assistant City Attorney, Santa Fe).

Middle Rio Grande (Otowi Bridge, near Los Alamos, to Elephant Butte Dam; see Fig. 1)

Water right prices rose slowly from 1960 until the early 1980s (see Figure 2, prepared by Southwest Water Consultants), then remained almost stable at or somewhat above $1,000 per AF/yr CU until the early 1990s because of a standing offer by the City of Albuquerque. Since the early 1990s, prices have risen rapidly, and the rise has accelerated recently. As of mid-2006, prices reaching as high as $11,000 per AF/yr CU have occurred, and asking prices are even higher. Part of the rapid escalation is attributed to large-scale conversion of ranch lands to semi-rural subdivisions by land developers based outside New Mexico.

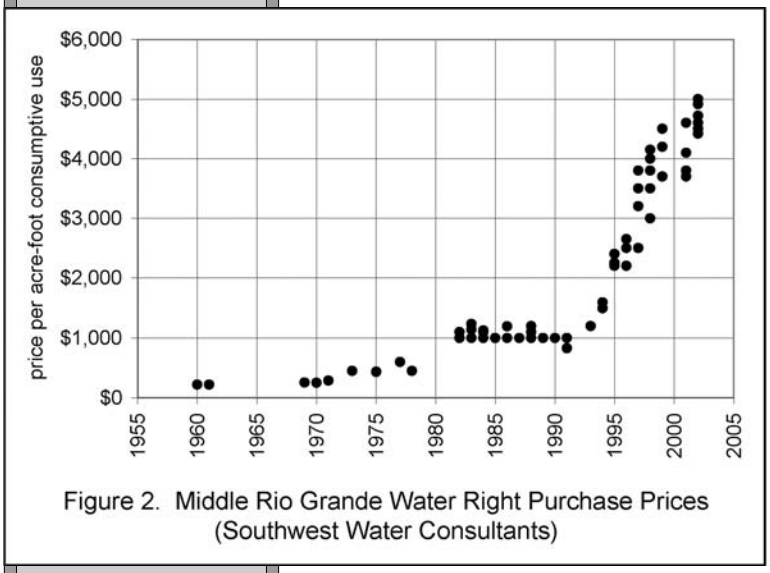

Figure 2. Middle Rio Grande Water Right Purchase Prices (Southwest Water Consultants)

Transfers are much more difficult and time-consuming now than they were 15 years ago. This is partly due to the fact that contracts are more elaborate and prices are less stable, and partly because the State Engineer's procedures and policies are in transition, plus the outcome of an application process is less predictable (a recurring theme during the seminar). Sellers are concerned about changes in State Engineer policy, the long delay between contract and payment, further delays that result from protests, and the rapid change in market value between the time a contract is secured and final approval of the transfer. Buyers frequently find that sellers have not provided good documentation, and that the State Engineer considers many rights, or portions of the rights, invalid (Irene Lee, Irene Lee Realty, Albuquerque; Suzanne Smith, Suzanne Smith Company, Socorro).

Albuquerque "Dominant Buyer"

In terms of economic analysis, the water rights market in the Middle Rio Grande has suffered from imperfect competition in the past, and is experiencing excess demand currently. During the 30 or more years beginning in 1960, the City of Albuquerque was a "dominant buyer," purchasing 55 to 90 percent of the rights sold, which led to imperfect competition for rights. Other buyers were happy to allow the City to hold prices down.

Excess Demand

A combination of several hypotheses may explain today's excess of demand for rights over the supply of rights for sale:

- Water market is still in a period of adjustment to accommodate the rapid increase in demand
- Institutional impediments to transfers represented by the restrictive and time-consuming State Engineer process
- Apparent dominance of agricultural use among sellers (and perhaps in the political climate)
- Rapidly changing price expectations which may be leading sellers to hold rights until prices go higher

"The capacity of the region to continue adjusting its water use patterns remains critical because we have not yet achieved a long-term sustainable balance among our water income, savings, and expenditures." (F. Lee Brown, Ph.D., H_2O Economics, Albuquerque).

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Upward Trend

Lower Rio Grande (Elephant Butte Dam to the Texas line near El Paso; see Fig. 1)

Market prices in the Lower Rio Grande roughly doubled between 1981 and 1997, but have risen more rapidly since then (see Figure 3), and can be expected to continue to rise. The circumstances of individual transactions have led to much variation in price, but the trend is clearly upward, and average prices have increased faster than the Consumers Price Index. Buyers are mutual-domestic and municipal water systems, a variety of industrial users, and land developers. Although agriculture has expanded, improved irrigation methods and other conservation efforts have reduced agricultural demand. Sellers are primarily farmers.

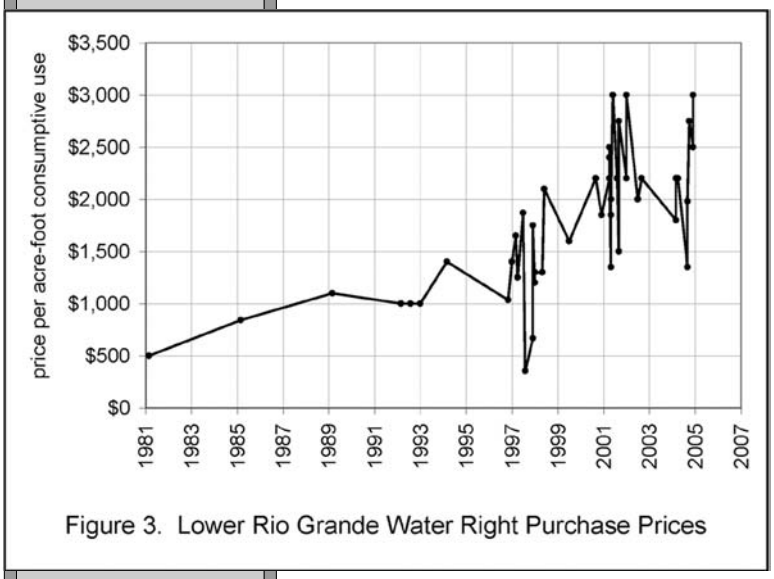

Figure 3. Lower Rio Grande Water Right Purchase Prices

PRICES FOR WATER ARE AFFECTED BY THE FOLLOWING:

- Increasing excess of demand over supply, related to population growth and expansion of water-system service areas
- State Engineer's policy requiring that water be put to use or lost, which means that few unused rights are lying dormant
- Slow availability of funding from the state legislature or federal grants to water systems, and the long process of approval by the Public Regulation Commission
- Sellers' desire to receive their money quickly

Another factor that comes into play is that the State Engineer is tightening administration, and scrutinizes transfers carefully.

Market Strategies

Several strategies for developing the market are possible. A buyer might buy the water rights and lease them back to the seller. One could buy groundwater rights and replace them with surface water rights or return flow credits. This is also the possibility of buying surface water rights and then utilizing them while anticipating a later sale as a future offset for new groundwater appropriations (Gerald Strauss, Aqua Terra, Las Cruces).

Timeline to Process

A recent inquiry to the State Engineer District Office in Las Cruces elicited an estimate of two to three years for processing of a new transfer application, with the proviso that the time might be shortened to less than a year if the applicant supplies, in a suitably conservative and credible form, much of the analysis that the State Engineer staff would otherwise do (John Shomaker, Ph.D., John Shomaker & Associates, Albuquerque).

Ownership Issue

Questions

Several questions arise in relation to the emerging market for Lower Rio Grande surface water rights. First, who owns the water? The United States (as the Bureau of Reclamation), the Elephant Butte Irrigation District, the individual farmers, and the New Mexico Interstate Stream Commission all have interests that must be considered. Second, how certain are the rules for transfer? Can groundwater rights in wells be used to offset streamflow depletion? How does the Rio Grande Compact affect transfers? Can water be transferred into the Basin from adjoining basins? What public-welfare considerations, which the State Engineer must address, are involved? Can the market include users in adjoining Texas, particularly El Paso? Can water be transferred out of the Basin? (Chuck DuMars, J.D., Law and Resource Planning Associates, Albuquerque).

