



The Water Report™

Water Rights, Water Quality & Water Solutions in the West

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& More!

INDIAN WATER RIGHTS

THE ERA OF SETTLEMENTS

by Jeanne S. Whiteing
Whiteing & Smith (Boulder, CO)

INTRODUCTION

This year, 2008, is the 100th anniversary of the Winters Doctrine. One hundred years ago, the seminal Indian water rights case, *Winters v. United States*, 207 U.S. 564 (1908), established the defining principles of Indian reserved water rights which continue to govern Indian water rights today. Under the Winters Doctrine, Indian tribes possess significant rights to water as of the date the reservation was established, that are not lost even if they are not used.

Surprisingly, few reservations have been quantified by court decree in the one hundred years since the *Winters* case was decided. With the exception of a few early decrees — e.g. 1910 Kent Decree (Salt River), 1935 Globe Equity Decree (Gila River and San Carlos), *United States v. Walker River Irrig. Dist.*, 104 F.2d 334 (1939) (Walker River) and the 1944 Orr Ditch Decree (Pyramid Lake) — the first modern adjudication under the Winters Doctrine was *Arizona v. California*, 373 U.S. 546 (1963), which quantified the water rights of five tribes on the main stem of the Colorado River. The case established the most significant and widely applied quantification standard — **practicably irrigable acreage** (PIA). Only two reservations appear to have been adjudicated since that time, the Wind River Reservation (in Wyoming) and the Mescalero Apache Reservation (in New Mexico). *In re the General Adjudication of All right to use Water in the Big Horn System*, 753 P.2d 76 (Wyo. 1988), aff'd by an equally divided court, *Wyoming v. U.S.*, 492 U.S. 406 (1989); *State of New Mexico ex rel. Martinez v. Lewis*, 861 P.2d 235 (N.M. Ct. App. 1993).

On the other hand, since 1978 there have been twenty Indian water settlements enacted by Congress, and at least two others that did not require congressional approval: Fort Peck (1985) and Warm Springs (1997). The first settlement was the Ak-Chin settlement in 1978. The three most recent settlements are Zuni Heaven in Arizona (2003), Gila River (2003) and Nez Perce (2004). There are an additional nine settlements that are reportedly completed and ready to be introduced in Congress. This article will explore the reasons why settlements are the preferred method for resolving Indian water rights, describe the negotiation process, the various terms of settlements and the prospects for future settlements.

PREFERENCE for SETTLEMENT

One of the most fundamental principles of Indian law since the adoption of the US Constitution is that Indian property rights are fundamentally matters of federal law, subject to the exclusive jurisdiction of the federal courts. As one of the most significant property rights of Indian tribes, Indian water rights are no different. However, the 1952 McCarran

Tribal Water Settlements

McCarran Amendment

Jurisdiction

Litigate or Negotiate

Amendment, 43 U.S.C. 666, changed this fundamental principle, at least insofar as adjudicatory jurisdiction over Indian water rights is concerned. The McCarran Amendment permitted the United States to be joined as a defendant in *state* court proceedings to adjudicate water rights in river systems.

The meaning of the McCarran Amendment, insofar as Indian water rights are concerned, was not fully determined until 1983 when the US Supreme Court in *Arizona v. San Carlos Apache*, 463 U.S. 545 (1983), interpreted the McCarran Amendment as allowing state courts to exercise jurisdiction to determine Indian water rights in "general stream adjudications" (i.e. an adjudication which determines all the water rights in a river system). The Supreme Court concluded that although the federal courts also have jurisdiction, the state court proceedings were entitled to deference given the policy of the McCarran Amendment and the policy against piecemeal or duplicative adjudications. The disclaimers of jurisdiction over Indians and Indian property in state enabling acts were held to be overridden by the McCarran Amendment. Further, the sovereign immunity of the tribes was held not to preclude state court jurisdiction because the McCarran Amendment "waive[d] sovereign immunity with regard to the Indian rights at issue," and a judgment against the United States would be binding on the tribes. *Id.* at 566, n.17.

The 1983 *Arizona v. San Carlos Apache Tribe* case represents the clear beginning of the era of Indian water rights settlements. Because Indian tribes historically have viewed state courts as hostile to Indian rights, *Arizona v. San Carlos* marks the turning point for many tribes in their decisions to litigate or negotiate their water rights. Rather than commit the determination of their significant water rights to state courts in an adjudication process, most tribes have opted to enter into negotiated settlements to resolve their rights. Moreover, it has become increasingly clear that there are significant benefits to settlement over litigation, and this has also influenced tribal decisions to enter into settlement negotiation.