Lower Pecos (below Sumner Dam; see Fig. 1)

Irrigated Acres Issue

Water right prices in the Roswell Basin (groundwater rights in the northern part of the basin), and the Carlsbad Irrigation District (surface water, in the southern end of the basin), are generally given in terms of acres of irrigated land, rather than acre-feet per year of consumptive use. Agriculture uses the great majority of the water, and transfers are generally either from one agricultural purpose to another, or from agriculture to other uses. Demand is at an historical high because of purchases by the New Mexico Interstate Stream Commission (NMISC) as part of the settlement of the adjudication of Pecos rights, and the development of the dairy industry. Nine classes of rights are recognized in the Roswell Artesian Basin, of which six are discussed below. Rights in the Carlsbad Irrigation District are discussed separately (Len Stokes, Progressive Environmental Systems, Ruidoso).

Water Right Types

SENIOR (PRE-1947 PRIORITY) ARTESIAN AQUIFER RIGHTS: These are typically highly valued because of early priority, shallow pumping levels, and good water quality. Such rights tend to belong to profitable farms. These rights are sought by NMISC, dairies, and purchasers seeking to develop pecan orchards. Prices in 2004 and 2005 were in the $4,500 to $5,500 per acre range (equivalent to $2,143 to $2,619 per AF/yr CU at the standard rate of 2.1 AF/yr per acre).

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Reclamation Lease

Quality Pricing

Surface & Groundwater

Urbanization Pressure

Severed Rights

No Legal Standing

Renewable?

SENIOR ARTESIAN AND SHALLOW AQUIFER COMBINED RIGHTS: Many parcels are close to the Pecos, and shallow water is of better quality than artesian aquifer water at some of those locations. NMISC is not pursuing these rights. A recent transaction brought $7,500 per water right acre ($3,571 per AF/yr CU).

SURFACE WATER (RIVER PUMP) RIGHTS: Most Pecos river pump rights were sold to NMISC some 15 years ago, in an initial retirement program. Most of the remaining such rights are leased by the U.S. Bureau of Reclamation, to augment Pecos flows for Endangered Species Act purposes, at $100 per AF/year.

COMBINED SURFACE WATER, ARTESIAN AQUIFER, AND SHALLOW AQUIFER RIGHTS—HAGERMAN CANAL: These rights have the earliest priority, with 1884 to 1887 priority dates. NMISC and newly established pecan orchards compete for farm rights. Prices in 2004 and 2005 ranged from $3,000 to $4,500 per water right acre, equivalent to $1,479 to $2,143 per AF/yr CU.

SENIOR SHALLOW AQUIFER RIGHTS: Most purchases are by dairies to meet nitrogen-loading requirements. Prices in 2004 and 2005 were $3,000 to $10,000 (within a designated Critical Management Area) per water right acre, equivalent to $1,479 to $4,762 per AF/yr CU, depending on location.

JUNIOR (POST-1946) ARTESIAN AQUIFER RIGHTS: These were brought into the administrative basin when the State Engineer extended the boundaries in past years, and may be subject to curtailment if priority administration occurs based on seniority of rights.

CARLSBAD IRRIGATION DISTRICT (CID) RIGHTS: The District's Board administers the surface water, and the State Engineer the groundwater. Some acreage is served by surface water only, some with surface water and supplemental wells, and some by primary groundwater rights. Surface water rights cannot be severed from the lands, but water may be used for purposes other than irrigation with approval from CID and the Bureau of Reclamation. Surface-water rights typically are priced at $3,000 per water right acre, with a range of $1,500 to $10,000 per acre depending on location. Prices are similar for the rights appurtenant to acreage with supplemental groundwater. Primary groundwater rights are highly valued because they can be transferred; a recent transaction brought $4,300 per acre.

Estancia Basin (see Fig. 1)

The Estancia Basin is a closed topographic depression, with no surface water outlet. Its proximity to Albuquerque has led to large-scale conversion of agricultural water rights to subdivision supply. Even before that trend began, groundwater levels were declining and it was clear that the supply is non-renewable. State Engineer regulations promulgated in 2001 prohibit new appropriations in most of the basin, so that rights to supply new uses must be purchased or leased from existing users.

The value of water rights varies widely, from $1,000 to $3,000 per AF/yr CU in much of the basin to $3,000 to $5,000 in the part of the area where development is most intensive. Prices are expected to continue rising. Several proposals to export water from the Estancia Basin to adjoining areas or to Santa Fe have been vigorously opposed (James Corbin, Corbin Consulting, Santa Fe).

SOME ECONOMIC OBSERVATIONS ON THE NEW MEXICO MARKET

(F. Lee Brown, Ph.D., H_2O Economics, Albuquerque)

Valuing Water Rights Severed From The Land

Irrigation rights severed from the land, in the Estancia Basin for example, sometimes sell for more than equivalent land sold along with rights. This counterintuitive phenomenon arises because there are two categories of buyers: 1) developers who are able and most willing to pay more for water than are irrigators and buy rights to be severed from the land; and 2) those buyers still interested in land for irrigation. The differential represented by this two-tier market may shrink, and eventually disappear, if development demand persists.

Limitations of Markets in Valuing Groundwater

The value of water left instream to maintain flow (for recreation and preservation of species) or water left in the form of a groundwater drought reserve (pore-filling to prevent subsidence) or waterbodies used for liquid-waste disposal is not captured in market prices in New Mexico. Most western jurisdictions have given explicit legal standing to instream water uses, but New Mexico has not. A rough estimate of the value to the City of Albuquerque of the drought reserve represented by groundwater (enabled by direct use of its San Juan-Chama Project water) is more than $750 million.

The Cost of Replacing Water Stocks

Flows of water, such as runoff or groundwater recharge, however uncertain they may be, are renewable "water income." Water stored in aquifers over geologic time, on the other hand is not. It is "water wealth," which can be exhausted. It has been customary for communities that become reliant on non-renewable sources to deal with replacement supplies only as the first source approaches

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exhaustion. This imposes a cost on future generations, which they may not be able to bear. To the extent that a community wishes to sustain itself indefinitely, the eventual cost of replacing exhaustible supplies should be built into the cost of extracting and using water today.

OUTLOOK—WATER AS THE LIMITING FACTOR IN NEW MEXICO

(F. Lee Brown, Ph.D., H_2O Economics, Albuquerque)

The renowned Steve Reynolds, New Mexico's State Engineer from 1955 to 1990, once described water as "simply the limiting factor" in New Mexico. He was not thinking of water as an immovable barrier, but rather as the factor that, more than any other, has shaped and will continue to shape the State's development. For some decades, a combination of atypically abundant precipitation, and the ability to tap the large volume of stored water in aquifers, has allowed us to avoid thinking deeply about stewardship and management of the resource.

Source Control

Economist Kenneth Boulding summarized the principal social mechanisms for managing a scarce resource as the "Three P's:" preachments, police, and prices. New Mexico has been using all three. Preachments — exhortations to conserve — have served well, and a conservation ethic has emerged. Policing, in the form of interstate compacts, regulation by the State Engineer, and conservation enforcement, has also been succeeding. The third "P," pricing, the focus of the seminar, brings us to several observations about the likely future.

Social and Political Acceptability of Water Markets

Commodity Acceptance

Many people react negatively to the concept of water as a commodity. But scarcity has always occurred from time to time, and the difference between traditional, informal ways of dealing with it, and more impersonal institutional mechanisms, may not be as great as people think. The legislature has been responsive to the concerns of acequias, settlements in adjudication cases have been negotiated, practical solutions to environmental problems are being worked out, and there is active dialogue among stakeholders.

Transformation of markets

Municipalities Dominant

Typical transactions in the New Mexico water market have been between individual users, rather than involving large institutions (as in California, for example). This situation is changing, however, as municipalities come to dominate. Once a sale has converted an irrigation right to public supply use, the right will probably never be on the market again. New Mexico owners are now recognizing the potential appreciation in value, and either are holding rights in expectation of higher prices, or more interestingly, are holding them as an investment portfolio and leasing rights or selling bulk water.

The Goal of Sustainability and Prescriptions for Reaching It

Water Budget

If New Mexico is unwilling to have parts of the State "dry up and blow away" the entire state must be put on a sustainable water budget. This will require water-management institutions that can routinely deal with variability and scarcity. We are making progress, but are far from the goal. Preachment and policing remain vital tools, but we must rely more heavily on pricing—i.e, water market institutions. It is clear that the price of water will continue to climb for the foreseeable future. We should begin to value groundwater in storage more accurately for the in situ services it provides, and treat it more as the drought reserve it should become. New Mexico is fortunate in being small enough that most of the principal players in the water arena know each other, and communication is good, so that broader interests can generally be represented by a small number of people who can work toward consensus.

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John W. Shomaker, Ph.D., is President of John Shomaker & Associates, Inc., in Albuquerque, New Mexico. With over 40 years of professional experience in geological and hydrogeological studies in New Mexico and surrounding states, he is a widely recognized expert in the theoretical and applied principles of hydrogeologic analysis, and technical aspects of water rights.

F. Lee Brown, Ph.D., is an economic consultant specializing in water resources and doing business as H_2O Economics, in Albuquerque, New Mexico. He has testified as an expert witness in numerous venues, including two interstate water suits before the U.S. Supreme Court. He is also Professor Emeritus of Economics and Public Administration at the University of New Mexico and has studied the evolution of water markets in New Mexico and the West for over thirty years.

A **Water Market Seminar** will be presented again on **May 14, 2007**, in **Albuquerque**, New Mexico. The seminar will focus largely on price trends and transfer issues. For information, contact the authors.

Wetlands Jurisdiction

CWA WETLANDS JURISDICTION

US SUPREME COURT RULES ON *RAPANOS* & *CARABELL*

by Jennie Bricker, Stoel Rives (Portland)

On June 19, 2006, the US Supreme Court decided two consolidated cases, *Rapanos v. United States* and *Carabell v. U.S. Army Corps of Engineers*, addressing the scope of Clean Water Act Section 404 jurisdiction over wetlands adjacent to tributaries of navigable waters. Although the Court vacated and remanded the judgments supporting the Army Corps of Engineers' (Corps') assertion of broad jurisdiction, it is not clear to what extent the decision will restrict future federal regulation of wetlands.

Overview of Corps Regulations

"Navigable Waters"

The Clean Water Act prohibits any discharge of dredged or fill materials into navigable waters, unless authorized by a permit issued by the Army Corps of Engineers. 33 USC § 1344. The Act defines "navigable waters" as "the waters of the United States." 33 USC § 1367(7). Corps regulations, in turn, define "waters of the United States" to include: (a) all waters, whether interstate or intrastate, used in or affecting interstate commerce, *see* 33 CFR § 328.3(1),(2),(3); (b) tributaries of any of those waters, *see Id.* § 328.3(5); and (c) wetlands adjacent to those waters or their tributaries, *see Id.* § 328.3(7). Under 33 CFR § 328.3(c), "adjacent" is defined to mean "bordering, contiguous, or neighboring," and adjacency is not affected by the presence of structures such as dikes or berms that may separate wetlands from a water course. Although the regulations do not define "tributary," the Corps identifies a tributary as any water channel that flows into navigable waters (even indirectly through another tributary) and possesses a discernible high water mark.

Previous Rulings

The Supreme Court has interpreted these regulations, or their predecessors, twice before—in *United States v. Riverside Bayview Homes*, 474 US 121 (1985), and in *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers*, 531 US 159 (2001) ("*SWANCC*"). In *Riverside Bayview*, the Court upheld Corps regulations and agreed with the Corps that it had jurisdiction over adjacent wetlands. The *SWANCC* Court rejected the regulations, to the extent the Corps used them to apply its "Migratory Bird Rule" and attempted to regulate isolated, intrastate ponds on the basis that they were visited by birds who presumably crossed state lines and otherwise unwittingly contributed to interstate commerce. After *SWANCC*, the Corps initiated a rulemaking to respond to the jurisdictional questions raised by the case, *see* 68 Fed Reg 1991 (2003), but new rules were never promulgated. In *Rapanos v. United States,* No. 04-1034, 547 US ___ (US June 19, 2006), the Court takes another look at the same set of regulations.

The Facts

Indirect Connection

There are four wetland sites at issue in *Rapanos*. Of the three sites controlled by John Rapanos, two are connected to "drains" that eventually flow into navigable waterways. The third is connected to the Pine River, which flows into Lake Huron. At the *Carabell* site, the owners were denied a permit to fill a 16-acre area of forested wetlands. The wetlands are separated from a ditch by a mostly impermeable, artificially constructed berm; the ditch connects to the Sutherland-Oemig Drain; the drain connects to Auvase Creek; and the creek flows into Lake St. Clair. Together, the sites implicate several features of the Corps' interpretation of "waters of the United States," including definitions of tributary and adjacency. Three of the four sites are not directly connected to navigable waters, but rather to channels the Corps could classify as tributaries. Thus the case presents the issue of whether "waters of the United States" can be interpreted to encompass wetlands adjacent to nonnavigable tributaries of navigable waters. The Supreme Court provides three different resolutions.

The *Rapanos* Suite of Opinions

Rapanos is a "four-one-four" decision reminiscent of *Regents of the University of California v. Bakke*, 438 U.S. 265 (1978). The *Bakke* Court provided no majority opinion, so Justice Powell's solo opinion became the law of the land, with four Justices to the left and four Justices to the right. As in *Bakke*, no position garnered a five-Justice majority in *Rapanos*, and thus the Court was unable to produce a majority vote in favor of any one jurisdictional standard for the Sixth Circuit to apply.

"Significant Nexus"

Instead, Justice Scalia authored a plurality opinion that would significantly narrow the reach of federal wetlands jurisdiction, while Justice Kennedy, concurring in the judgment, concluded that the appropriate test for jurisdiction over wetlands was the presence of a "significant nexus" between wetlands and what we traditionally understand as "navigable waters." The remaining four Justices, in a dissenting opinion by Justice Stevens, would have upheld the Corps' assertion of jurisdiction and would have affirmed the Sixth Circuit's decisions. Chief Justice Roberts added a brief concurring opinion chastising the Corps for failing to offer regulatory guidance, and Justice Breyer wrote separately in dissent to clarify his view that, in defining "waters of the United States," Congress intended the reach of the Clean Water Act to extend to the limits of the Commerce Power.

Wetlands Jurisdiction

Plurality Limitations

Significant Affects

Case-by-Case Inquiry

Dissent: Broad Scope

Adjacent Wetlands

Corps Ecological Judgement

THE PLURALITY OPINION

Justice Scalia, joined by Justice Alito, Justice Thomas, and Chief Justice Roberts, proposed a jurisdictional test that would limit the definition of "waters of the United States" and curtail the Corps' interpretation of what counts as a tributary. Specifically, Justice Scalia posits that "waters of the United States" may include only "relatively permanent, standing or flowing bodies of water" of the type that form "geographical features" and, at a minimum, constitute "a continuous flow of water in a permanent channel." *Slip Op.* at 13-14 (Scalia, J.). Further, the plurality would limit the definition of "tributary" to a "relatively permanent body of water *connected to* traditional interstate navigable waters." *Id*. at 24 (emphasis added). To fall within the Corps' jurisdiction, wetlands must have "a continuous surface connection with that water, making it difficult to determine where the 'water' ends and the 'wetland' begins." *Id*. According to the plurality, ordinarily dry channels containing intermittent or ephemeral flows, and channels that periodically drain rainfall are not jurisdictional, and neither are wetlands adjacent to them.

THE KENNEDY OPINION

Justice Kennedy concluded that the Clean Water Act applies only to those wetlands having a "significant nexus" with "navigable waters in the traditional sense." *Slip Op.* at 22 (Kennedy, J.). A significant nexus exists when wetlands, "either alone or in combination with similarly situated lands in the region, significantly affect the chemical, physical, and biological integrity" of navigable waters. *Id*. at 23. Under the *Riverside Bayview* precedent, wetlands adjacent to navigable waters meet this test. For wetlands located near tributaries of navigable waters, however, each wetland demands a case-by-case jurisdictional inquiry. Justice Kennedy throws out several possible factors: for example, a tributary's "volume and regularity of flow" may serve as a measure of the requisite "nexus." *Id*. at 24. Also, a "mere hydrological connection" is not enough in all cases, *Id*. at 28, and "speculative or insubstantial" effects on water quality will not suffice, *Id*. at 23. Other than that, the "significant nexus" test is an open invitation back to court.

THE DISSENT

Justice Stevens wrote a dissenting opinion joined by Justices Souter, Ginsburg, and Breyer. The dissenting Justices would have affirmed the Sixth Circuit's judgments, endorsing the scope of jurisdiction as the Corps asserted it. For these Justices, the question of Corps jurisdiction over wetlands adjacent to tributaries was resolved in *Riverside Bayview*.