Federal and State Indian Reservations

(see website: www.uoregon.edu/~pchamber/indianaffairs_files)



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Tribal Water Settlements

Litigation Limits

Settlement Flexibility

Tribal Use

Broader Resolution

Settlement Benefits

First, the negotiation process is seen as a more flexible, broad-based process. Negotiation allows the parties to reach agreements on wide-ranging disputes and problems based on circumstances and practicalities, rather than the more restrictive standards that would be applied by the courts. Appropriate alternatives and creative solutions that allow the parties to reach an accommodation between federal reserved water rights and state water rights (primarily private rights) can be assessed and included in a settlement in a manner that would not be possible in litigation. Alternatives such as: the development of additional water supplies; use of existing unused water supplies; deferral agreements; exchange agreements; and other such options can be utilized in settlements in order to provide for the determination of tribal rights while also ameliorating impacts to existing water users.

Second, the parties are also able to resolve issues that would not be resolved otherwise in the adjudication process. Some of these issues include: administrative jurisdiction and administration standards; water marketing; and protection of cultural resources. While these are issues that likely would be resolved over time as water rights are implemented and used, they would not necessarily be resolved as part of a general stream adjudication.

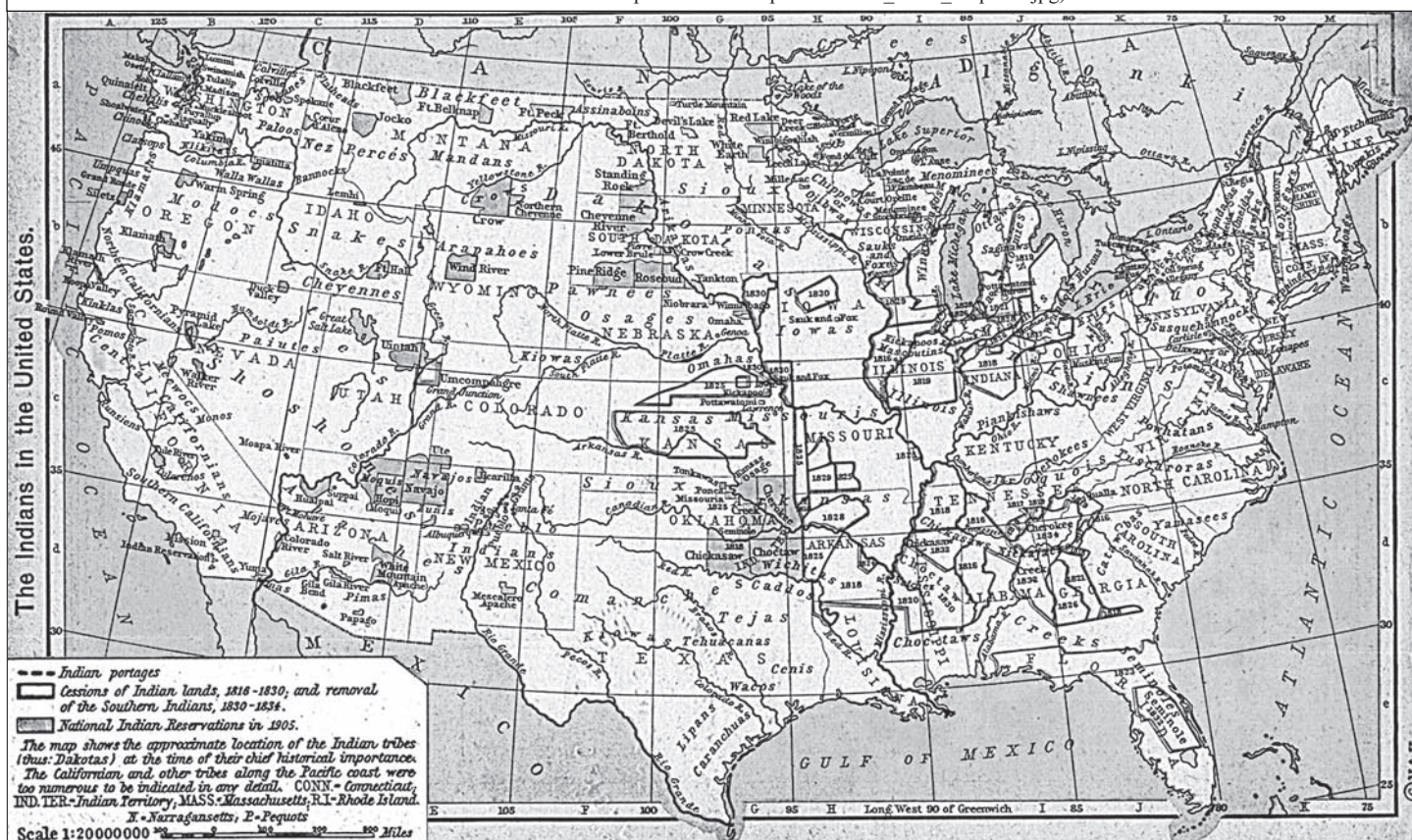
Third, settlements provide the means for tribes to employ their water rights in an expanded fashion. Federal contributions to settlement, as well as state and local contributions, can provide funding for new projects, rehabilitation of existing projects, construction of community water systems, as well as other water-related projects and economic development projects. While water development throughout the West has largely been subsidized by the federal government, Indian reservations have largely been bypassed. Settlements can help to correct that inequity.

Fourth, settlements can provide the means to resolve larger concerns, such as: endangered species issues; other fish and wildlife issues; water quality issues; and local and regional water supply issues.

For these reasons, settlements are now the primary means by which Indian water rights are resolved. Given the conservative nature of the courts and the prospect of increasingly restrictive legal standards that may be applied by the courts in adjudications, it is unlikely tribes will turn to litigation of their reserved water rights at any time in the near future. Nevertheless, there are a number of impediments to settlements that are now making it increasingly more difficult to reach a final congressionally approved settlement.

Indian Lands: 1816-1905

(see The Historical Atlas by William R. Shepherd, 1923: located in the University of Texas at Austin, Perry-Castañeda Library Map Collection
website: www.lib.utexas.edu/maps/historical/shepherd/indians_states_shepherd.jpg)



THE NEGOTIATION PROCESS

Tribal Water Settlements

Montana Approach

The Parties

The tribes and the Federal Government are parties to every negotiation. The state parties may be represented by the state itself, usually through the office of the state attorney general, or by the water users individually or through a loose coalition. State interests may also be represented through a combination of state officials and individuals. Montana is unique among the states in that it has indicated its intent to negotiate rather than litigate federal reserved water rights (see MCA 85-2-701) by establishing the Montana Reserved Water Rights Compact Commission specifically to negotiate water rights compacts with Indian tribes and with federal entities (MCA 2-15-212).

Federal Participation

Since 1989, it has been the policy of the Executive Branch of the federal government (Administration) to resolve Indian water rights through settlement rather than litigation. In 1990, the US Department of the Interior (Interior) published criteria and guidelines for federal participation in Indian water rights negotiations. *Criteria and Procedures for the Participation of the Federal Government in Negotiations for the Settlement of Indian Water Rights Claims*, 55 Fed. Reg. 9223 (March 12, 1990). Interior engages in negotiations through Federal Negotiation Teams made up of representatives of Interior agencies and bureaus that are relevant to the particular negotiation, along with a US Solicitor's representative and a US Department of Justice attorney. Agencies in federal Departments other than Interior (e.g. US Forest Service) may also participate, depending on the issues in the negotiations.

Federal Criteria

Procedure

Under the criteria and procedures, the Administration acknowledges the United States' trust responsibility to tribes in relation to their water rights, and establishes federal procedures for the negotiations. These procedures include four phases: 1) fact-finding; 2) assessment and recommendations; 3) briefings and negotiating position; and 4) the actual negotiations. The criteria establish that the Federal Government expects to resolve not only the specific quantity and priority of Indian water rights, but all water related claims, including claims by a tribe against the United States and claims by the United States and a tribe against third parties.

Monetary Component

The criteria otherwise primarily address the monetary components of a settlement. The federal contribution is not to exceed the calculable legal exposure of the Federal Government plus the costs related to Federal trust or programmatic responsibilities. State and local contributions are required in proportion to the benefits received by the non-Federal parties.

Notwithstanding the fairly detailed criteria and procedures guiding federal involvement in negotiations, the Administration has supported few settlements when they reach Congress. This appears to be the result of both the substance of the criteria and procedures, and the manner in which they are applied.

FACTORS INFLUENCING THE ADMINISTRATION POSITION BEFORE CONGRESS INCLUDE:

Authority Limits

TEAM AUTHORITY LIMITS: The Federal Teams are not given authority to take positions in the negotiation process and often are mere observers to the process. Therefore, the full resources of the United States are not brought to the table to resolve issues and problems. This is true even if the problems involved are the result of the actions or inactions of the Federal Government, which is frequently the case. A federal position is often not taken until the end of the process.

State Contribution

STATE AND LOCAL CONTRIBUTION CONCERNS: The state and local contribution to settlement is often determined to be inadequate or lacking under the criteria and procedures, and this serves as a frequent basis for objection by the Administration. Such contributions vary widely particularly from state to state, and are sometimes questioned by states where the issues involved are primarily federal issues.

Liability Impediment

LIABILITY CONCERNS: The legal liability approach to federal contributions is the most significant impediment to settlements (i.e. the calculable legal exposure of the Federal Government). The requirement prevents consideration of reasonable and practical solutions that may exceed the Government's legal liability. The failure to meet the legal liability standard is the primary reason that the Administration objects to settlements before Congress. Even though the criteria and procedures also allow costs related to Federal Trust or programmatic responsibilities, the Administration has focused more recently almost exclusively on legal liability to justify all costs. This is especially the case with some of the pending settlements, and appears to be a reaction to the recent passage of some large settlements, even though those settlements were supported by the Administration.