The *Riverside Bayview* Precedent

The Court's most relevant precedent, *Riverside Bayview*, pops up insistently through all three opinions, each of which relies on the case to support—indeed, to mandate—its own test for jurisdiction. Justice Scalia picks up the "boundary-drawing problem of *Riverside Bayview*" and fashions it into a necessary condition for determining whether wetlands are jurisdictional. Justice Kennedy cites the case for its most narrow holding—that wetlands adjacent to *navigable* waters satisfy the "significant nexus" test. The dissent, construing the *Riverside Bayview* holding more broadly, contends that that case resolved the question of jurisdiction over wetlands adjacent to both navigable waters *and* their tributaries.

What did *Riverside Bayview* really say? Refreshingly, it said only one thing—it was a unanimous opinion. The specific issue in the case was whether adjacent wetlands could be within the definition of "waters of the United States" even where "the moisture creating the wetlands does not find its source in the adjacent bodies of water." 474 US 121, 135 (1985). The Court was addressing Corps regulations that (a) defined "wetlands" and (b) construed "waters of the United States" to include all wetlands adjacent to navigable waters and to their tributaries. 747 US at 123; *see* 33 CFR § 323.2 (1985).

In creating its regulations, the Corps had made "an ecological judgment about the relationship between waters and their adjacent wetlands." 474 US at 134. The Court said the Corps' ecological judgment provided an "adequate basis for a legal judgment" about the scope of jurisdiction *because of*:(a) the intended broad reach of authority evidenced in the Clean Water Act itself; and (b) the difficulty of defining the precise boundaries of "regulable waters." *Id*. The Court's holding was that the regulatory definition of "waters of the United States" was permissible under the Act, and that definition encompassed wetlands adjacent to tributaries. 474 US at 135. However, the wetlands specifically at issue in the case were not adjacent to a tributary, they were adjacent to Black Creek, a navigable waterway. 474 US at 131. Thus the portion of the regulations having to do with tributaries was not squarely before the Court; although the Court held that the regulations were valid, that portion of the holding could be regarded as *dicta* (i.e., legal opinion peripheral to the principal issues of the case).

In Search of a Standard

To which opinion—and more importantly, to which regulatory standard—should one hitch one's proverbial wagon? When no opinion garners at least five votes, lower courts follow the concurrence

Wetlands Jurisdiction

Standard Unclear

Possible Applications

No Nexus

Physical Integrity

Broad Interpretation Overturned

which reached the result on the narrowest grounds. Here that is probably Justice Kennedy's opinion. However, as the dissent points out, lower courts should find jurisdiction not only in cases that meet the "significant nexus" standard, but also "in the unlikely event that the plurality's test is met but Justice Kennedy's is not." *Slip Op.* at 26 n14 (Stevens, J.).

To see how this three-for-one sale on jurisdictional tests might work on the ground, we can explore a set of three wetlands hypotheticals. In each case, we will assume that the potential permit applicant wants to fill wetlands adjacent to a nonnavigable tributary, and that the proposed activities do not fall within one of the Corps' agricultural or other exemptions. The question in each case is whether the Corps has jurisdiction.

HYPOTHETICAL ONE

The wetlands in question are next to a nonnavigable but defined channel that, for about half the year, collects rainwater and runoff and directs its flow into a navigable waterway. The area consists of depression-type wetlands saturated by precipitation and groundwater but with no hydrological connection to the tributary—let's say an impenetrable berm separates the wetlands from the tributary, as was maintained in the *Carabell* case. On these facts, filling the wetlands will not require a Corps permit; only the four dissenting Justices would view them as jurisdictional. Justice Kennedy would disallow jurisdiction because of the lack of a "significant nexus," viewed under his chemical/physical/biological integrity criteria. The plurality would disallow jurisdiction both because the tributary lacked a "continuous flow" and because there is no surface water connection between the wetlands and the tributary.

HYPOTHETICAL TWO

Starting with the same facts as above, we'll remove the berm and add the following feature: During rare but periodic high-water events, the wetlands provide an overflow function, marshalling excess flow from the tributary that might otherwise run into the navigable waterway and cause flooding. In this case, five Justices would probably approve jurisdiction. Though we can't know for certain because of the case-by-case nature of the "significant nexus" test, Justice Kennedy would likely consider the wetlands' flood control feature determinative evidence that the wetlands served to protect the nearby navigable waterway's physical integrity. The counter-argument would reject jurisdiction both because of the lack of "continuous flow" in the tributary and because the surface water connection between the wetlands and the tributary was only sporadic.

HYPOTHETICAL THREE

Using the same geographical configuration, we'll change the facts for the third hypothetical so that the tributary carries water year-round, and the wetlands gather precipitation and runoff throughout the year, releasing it into the tributary continuously. In doing so, however, the wetlands contribute nothing to the ecological integrity of the tributary or the navigable waterway. In fact, just for fun, let's say the wetlands collect runoff from a historical deposition site for dredged materials and as a result they direct silt and low-level contaminants into the tributary. Far from preserving the waterway's biological integrity, the wetlands actually degrade it, so that there is no way the "significant nexus" test can be satisfied. Nevertheless, the plurality's geographically based test *would* be met, because the wetlands are connected by a continuous surface water flow to a tributary characterized by a "continuous flow of water in a permanent channel." The result, after *Rapanos*, is that the Corps would be permitted to assert jurisdiction.

The Post-*Rapanos* Outlook

As the third hypothetical illustrates, it is theoretically possible for wetlands to be jurisdictional under the plurality's test but not under the "significant nexus" test. As a practical matter, however, lower courts in these cases as well as future wetlands cases can be expected to follow Justice Kennedy's concurring opinion. Nevertheless, as courts apply the "significant nexus" test, and as the Corps makes jurisdictional determinations in the field, the decision making process will no doubt be influenced by the fact that a majority of the Supreme Court voted to overturn the Corps' broad interpretation of its Clean Water Act jurisdiction. Wetlands adjacent to navigable waters will continue to fall within the Corps' jurisdiction. Wetlands adjacent to tributaries of navigable waters, on the other hand, may end up as jurisdictional—but only after an individual determination in each case, or perhaps each watershed.

For Additional Information: Jennie Bricker, Stoel Rives, 503/ 294-9631 or email: jlbricker@stoel.com

Jennie Bricker is an attorney at Stoel Rives LLP who assists clients with waterway issues, including compliance with federal and state wetlands regulation.

WATER BRIEFS

GROUNDWATER POLLUTION - MANUFACTURERS LIABILITY CA

On June 9, a jury awarded the City of Modesto $3.2 million in compensatory damages from several companies involved in the manufacture of dry-cleaning chemicals for contaminating Modesto's soil and groundwater. On June 13 the jury then awarded punitive damages of more than $175 million after ruling that three chemical companies "acted with malice" because the companies were aware of the potentially harmful effects of dry cleaning solvents they manufacture and their historical warnings and instructions regarding perchloroethylene were improper (including flushing PCE into the municipal sewer system). The jury verdict was based on common law doctrines of product liability, nuisance and trespass.

In the case of *City of Modesto et al. v. TDCC et al.* (Case No. 999345; see also 999643) filed in San Francisco Superior Court on behalf of Modesto, California and related municipal entities, the jury awarded the punitive damages against defendants Dow Chemical ($75 million), Vulcan Materials Company ($100 million) and R.R. Street & Co. Inc. ($75,000). Modesto sued the manufacturers for failing to warn dry cleaners how to use perchloroethylene (PCE) properly and how the solvent could harm the environment. See also Axline and Miller, TWR #5.

A separate statutory claim in the lawsuit was brought under the Polanco Redevelopment Act (California Health & Saf. Code, § 33459 et seq.); see earlier appellate court decisions regarding the ability to sue the manufacturers, dated 5/28/04 and 6/28/04, First Appellate District, California Court of Appeals (Cases No. A104367, 119 Cal.App.4th 28, and A104367M, 119 Cal.App.4th 1217a respectively).

Dow Chemical's (DOW) press release regarding the jury verdict noted that it will "vigorously challenge this baseless jury verdict in the trial court and if necessary in the appellate courts. The jury's verdict, particularly with respect to punitive damages, is clearly erroneous and Dow is confident that this verdict will be reversed. There was no evidence whatsoever to support a finding of punitive damages in this case. Moreover, the amount of punitive damages awarded by the jury is clearly excessive as a matter of both California and federal law, and cannot stand. Further, the jury's verdict with respect to compensatory damages also is unsupportable given the lack of evidence that any Dow product, warning, or instruction contributed to any contamination in Modesto."