Significantly, the Administration does not apply the criteria and procedures to all settlements. Particularly where the Administration is politically invested in a particular settlement, the Administration appears willing to overlook the requirements of the criteria and procedures. For example, the criteria and procedures do not appear to have been applied to the Gila River and Nez Perce settlements. There were

Tribal Water Settlements**Administration Inconsistency**

other issues that were resolved in those settlements, i.e. CAP repayment and ESA issues respectively, but the tribal provisions were not subjected to the criteria and procedures. This inconsistency has led some tribes to avoid the federal process altogether.

Fortunately, tribes, states and other parties to the settlements have fared better in Congress than before the Administration. As mentioned earlier, there are now twenty settlements that have been enacted by Congress. For this reason, it is likely that the focus will remain on settlement rather than litigation of water rights.

SETTLEMENT PROVISIONS

Legislation approving Indian water settlements varies widely, but some basic elements appear in most settlement legislation.

Approval of the Settlement**Approval Process**

The fundamental aspect of all Indian water rights settlements is the quantification of the tribe's water rights. This quantification is sometimes set forth in the settlement legislation enacted during the Congressional approval process. More often, however, this quantification exists as a separate settlement agreement which is approved in the settlement legislation. The underlying agreement usually includes not only the substantive provisions concerning the quantification of the tribe's water rights, but also other unique terms of the settlement. By approving the agreement, the legislation approves each of the specific terms of the agreement. However, some settlement terms need specific congressional authorization to implement them, and that authorization must be included in the legislation approving the settlement.

The approval of the underlying agreement also typically directs the Secretary of the Interior to sign the agreement. Because settlements are frequently opposed by the Administration for the reasons described above, the United States usually has not signed the settlement agreement at the point it is presented to Congress. The legislation provides the authorization for the Secretary of the Interior to sign the settlement as a party.

Federal Contributions**Federal Appropriations**

Settlement legislation also authorizes federal contributions to the settlement. While the exact amount of the federal contributions in existing settlements is often difficult to pin down exactly, appropriations in settlements have ranged from a high of \$200 million in the Gila River settlement to much smaller amounts. The Arizona Water Settlements Act, of which the Gila River settlement was a part, was in the \$900 million range. Federal contributions are usually appropriated over a period of years, requiring the parties to ensure that the amounts are appropriated each year.

Authorized Uses

Federal contributions are typically appropriated to a tribal fund established by the legislation.

Authorized uses of the fund are spelled out in the legislation in either broad or narrow terms. Authorized purposes may include tribal governmental or economic development purposes and water or water-related project purposes. Most recently the emphasis has been on funding specific water projects.

Water Projects

Settlements have involved the construction of new water facilities, for example, the Animas-LaPlata Project, which is a central feature of the Colorado Ute Settlement, or the enlargement of existing facilities, such as the enlargement of the Tongue River Dam, which is the central feature in the Northern Cheyenne Settlement. Many settlements also include the rehabilitation of existing facilities, usually US Bureau of Indian Affairs (BIA) irrigation project facilities, many of which serve both Indians and non-Indians. Funds for such projects may be appropriated directly to the tribal fund, or may be appropriated through BIA or the US Bureau of Reclamation (Reclamation).

Larger Benefits

Some settlements provide benefits to states or non-Indians, or resolve larger related issues that require federal funding as well. Thus, the total cost of a settlement may be many times the cost of the Indian settlement. The recent Arizona Water Settlements Act included settlement provisions for three tribes, as well as provisions concerning repayment issues relating to the Central Arizona Project as between the Central Arizona Water Conservation District and the United States. The recent Nez Perce settlement in Idaho resolved difficult Endangered Species Act issues. The Rocky Boys settlement provided the means to study and provide solutions to resolve regional water supply problems in Montana.

Use of Water Supplies from Existing Facilities**Federal Facilities**

Existing water supplies from federal facilities are also frequently utilized for settlement purposes. Central Arizona Project water serves as the basis for several Arizona settlements. The use of storage space in federal facilities in the Fort Hall Settlement in Montana is an important aspect of that settlement. Water supplies from Reclamation facilities, such as the Big Horn Reservoir (Northern Cheyenne settlement) and Lake Elwell (Rocky Boys settlement) in Montana, frequently play a large part in settlements by providing alternative or additional water supplies. These uses require specific federal legislation authorization to change the use of the federal facility, and such authorizations are included in many settlements.

Tribal Water Settlements

Marketing Authorization

Restrictions

Off-Reservation Uses

Interior Approvals

Finality

Water Marketing

Nearly all settlements contain provisions relating to water marketing. The Federal Government takes the position that there is presently no existing legislative authorization for Indian water marketing. Therefore, this is one area where it is generally agreed that federal authorization in settlement legislation is required.

The circumstances and conditions relating to water marketing vary greatly from settlement to settlement. Some settlements place limitations on the quantity of water that can be marketed and the term of years. Other settlements limit water marketing to specific communities or within a certain geographic area. Several of the Arizona settlements restrict marketing to specified municipalities or within certain counties' Active Management Areas (see Staudenmaier, TWR #33). The Colorado Ute and Northern Ute settlements restrict water marketing to transfers within their respective states, unless certain conditions are established in the future. Other settlements limit the source of the water that can be marketed.

Many settlements require application of state water law, at least to tribal water marketing for off-reservation uses — including the conditions or limitations that may exist in state law. At least two settlements (Colorado Ute and Northern Ute) provide that water marketed off the reservation is treated as a state water right, except that the water right cannot be permanently alienated from tribal ownership (e.g. title to the water right passing permanently to non-tribal owners). The Idaho settlements (Fort Hall and Nez Perce) require that off-reservation marketing be done through state water bank procedures, and tribal water banks are set up for this purpose.

Many settlements require that water marketing arrangements must be approved by the Secretary of the Interior; others specifically provide that no further authorization is required. A few specifically provide that the federal Non-Intercourse Act, 25 U.S.C. 177, does not apply (Colorado Ute and Northern Ute). Section 177 of the Act prohibits any "purchase, grant, lease, or other conveyance of land, or of any title or claim thereto from any Indian Nation or tribe of Indians" without federal consent. By making section 177 inapplicable to water marketing, no federal consent is required.

Whatever conditions or limitations on marketing that have been agreed to by the parties are the conditions and limitations approved by settlement legislation. Specific deferral agreements and exchange agreements may also require Congressional approval under Department of the Interior policy.

Waiver and Release of Claims

Some of the most significant provisions of settlement legislation are the waivers and release of claims. In general, the waivers make clear that the water rights included in the settlements are in full satisfaction of the tribes' reserved water rights. The Administration is especially concerned that the settlements are final determinations of tribal water rights and that no additional claims to water will be brought by the tribes.

Because settlements often resolve tribal claims against the Federal Government, states or third parties, waivers of claims for damages, loss or injury to water rights, or the taking of water rights are often included. These waivers may be included as part of the congressional settlement approval legislation or may be authorized by such legislation. Such waivers usually do not take effect until the settlement has been entered as a decree, the funding authorized by the settlements has been appropriated or other necessary actions have been taken. More recently, the Administration has moved to make the waivers consistent from settlement to settlement.

FINALIZING SETTLEMENTS

Once a settlement is enacted by Congress, there are additional steps required to finalize a settlement. State legislative approval and/or tribal approval may still be required. In addition, the settlement still may not be final until all funds authorized by the settlement legislation are appropriated and other conditions of settlement are met.

All settlements must be submitted to the relevant court to be entered as a decree. Such procedures usually provide for an opportunity to object by non-parties to the settlement, and procedures for evaluating the settlement. At the end of the day, in most cases a water rights decree is issued confirming the water rights of the tribes as set out in the settlement. The decree is the ultimate mechanism for enforcing the water rights of the tribe.

PROSPECTS FOR FUTURE WATER SETTLEMENTS

While Indian water rights settlements have become the norm, the sheer number of settlements and the potential costs related to settlements means that the road to a final settlement has become more difficult. Although federal policy supports settlements over litigation, settlements have yet to be made a priority by the Administration. Federal budgetary issues have significantly tightened the manner in which the Administration reviews and assesses settlements, and no clear mechanism for funding Indian water rights settlements has been established. State and tribal interests have worked together to raise the priority of

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Tribal Water Settlements

Congressional Hearings

settlements within the Administration and the Congress, and to identify an appropriate funding mechanism. Those efforts continue.

Recently, the Subcommittee on Water and Power of the House Natural Resources Committee held an oversight hearing on Indian water rights settlements, focusing on issues relating to the federal process and funding. That effort may help to bring about some needed changes to both the process and funding issues in order to increase the prospects of congressional approval of settlements.

[Subcommittee on Water and Power (House of Representatives, Committee on Natural Resources) website: http://resourcescommittee.house.gov/index.php?option=com_frontpage&Itemid=62]

CONCLUSION

With nine settlements that are likely to come before Congress this year, 2008 may be a new turning point for Indian water rights settlements that will influence whether settlements continue to be the preferred method of resolving Indian water rights, or whether the parties will be forced to turn again to litigation.