Modesto's lawsuit accused the defendants, who manufactured and supplied solvents and equipment, of instructing dry cleaners that chlorinated solvents could be discharged into sewers, and that the defendants failed to issue recalls or warnings regarding the equipment and solvents.

Michael Axline, one of the attorneys for Modesto, told The Water Report "the jury obviously had problems with the defendants' hypocrisy." TWR asked Axline about Dow Chemical's press release that stated that there was no evidence to support the punitive damages award. Axline cited an example of a Dow Chemical report (prepared in 1965 and updated in 1975) that was entitled "The Pollutional Evaluation of Compounds with 'Red Flag' Designations." In the report, that was stamped "Confidential," Dow identified chemicals (including PCE) that should not be put into their own sewer system, while also noting that the chemicals had a propensity to leak through concrete sewer pipes, according to Axline. "At the same time, Dow continued to inform the dry cleaners that it was okay to discharge to the sewers." In 1992, the manufacturers began informing dry cleaners not to dispose of the chemical into the sewer system.

Axline also said that similar contamination problems exist in most cities in the US since the same dry cleaning chemicals have been widely used. He believes that the decision will serve as a precedent for contamination cases in California as well as elsewhere in the US.

For info: Michael Axline, Miller, Axline & Sawyer, 916/ 927-8600 or email: toxictorts@toxictorts.org; Scot Wheeler, Dow Chemical, 989/ 636-2205 or website: http://news.dow.com/dow_news/corporate/2006/20060614c.htm; Appellate decisions: http://caselaw.lp.findlaw.com/ca/caapp4th/119.html

INTENTIONAL SURPLUS CA

COLORADO RIVER PROGRAM

On June 1, the Bureau of Reclamation signed an agreement with the Metropolitan Water District of Southern California (MWD) for a demonstration program that will help determine if creating "surplus" water in Lake Mead can be used as a long-term water management tool on the lower Colorado River. This program will allow MWD to leave water in Lake Mead in 2006 and 2007 that the district would otherwise use. The "Intentionally Created Surplus" (ICS water) is defined as water that has been conserved through an extraordinary conservation measure, such as land fallowing.

MWD plans to create 50,000 acre-feet (AF) of ICS water in 2006 using water that has been conserved through an existing land management, crop rotation and water supply program with Palo Verde Irrigation District near Blythe, California. MWD is entitled to divert and use the water conserved through this program in its six-county Southern California service area. To create the ICS water, MWD will leave up to 50,000 AF of this conserved water in Lake Mead instead of using it this year.

In 2007, MWD will be allowed to create up to 200,000 AF of ICS water in Lake Mead; that water would come from a variety of programs being implemented in California to conserve Colorado River water. A separate agreement will be required to allow MWD to recover the ICS water in subsequent years.

Bob Johnson, Regional Director for Reclamation's Lower Colorado Region, touted the benefits of the program. "For example, five percent of the ICS water will be dedicated to the Colorado River system, providing a water supply benefit to all Lower Basin water users. The program also will augment the Colorado River system storage, and help avoid, delay or reduce the severity of a shortage in the Lower Colorado River Basin."

MWD General Manager Jeff Kightlinger said the demonstration project could serve as a model for

future programs that would help improve dry-year supply reliability without building costly infrastructure. "The true significance of this demonstration program is that the benefits are spread among all Colorado River users," Kightlinger said. "In addition to providing supply, power generation and recreational benefits, this innovative approach offers a creative solution that could delay or prevent shortage conditions in the future for all Basin states."

Under the program, if conditions change during the year because of unforeseen circumstances, MWD may request a modification of its water order to reduce the amount of ICS water created. If Reclamation has to release water from Hoover Dam (Lake Mead) for flood control purposes, ICS water will be the first water to be released. ICS water will also be subject to an annual evaporation loss.
For info: Dale Ensminger, Reclamation, 702/ 293-8659 or email: densminger@lc.usbr.gov; the full agreement is available on Reclamation's website: www.usbr.gov/lc/region/programs/demo.html

WASTEWATER DISCHARGE ID PERMITS-POLLUTANT TRADING

EPA is proposing two new general wastewater discharge permits for 100 aquaculture facilities in Idaho and an individual permit for Epicenter Aquaculture. A new **g**eneral **p**ermit (GP) is also being proposed for Idaho's four fish processors. The new NPDES permits contain a pollutant trading option aimed at achieving water quality improvement more efficiently than through a traditional permitting approach. These permits replace the one NPDES GP in 1999, which previously authorized discharges from most of the Idaho aquaculture facilities. These general permits also will authorize facilities currently operating under individual permits, thereby terminating the authorization to discharge under the individual permits.

According to Jim Werntz, Idaho state director for EPA, the permits will reduce pollutants discharged to Idaho's streams and rivers. "They will cover all aquaculture facilities in Idaho that produce more than 20,000 pounds of fish per year. The net benefit will be a 40% reduction in phosphorus discharges from mid-Snake producers. We're hoping that by offering permittees a pollutant trading option, we'll see streams getting healthier in a shorter time horizon."

Permit highlights include: pollutant trading is allowed for phosphorus discharges in the mid-Snake River; limits are based on pollutant loads assigned by the State to improve water quality in seven watersheds; copper monitoring is required when it is used to control diseases or algae growth in facilities; and PCB monitoring is required for facilities with painted raceways or caulking. A 45-day public comment period will run until August 3, 2006. After EPA reviews comments, permits will be finalized for a 5-year term.
For info: Sharon Wilson, EPA, 206/ 553-0325 or email: Wilson.Sharon@epa.gov; or EPA website: http://yosemite.epa.gov/R10/WATER.NSF/NPDES+Permits/General+NPDES+Permits#Aquaculture

TRANSBOUNDARY CERCLA US INTERNATIONAL POLLUTION

The Bush Administration and the world's largest zinc producer have reached an international agreement to investigate contamination in the Upper Columbia River in northeast Washington State after several years of legal wrangling and negotiations. Under the agreement announced June 2, Teck Cominco, a Canadian corporation, will fund and perform an EPA-monitored assessment of decades of past pollution in the river running downstream from Canada into US waters. This study is the initial step in the clean-up process. EPA began its assessment in the Upper Columbia River in 2000 following a petition by the Confederated Tribes of the Colville Nation.

The agreement calls for Teck Cominco to assess the environmental contamination caused by the company's smelter operations in Trail, British Columbia, just 10 miles north of the US border in northeast Washington State. The multi-year study will assess risks from contamination to both people and the environment, and covers 150 river miles from the Canadian border downstream to Grand Coulee Dam. Under the agreement, the company will complete a Remedial Investigation and Feasibility Study consistent with US Superfund law. EPA retains full oversight authority for the duration of the study.

Teck Cominco agreed to fully fund the multi-year study to completion and to pay federal oversight costs up front. In addition the agreement provides for state and tribal involvement throughout the study and $1.1 million in annual funding for their participation. The company will place $20 million in escrow to provide financial assurance.

Meanwhile, litigation between Teck Cominco (TCM Metals, Ltd.) and two members of the Confederated Tribes of the Colville Nation is pending before the 9th Circuit Court of Appeals. The plaintiffs filed a citizen suit under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) to seek enforcement of an EPA Unilateral Administrative Order (*Teck Cominco Pakootaas v. TCM Metals, Ltd*., E.D. Wash., No CV-04-256, 2004 U.S. Dist. LEXIS 23041 (Nov. 8, 2004). See Du Bey, Rosenthal & Clark, TWR #15.
For info: Jennifer Wood, EPA, 202/ 564-4355 or email: wood.jennifer@epa.gov; EPA website: http://yosemite.epa.gov/opa/admpress.nsf/names/hq_2006-6-2_International_Pollution_Agreement

UMATILLA TRIBE STUDY WA WALLA WALLA FLOW RESTORATION

The Washington Department of Ecology (Ecology) has allocated $400,000 to the Confederated Tribes of the Umatilla Indian Reservation under The Columbia River Basin Water Management Act (House Bill 2860) passed by the 2006 Washington State Legislature. The Columbia River Water Management Act (CRWMA) specifically highlighted restoration projects in the Walla Walla

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Basin to be funded by Ecology. The study is designed to contribute to recovery of bull-trout and steelhead and the re-introduction of Chinook salmon by restoring stream flows to the Walla Walla River, while maintaining a healthy agricultural economy. See Moon, TWR #25.