FOR ADDITIONAL INFORMATION:

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LIST OF INDIAN WATER RIGHTS SETTLEMENTS

Arizona

Arizona Water Settlements Act of 2004 (Gila River, Tohono O'odham, San Carlos), Pub. L. 108-451, 118 Stat. 3478
Zuni Indian Tribe Water Rights Settlement Act of 2003 (Zuni Heaven), Pub. L. 108-34, 117 Stat. 782 (2003)
Yavapai-Prescott Indian Tribe Water Rights Settlement Act of 1994, Pub. L. 103-434, title I, 108 Stat. 4526, as amended, Pub. L. No. 104-91, § 201, 110 Stat. 7 (1996)
San Carlos Apache Tribe Water Rights Settlement Act of 1992, Pub. L. No. 102-575, title XXXVII, 106 Stat. 4600, as amended, Pub. L. 103-435, § 13, 108 Stat. 4566 (1994), as amended, Pub. L. 104-91, § 202, 110 Stat. 7 (1996), as amended, Pub. L. 104-261, 100 Stat. 3176 (1996), as amended, Pub. L. 105-18, § 5003, 111 Stat. 158 (1997)
Southern Arizona Water Rights Settlement Act of 1982 (Tohono O'odham), Pub. L. No. 97-293, title III, 96 Stat. 1261, as amended, Pub. L. No. 102-497, § 8, 106 Stat. 3255 (1992), as amended, Arizona Water Rights Settlement Act of 2004, Pub. L. 108-451, 118 Stat. 3478 (2004)
Salt River Pima-Maricopa Indian Community Water Rights Settlement Act of 1988, Pub. L. 100-512, 102 Stat. 2549, as amended, Pub. L. 102-238, 105 Stat. 1908 (1991)
Fort McDowell Indian Community Water Rights Settlement Act of 1990, Pub. L. 101-628, 104 Stat. 4469 (1990)
Ak-Chin Indian Community Act of 1978, Pub. L. 95-328, 92 Stat. 409, as amended, Pub. L. 98-530, 98 Stat. 2698 (1984), as amended, Pub. L. 102-497, § 10, 106 Stat. 3258 (1992), as amended, Pub. L. 106-285, 114 Stat. 878 (2000).

California

San Luis Rey Indian Water Rights Settlement Act (La Jolla, Rincon, San Pasquale, Pauma and Pala Bands of Mission Indians), Pub. L. 100-675, title I, 102 Stat. 4000 (1988), as amended, Pub. L. 102-154, 105 Stat. 990 (1991), as amended, Pub. L. 105-256, § 11, 112 Stat. 1896 (1998), as amended, Pub. L. 106-377, § 211, 114 Stat. 1441 (2000)

Colorado

Colorado Ute Indian Water Rights Settlement Act of 1988 (Southern Ute and Ute Mountain Ute), Pub. L. 100-585, 102 Stat. 2973, as amended, Pub. L. 104-46, 109 Stat. 402 (1995), as amended, Pub. L. 106-554, title III, 114 Stat. 2763 (2000)

Florida

Seminole Indian Land Claims Settlement Act of 1987, Pub. L. 100-228, § 7, 101 Stat. 1556 (1987)

Idaho

Snake River Water Rights Act of 2004, Pub. L. 108-447, 118 Stat. 2809 (2004) (Nez Perce Tribe)
Fort Hall Indian Water Rights Act of 1990, Pub. L. 101-602, 104 Stat. 3059 (1990)

Montana

Chippewa Cree Tribe of the Rocky Boy's Reservation Indian Reserved Water Rights Settlement and Water Supply Enhancement Act of 1999, Pub. L. 106-163, 113 Stat. 1778 (1999)
Northern Cheyenne Indian Reserved Water Rights Settlement Act of 1992, Pub. L. 102-374, 106 Stat. 1186, as amended, Pub. L. 103-263, §§ 1-1(a), 108 Stat. 707 (1992)
Fort Peck-Montana Compact, MCA 85-20-201 (1985) (Assiniboine and Sioux Tribes of the Fort Peck Reservation, Montana)

Nevada

Truckee-Carson-Pyramid Lake Water Rights Settlement Act of 1990, Pub. L. 101-618, Title II, 104 Stat. 3289 (1990)
Fallon Paiute Shoshone Indian Tribes Water Rights Settlement Act of 1990, Pub. L. 101-618, title I, 104 Stat. 3289, as amended, Pub. L. 109-221, § 104, 120 Stat. 336 (2006)

New Mexico

Jicarilla Apache Tribe Water Rights Settlement Act of 1992, Pub. L. 102-441, 106 Stat. 2237, as amended, Pub. L. 104-261, 110 Stat. 3176 (1996), as amended, Pub. L. 105-256, § 112 Stat. 1896 (1998)

Oregon

Confederated Tribes of the Warm Springs Reservation Water Rights Settlement Agreement (1997)

Utah

Shivwits Band of the Paiute Indian Tribe of Utah Water Rights Settlement Act of 2000, Pub. L. 106-263, 114 Stat. 737 (2000)
Ute Indian Water Rights Settlement Act of 1992, Pub. L. 102-575, title V, 106 Stat. 4600 (1992)