The four-year study, co-sponsored by the US Army Corps of Engineers (Corps), is to be completed in late 2007. It will determine the feasibility of restoring stream flows through two construction project alternatives: delivery of Columbia River water for irrigation to the Walla Walla Basin in exchange for irrigators leaving an equal amount of water in the Walla Walla River to support fish; or a new water storage facility on Pine Creek. The study is also examining the feasibility of purchasing water rights from willing sellers, increasing irrigation efficiencies, and shallow groundwater recharge.

The Cayuse, Umatilla and Walla Walla Tribes (now known as the Confederated Tribes of the Umatilla Indian Reservation) entered a Treaty with the US in 1855 in which they reserved a permanent homeland (Umatilla Reservation) and rights to hunt, fish, gather foods and medicines, and pasture livestock throughout 6.4 million acres ceded to the US. Although the tribal government headquarters are located in Oregon, the Tribe's ceded territory — where Tribal members exercise Treaty Rights and protect Treaty resources — includes much of northeastern Oregon and southeastern Washington.
For info: Derek Sandison, Ecology, email: dsan461@ecy.wa.gov; CRWMA WEBSITE: www.ecy.wa.gov/programs/wr/cwp/crwmp.html; CONFEDERATED TRIBES WEBSITE: www.umatilla.nsn.us/

FEDERAL CAFO RULES US

PROPOSED NPDES REVISIONS

EPA is proposing to revise the NPDES permitting requirements (Section 122) and Effluent Limitations Guidelines (Section 412) for **c**oncentrated **a**nimal **f**eeding **o**perations (CAFOs) in response to the order issued by the Second Circuit Court of Appeals in *Waterkeeper Alliance et al. v. EPA*, 399 F.3d 486 (2nd Cir. 2005). See Water Briefs, TWR #13. On June 22, EPA announced it would commence a 45-day comment period concerning the agency's proposed rule.

There are approximately 18,800 CAFOs in the US, contributing up to 60% of all manure generated by operations that confine animals. Poorly managed CAFO operations threaten water quality and public health by releasing pollutants into the environment through spills, overflows, or runoff. In February 2003, EPA issued a revised rule that focused on the 5% of the nation's **a**nimal **f**eeding **o**perations (AFOs) that presented the highest risk of impairing water quality and public health (68 FR 7176). The revised rule expanded the number of operations covered by the CAFO regulations to an estimated 15,500 and included requirements to address the land application of manure from CAFOs. It required all Large CAFOs, and all Medium CAFOs that discharge manure, litter, or process wastewater to waters of the US, to apply for an NPDES permit. The rule became effective on April 14, 2003 and authorized NPDES states were required to modify their programs by February 2005 and develop state technical standards.

The proposal would revise several aspects of EPA's regulations governing discharges from CAFOs. First, EPA proposes to require only the owners and operators of those CAFOs that discharge or propose to discharge pollutants to seek coverage under a permit. Second, EPA proposes to require CAFOs seeking coverage under a permit to submit their **n**utrient **m**anagement **p**lan (NMP) with their application for an individual permit or notice of intent to be authorized under a general permit. Permitting authorities would be required to review the plan and provide the public with an opportunity for meaningful public review and comment. Permitting authorities would also be required to incorporate terms of the NMP as NPDES permit conditions. Third, this action proposes to authorize permit writers, upon request by a CAFO, to establish best management, zero discharge effluent limitations when the facility demonstrates that it has designed an open containment system that will comply with the no discharge requirements.

This proposed rule also responds to the court's remand orders regarding **w**ater-**q**uality **b**ased **e**ffluent **l**imitations (WQBELs) and pathogens. EPA proposes to clarify that WQBELs are available in permits with respect to production area discharges but are statutorily unavailable in permits for Large CAFOs with respect to land application discharges. The proposed rule clarifies that under the exemption established by the Clean Water Act, CAFOs land applying manure, litter or processed wastewater don't need NPDES permits if the only discharge from those facilities is agricultural stormwater. Finally, EPA proposes to clarify its selection of **B**est **C**onventional Pollutant Control **T**echnology (BCTs) for pathogens (fecal coliform), and reaffirm its decision to set the BCT limitations for fecal coliform to be equal to the **B**est **P**racticable **T**echnology (BPT) limits established in the 2003 CAFO rule.

EPA's website contains pdfs of the Proposed Rule Preamble and Regulatory Text, the Fact Sheet on the Proposed Rule, and the Draft NMP Template. Public meetings on the proposed CAFO rule will be held at the following locations: Raleigh, NC (July 24); Ames, IA (July 25); Denver, CO (August 1); Dallas, TX (August 2); and Sacramento, CA (August 3); see also Calendar, this TWR. Exact times and locations will be posted soon.
For info: Kawana Cohen, EPA, 202/564-2345, email: cohen.kawana@epa.gov; EPA website: www.epa.gov/npdes/afo/revisedrule

CONJUNCTIVE USE CO

GROUNDWATER AUGMENTATION

On June 12, the Colorado Supreme Court upheld a decision by the state Water Court that supports the authority of the State Engineer to shut off groundwater pumping when necessary to prevent injury to senior vested water rights. In an abbreviated

decision, the court found that a 2005 Water Court decree accurately set forth the statutory authority granted to the State Engineer to curtail all out-of-priority diversions, when depletions from the diversions have not been sufficiently replaced so as to prevent injury to senior water rights.

The case arose from an application for approval of a plan for augmentation for approximately 1,000 wells in the South Platte River basin on December 23, 2002, filed by the Ground Water Management Subdistrict of the Central Colorado Water Conservancy District. The augmentation plan proposed to allow out-of-priority well pumping by replacing the resulting out-of-priority depletions. Approximately 50 entities and individuals, including the state engineer, filed statements of opposition to the application.

The Harmony Ditch Company and various other opposers appealed directly to the Supreme Court of Colorado, maintaining that the Water Court erred by including the language of the statute involved in its decree without a further explanation of the limit on the State Engineer's power. Section 37-92-305(8), C.R.S., requires that the "state engineer curtail all out-of-priority diversions, the depletions from which are not so replaced as to prevent injury to vested water rights." The parties opposing the augmentation plan, however, argued that the Water Court decree should instead include an interpretation of the statute "that the state engineer is authorized to curtail out-of-priority diversions *only* when the augmentation plan is not being operated in compliance with the other terms and conditions of the decree." (court emphasis) *Harmony Ditch Company, et al. v. Ground Water Management Subdistrict, et al.,* Case No. 05SA205, (June 12, 2006). Slip Op. at 1.

The court disagreed with that assertion, stating that the "mandate of section 37-92-305(8) – that decrees approving plans for augmentation impose a duty of curtailment, under certain circumstances, on the state engineer – is entirely a creature of statute, and the statute itself specifies what the decree must demand of the state engineer." *Id.* The decision clearly upholds the State Engineer's authority as set forth in the governing statute. However, the case may return to the court in the future if the groundwater users believe the State Engineer's curtailment is not justified: "Should a party suffer injury as a result of the state engineer's attempt to comply with his obligation, avenues exist to challenge the scope of his authority, as intended by the legislature and decreed by the water court, in the context of the particular circumstances." *Id.*

For info: Opinion available at the Colorado BAR's website: www.cobar.org/opinions/opinion.cfm?OpinionID=5645

GROUNDWATER/MINING AZ

NEW AQUIFER PROTECTION PERMIT

Arizona Department of Environmental Quality (ADEQ) Director Steve Owens recently announced that ADEQ has issued a revised draft water quality permit for the Phelps Dodge Sierrita copper mine near Green Valley.

ADEQ and Phelps Dodge have entered into a first-of-its-kind Consent Order under the State Superfund clean-up statute—known as the Water Quality Assurance Revolving Fund (WQARF) law—that requires Phelps Dodge to mitigate the plume of sulfate contamination and protect the community's drinking water supply from further sulfate contamination.

The permit, known as an Aquifer Protection Permit (APP), protects groundwater in the area by requiring Phelps Dodge to employ pollution controls at three principal drainage areas at the mine; at discharging facilities in the mill area and tailings impoundments; and at wash stations used to clean mine haulage trucks and other vehicles.

The new permit also establishes a maximum allowable limit of 250 **p**arts-**p**er-**m**illion (ppm) for sulfate in drinking water affected by the mine's operations, the most stringent sulfate level that ADEQ has ever included in a permit.

Elevated sulfate levels attributable to the Phelps Dodge mine have been identified in groundwater samples collected from wells. Although sulfate is considered "non-hazardous" under federal and state law, ingestion of water containing levels of sulfate exceeding 250 ppm can cause diarrhea and other heath problems.

The Consent Order between ADEQ and Phelps Dodge represents the first time that ADEQ has ever used its authority under WQARF to require a party to deal with contamination caused by a "non-hazardous" substance such as sulfate.

The Order requires Phelps Dodge to characterize and mitigate the sulfate plume, conduct an inventory of wells in the area and ensure that drinking water provided to area residents meets all applicable drinking water standards, including the 250 ppm sulfate limit established in the permit.

The Consent Order also requires Phelps Dodge to conduct quarterly water quality sampling and establish a Community Advisory Group to keep community members informed.

Last year, the Community Water Co. of Green Valley was forced to close two drinking-water wells after sulfates in the wells rose to above 500 ppm. Phelps Dodge subsequently provided temporary replacement wells and paid $8 million toward building new, permanent replacement wells.

ADEQ will hold a public hearing concerning the the revised draft APP in the Green Valley area on July 27.

For info: Eric Wilson, ADEQ, 602/771-4663; website: www.azdeq.gov

DESAL PROGRAM CA

The California Department of Water Resources (CDWR) Staff is recommending that 23 desalination projects be awarded $21.5 million from the State's Proposition 50 funds.

The grants will be used by local agencies, water districts, academic and research institutions for construction, demonstration projects, research and development, and feasibility studies to increase new water supplies using water desalination technologies.

The projects recommended for funding include desalination facilities in the San Francisco Bay Area and in

WATER BRIEFS

Monterey and Ventura counties. Pilot projects in Long Beach, Los Angeles, Contra Costa County, Kern County, and Imperial County are among those nominated to receive funds. Research activities at Lawrence Livermore National Laboratory, UCLA, and Colorado School of Mines are included in the proposed awards, as are feasibility studies by agencies in San Luis Obispo and San Diego counties.

Funding for the projects is available through Proposition 50—the Water Security, Clean Drinking Water, Coastal and Beach Protection Act (2002). Proposition 50 authorized CDWR to administer a $50 million desalination grant program. The grant program aims to assist local public agencies with the development of new local potable water supplies through the construction of feasible brackish water and ocean water desalination projects and help advance water desalination technology.

In March 2006, CDWR received 49 eligible applications. The total funds requested by these applications amount to approximately $57.5 million while the total cost of the 49 proposed projects is $543.5 million. The available $21.5 million under this second desalination grant cycle is proposed to fund 23 of these projects. Approximately $11.2 million of the available funds will support ocean and bay water desalination related projects and $10.3 million will support brackish water desalination related projects. The term "brackish" describes water with a high salinity level, found in some surface and groundwater supplies.

A Desalination Review Panel comprised of members representing local, State, and federal agencies and other stakeholders, evaluated the proposals using the criteria established for the grant program.

A complete list of the awarded projects and other related information is at: www.owue.water.ca.gov/recycle/index.cfm.

For info: Fawzi Karajeh, CDWR Office of Water Use Efficiency and Transfers, 916/ 651-9669

DESAL PROGRAM US

Sandia National Laboratories researchers Pat Brady and Tom Hinkebein are putting the final touches on an updated "*Desalination and Water Purification Roadmap*" (*Roadmap 2*).

Roadmap 2 outlines the future of desalination in the US. The first roadmap, which identified overall goals and areas of desalination research, was submitted to Congress in 2003.

Brady expects *Roadmap 2* to be completed shortly, and the Joint Water Reuse and Desalination Task Force will then submit it to the Senate Energy and Water Development Appropriations Subcommittee and eventually the water user and research communities. The task force consists of the Bureau of Reclamation, the WaterReuse Foundation, the American Water Works Association Research Foundation and Sandia National Laboratories.

Roadmap 2 will recommend specific areas of potential water desalination research and development to solve water shortage problems.

"Population growth in the US is expected to increase 13.6 percent per decade [over the next two decades]," says Hinkebein, manager of Sandia's Geochemistry Department and head of Sandia's Advanced Concepts Desalination Group. "There will be 29 percent more of us in 20 years. Put that together with an unequal distribution of people—more moving to Texas, California, Arizona and New Mexico where fresh water is limited—and it is easy to see we are facing a challenging water future."

Only 0.5 percent of Earth's water is directly suitable for human consumption. The rest is composed of saltwater or locked up in glaciers and icecaps. As the world's population grows, the increased water demand will have to come from someplace. Brackish water seems to be a natural source, according to Hinkebein.

Roadmap 2 will outline the specific research needed in high-impact areas to create more fresh water from currently undrinkable brackish water, from seawater, and from wastewater. It will ensure that different organizations are not duplicating research.

Water desalination is not a new concept. In the US, the largest plants are in El Paso and Tampa. It is also commonplace in other parts of the world. Except for the Middle East, most desalination is done through reverse osmosis.

Brady says 43 research areas have been tentatively identified and some projects are already underway, jump started with $2 million made available for the preliminary research through a matching grant from the California Department of Water Resources. California provided $1 million and members of the Joint Water Reuse and Desalination Task Force each contributed $250,000.

Another $4 million in fiscal years 2004, 2005 and 2006 through federal Energy and Water Development Appropriations bills secured by Domenici has also funded desalination research at Sandia.

"The task force will decide which of the 43 projects get to the top of the research pile," Brady says. "As more money is made available, universities, research groups, national laboratories and private companies will bid on projects."

RESEARCH AREAS IN *Roadmap 2* INCLUDE:

- Membrane technologies (mainly reverse osmosis) that desalinate and purify water by pushing it through a semipermeable membrane that removes contaminants
- Alternative technologies that take advantage of nontraditional methods
- Concentrate management technologies that consider the disposal and/or beneficial use of desalination waste streams
- Reuse/recycling technologies that look at ways membrane and alternative technologies can be used to more efficiently recycle water

Much of the research could be conducted at the soon-to-be-completed Tularosa Basin National Desalination Research Facility in Alamogordo.

For info: Chris Burroughs, DOE/ Sandia National Laboratories, 505/ 844-0948 or email: coburro@sandia.gov

CALENDAR

July 14 — OR
Ocean Renewable Energy Conference. Newport. Oregon Science and Technology Partnership Event. For info: Partnership website: www.ostpartnership.org or email Kristen at Kristen@ostpartnership.org.

July 14 — WY
2005 Summer Water Resources Tour, Lander. Sponsored by the Wyoming Water Association. For info: John Shields, WWA, 307/ 631-0299, email: wwa@wyoming.com, or website www.wyomingwater.org

July 18-20 — NM
Increasing Freshwater Supplies - UCOWR/NIWR Annual Conference, Santa Fe. For info: UCOWR, 618/ 536-7571, email: ucowr@siu.edu or website: www.ucowr.siu.edu/

July 19-21 — CO
Western States Water Council 151st Meeting, Breckenridge, Beaver Run Resort & Conference Center. For info: Tony Willardson, WSWC Associate Director, 801/ 561-5300, email: twillards@wswc.state.ut.us, or website: www.westgov.org/wswc/meetings.html

July 20-22 — NM
Rocky Mountain Mineral Law Institute 52nd Annual, Santa Fe. For info: RMMLF, 303/ 321-8100, email: info@rmmlf.org, or website: www.rmmlf.org

July 22-26 — CO
Soil and Water Conservation Society 2006 Environmental Management Conference, Keystone, Keystone Resort. RE: Current Issues in Natural Resource Management & Planning. For info: SWCS, 515/ 289-2331, or website: www.swcs.org/en/swcs_international_conferences/2006_international_conference/

July 24-26 — CO
Colorado Water Conservation Board and RICD Meeting, Durango. For info: Dena Crist, CWCB, 303/ 866-2599, or website: http://cwcb.state.co.us/

July 24-27 — CO
StormCon 2006, NPDES Phase II Training, Denver. All Aspects of Stormwater Management for Municipalities, Consultants, Highway and Construction Contractors, Developers, Regulated Industries, and Special Sites. More than 140 Presentations by the Nation's Leading Stormwater Professionals. For info: Scott Nania, StormCon, 805/ 682.1300 or website: www.stormcon.com

July 25 — OR
Emiment Domain: Legal Update, Portland. For info: National Business Institute, 800/ 930-6182 or website: www.nbi-sems.com

July 26-28 — CO
31st Water Workshop: The Developed Resource, Gunnison, Western State College of Colorado. For info: George Sibley, 970/ 943-2055, email: gsibley@western.edu, or website: www.western.edu/water/