Reservoir Rehabilitation

Multi-Use Needs

Rio Grande Compact

Dam Construction

Outlet Works

MULTI-USE RESERVOIR ANALYSIS

RIO GRANDE RESERVOIR

by Matthew Bliss, CDM, Inc. (Denver, CO)

EDITORS' INTRODUCTION: Throughout the American West, communities continue to rely on aging water management infrastructure. This includes hundreds of dams and reservoirs built in the late 1800s and early 1900s to support farming, ranching, navigation, and flood control, as well as helping to supply a basic water supply for an ever-growing population. All these uses are by now entrenched. Thus, in addition to having to address daunting technical and engineering issues, dam rehabilitation must accommodate a wide range of stakeholders. It is also necessary to ensure that such projects avoid, or at least minimize, impacts to an already over-taxed environment.

On the other hand, the many benefits of dam and reservoir rehabilitation are very real and increasingly necessary. Moreover, the rehabilitation process presents an opportunity to further multi-stakeholder cooperation, enhance water resources planning capabilities, and greatly improve the safety and efficiency of our water use. In Colorado, one such project is continuing to make progress towards all these ends.

OVERVIEW

The San Luis Valley Irrigation District (District), located in southern Colorado's San Luis Valley, has contracted CDM, Inc. to undertake a study to examine potential uses and benefits of an enlarged or rehabilitated Rio Grande Reservoir (Reservoir) to address multi-use needs in the Rio Grande Basin. Located on the headwaters of the Rio Grande (River), the Reservoir provides a unique on-stream ability to manage Colorado's water allocation under the Rio Grande Compact ("Compact" — the multi-state agreement addressing River-water apportionment — Moon, TWR #13). Management options provided by this pre-Compact facility benefit residents of the San Luis Valley, the District, the State of Colorado, and Compact participants all along the River corridor (see "Benefits" section below).

The Reservoir is owned by the District and is situated in southern Colorado, approximately 30 miles southwest of Creede, Colorado. The dam sits on District owned land, but impounds water flowing over US Forest Service (USFS) land under an 1891 Right-of-Way. The primary use of the Reservoir is for storage of irrigation water. This water is applied to District lands in the San Luis Valley, approximately 70 miles downstream. Agreements with other entities, including the State of Colorado and the San Luis Valley Water Conservancy District, allow for storage of water for other purposes as well.

BACKGROUND

Construction of the dam began with the outlet tunnel, bored in 1909. The dam was completed in 1914. The dam is a large earth and rockfill dam, 111 feet high and approximately 600 feet wide along its center axis. The Reservoir has a storage capacity of 52,192 acre-feet (AF), with 20 feet of freeboard when at capacity (freeboard is the vertical distance from the maximum water level in a reservoir (i.e. spillway elevation) and the top of the dam - "dam crest"). The dam was constructed using a puddle-basin technique for the upstream earth-fill section, and dumped and hand-placed rock as the downstream rockfill section. (Puddle-basin is a dam construction technique, used primarily in the early 20th century (and possibly before) where impermeable layers or soil cells are constructed by creating small basins in the dam core, then adding water to make a clay mixture. A layer of un-puddled material is then built adjacent to the puddled material. This process is repeated as the dam is built up. The puddling of the clay creates a more impermeable layer than dry material would.) The left abutment of the dam rests largely on a landslide that originates from cliffs to the north. The right abutment rests on welded-tuff bedrock, through which the outlet tunnel is bored.

There have been issues with the outlet works since the Reservoir was first filled in 1914. Two of the five original gates were plugged with concrete due to severe operation-related vibrations. The remaining outlet structure was reinforced. These repairs sufficed, but deteriorated over time. By 1980, the gates had to be replaced due to the high amount of leakage. A series of partially successful repairs took place over the next two decades. However, currently the gates still leak, and are only partially operable. At certain release rates, a hydraulic jump develops in the outlet tunnel. This causes severe vibrations and pounding in the outlet tunnel which can be felt on the dam crest. Hydraulic jump occurs where water changes from a supercritical flow regime (high velocity, lower depth) to a subcritical flow regime (slower velocity, increased depth). In water, a hydraulic jump is associated with significant turbulence. This turbulence, along with the increased flow depth is what causes the vibrations and pounding within the outlet tunnel.