July 26-28 — UT
Western Water Seminar (National Water Resources Association), Park City, Park City Mariott. For info: NWRA website: www.nwra.org/

July 28 — HI
NEPA & EIS Workshop: New Developments, Cultural Assessments, Recent Litigation, Honolulu, Waikiki Beach Marriott Resort & Spa. For info: Law Seminars International, 800/ 854-8009, website: www.lawseminars.com/seminars/06SEPAHI.php

July 31–August 1 — WA
Designated Uses and Use Attainability Analyses, Public Meeting, Seattle, Sheraton Seattle Hotel, 1400 Sixth Avenue. The Water Environment Federation and EPA Cosponsored. Educating the Public on Current Water Quality Standards Regulations, Policy, and Practices Related to Designated Uses and Use Attainability Analyses. For info: Pat Harrigan, EPA, 202/ 566.1666 or email: harrigan.patricia@epa.gov

August 1 — CO
CAFO Rule Revision Meeting, Denver. RE: NPDES permitting requirements (Section 122) and Effluent Limitations Guidelines (Section 412). See Water Brief, this TWR. For info: Kawana Cohen, EPA, 202/ 564-2345, email: cohen.kawana@epa.gov; EPA website: www.epa.gov/npdes/afo/revisedrule

August 2 — TX
CAFO Rule Revision Meeting, Dallas. RE: NPDES permitting requirements (Section 122) and Effluent Limitations Guidelines (Section 412). See Water Brief, this TWR. For info: Kawana Cohen, EPA, 202/ 564-2345, email: cohen.kawana@epa.gov; EPA website: www.epa.gov/npdes/afo/revisedrule

August 3 — CA
CAFO Rule Revision Meeting, Sacramento. RE: NPDES permitting requirements (Section 122) and Effluent Limitations Guidelines (Section 412). See Water Brief, this TWR. For info: Kawana Cohen, EPA, 202/ 564-2345, email: cohen.kawana@epa.gov; EPA website: www.epa.gov/npdes/afo/revisedrule

August 6-11 — WI
International Conference on Mercury as a Global Pollutant, Madison, Monona Terrace Community and Convention Center Scientific Advances Concerning Environmental Mercury Pollution. For info: James Hurley, 608-262/ 0905 Fax: 608-262-0591 or website: http://www.mercury2006.org/

August 7-8 — NM
New Mexico Water Law, Santa Fe, The Eldorado Hotel. For info: CLE Int'l, 800/ 873-7130, email: registrar@cle.com, or website: www.cle.com

August 10-11 — AZ
Arizona Water Law, Phoenix, Biltmore Resort & Spa. For info: CLE Int'l, 800/ 873-7130, email: registrar@cle.com, or website: www.cle.com

August 10-11 — CO
Eminent Domain, Denver. For info: CLE Int'l, 800/ 873-7130, email: registrar@cle.com, or website: www.cle.com

August 10-11 — OR
Oregon Water Resources Commission Meeting, Bandon. For info: Cindy Smith (OWRD), 503/ 986-0876, website: www.wrd.state.or.us/commission/index/shtml

August 10-11 — OR
Oregon Environmental Quality Commission Meeting, Location TBA. For info: Cat Skaar, ODEQ, 503/ 229-5301, or website: www.deq.state.or.us/about/eqc/EQCagendas.htm

August 10-11 — WA
Renewables and Energy Efficiency Conference, Seattle, Renaissance Seattle Hotel. For info: Law Seminars Int'l, 800/ 854-8009, or website: www.lawseminars.com/seminars/06RENUWA.php

August 11 — OR
"New Directions for Oregon Water Quality" Seminar, Portland, World Trade Center. RE: Recent Legal & Regulatory Changes, Impacts on Operation & Development Activities. For info: The Seminar Group, 800/ 574-4852, email: registrar@theseminargroup.net, or website: www.TheSeminarGroup.net

August 14-15 — AZ
EPA Workshop: Stormwater Program Managers, Phoenix. RE: NPDES Phase II Stormwater Requirements, Illicit Discharge Detection & Elimination, Post-Construction Runoff Controls, Construction Management, Public Education & Involvement. For info: Bob Faxon, City of Prescott, 928/ 777-1126, email: bob.faxon@cityofprescott.net, or EPA Office of Wastewater Management's website: http://cfpub2.epa.gov/npdes/outreach/calendar.cfm?program_id=0&outreach_id=200&schedule_id=92

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August 15-16 TX

2006 Public Drinking Water Conference, Austin, Doubletree Hotel. Sponsored by the Texas Commission on Environmental Quality. For info: TCEQ, 512/ 239-1000, website: www.tceq.state.tx.us/permitting/water_supply/pdw/conference.html

August 15-17 NM

Natural Attenuation for the Remediation of Contaminated Sites, Albuquerque. RE: Contaminant Transport & Attenuation, Solute Transport Models, Monitoring Programs, Graphic & Statistical Techniques, Negotiating Options, & Field Sampling. For info: National Ground water Association, website: https://info.ngwa.org/servicecenter/Meetings/Index.cfm#MT2

September 17-20 CA

California and the World Ocean Conference (CWO '06), Long Beach, Hyatt Regency. Agenda Includes Discussion of Implementing the California Ocean Protection Council's Strategic Plan. For info: Conf Organizers, 916/ 922-7032 or email: cwo02@completeconference.com or website: http://resources.ca.gov/ocean/cwo06/

August 19-22 TX

Second International Conference on Environmental Science & Technology, Houston, Wyndham Greenspoint Hotel. Sponsored by the American Academy of Sciences. For info: Jim Hong, 713/ 776-8846, Conference email: env-conference@AASci.org, or website: www.AASci.org/conference/env/2006/index.html

August 23-25 CO

Water in the Holy Land: Can We Learn From Water Planning in the Middle East? Colorado Water Congress Annual Meeting, Breckenridge, Great Divide Lodge. RE: Legislature & Water, New Technology (Desal), Drip Irrigation, Groundwater Augmentation, Regional Cooperation, Water Supply Update, Colorado River Reservoirs, & Water Quality in Water Transfers. For info: CWC, 303/ 837-0812, email: cwc@cowatercongress.org, or website: www.cowatercongress.org/summer_convention.htm

August 27 -29 OR

Environmental Council of the States (ECOS) Annual Conference, Portland, Benson Hotel. DEQ Hosts. More than 200 Environmental Regulators and Stakeholders Expected. Highlights Include Joint Meeting of the Environmental Health Forum and the Children's Health Workgroup; Local Government Forum; Remarks by Congressional Staff on Priority Environmental Issues and a Keynote Address by EPA Administrator Stephen L. Johnson. DEQ Director Hallock Completes Her Term as ECOS President at Conference. For info: Cat Skaar, DEQ, 503/ 229-5301 or ECOS website: www.ecos.org

August 28-31 MI

Wetlands 2006-Focus on the Great Lakes: Applying Scientific, Legal, and Management Tools to Restore Wetland and Watershed Functions, Traverse City, Grand Traverse Resort. RE: Annual Meeting of Association of State Wetland Managers. For info: Association of State Wetland Managers, email: laura@aswm.org or website: www.aswm.org/calendar/wetlands2006/wetlands2006.htm

September 7-8 MT

Agricultural Law, Billings. For info: The Seminar Group, 800/ 574-4852, email: registrar@theseminargroup.net, or website: www.TheSeminarGroup.net

September 10-14 NY

American Fisheries Society Annual Meeting, Lake Placid. For info: AFS website: www.fisheries.org/html/index.shtml

September 13 IL

Clean Water in the Midwest, Chicago, The Gleacher Center. For info: Law Seminars Int'l, 800/ 854-8009, website: www.lawseminars.com/seminars/06CLIL.php

September 13-16 AZ

Water & Water Science in the Southwest: Past, Present & Future, Arizona Hydrological Society 19th Annual Symposium, Glendale. RE: Runoff Impacts, Recharge, Subsidence, Groundwater Remediation, Monitored Natural Attenuation, Emerging Contaminants, Modeling and GIS, Tribal issues, Colorado River Issues, Privatization, Mining & Energy Development Hydrology, Glen Canyon/Grand Canyon Issues, Delivery/Distribution of Water Supply, Climate Change & More. For info: Christie O'Day, AHS, 480/ 894-5477, or AHS website: www.azhydrosoc.org

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