Reservoir Rehabilitation

Compact Obligations

Seepage

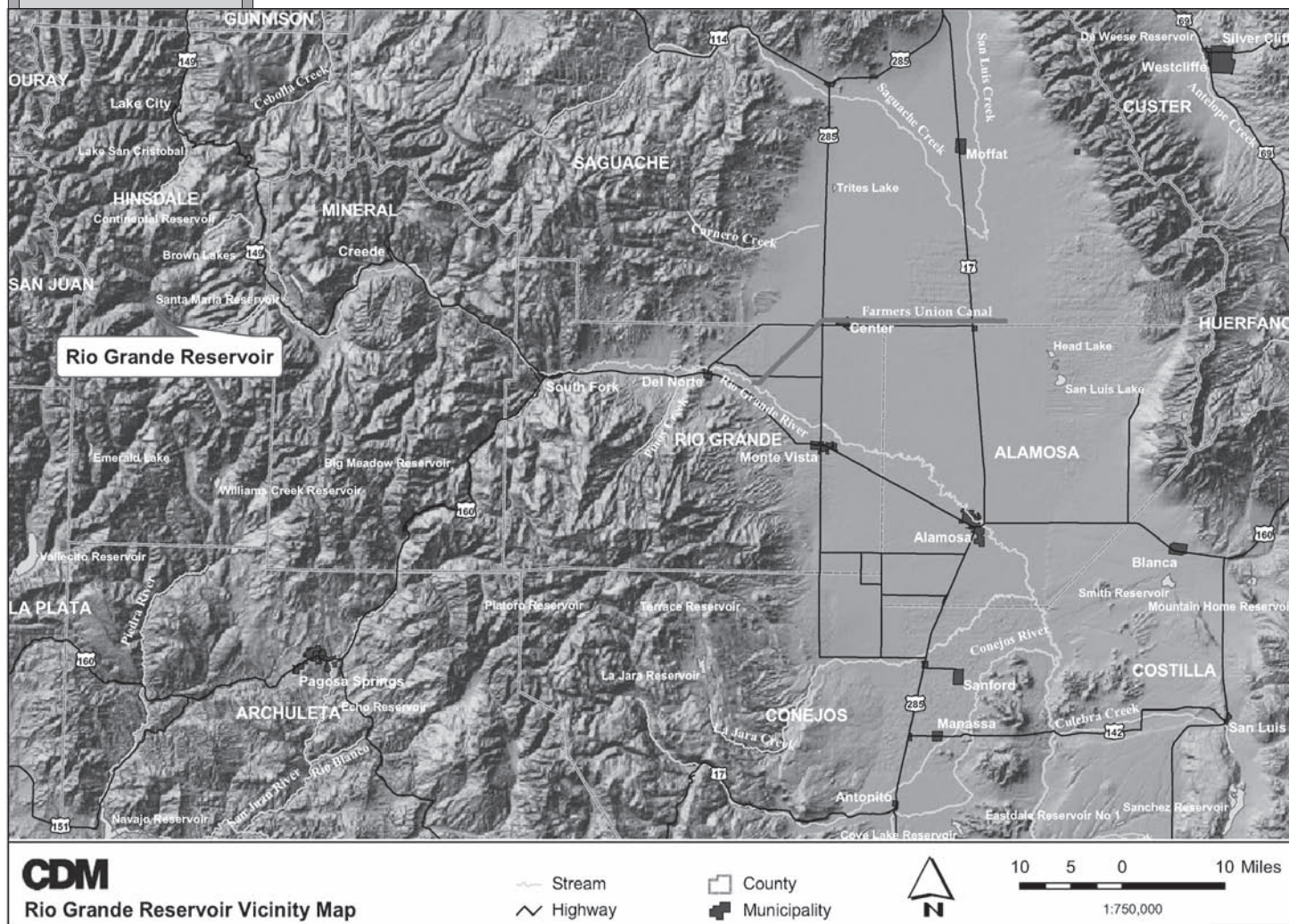
Fatal Flaw Analysis

The Reservoir is currently operated under a Memorandum of Understanding (MOU) with the Colorado State Engineer's Office. Due to ongoing structural problems, the MOU notes that releases above 1,200 cubic feet per second (cfs) are undesirable. However, in order to meet water right and Compact obligations, releases of up to 2,500 cfs may be required.

Seepage through the dam has also been an issue, with rates of up to 2,500 gallons per minute (gpm) during higher water levels in the Reservoir, a large portion of which seeps through the left abutment. [Editor's Note: 1 cfs = 448.83 gpm]. Toe drains were installed during repairs in the 1980's and horizontal drains were installed in the left abutment in the 1990s. However, these were not installed as deep into the abutment as designed due to the heterogeneous and blocky nature of the left abutment landslide material. (Toe drains are perforated pipes or other high-permeable material placed into the downstream side of the dam, near the base (toe). The toe drains are designed to increase dam stability by draining water from inside the dam so that it does not seep through the dam face.)

RESERVOIR STUDY OVERVIEW

The study analyzing Reservoir rehabilitation and enlargement options has to date been comprised of two phases. Phase I was a fatal flaw analysis that was completed in 2007. Fatal flaw analysis is a reconnaissance level examination of key issues with a project. Should the evaluation reveal that any of these key issues would preclude the project from occurring, that issue is considered a fatal flaw. The fatal flaw analysis looks to see if there are any such issues that would make the proposed project infeasible.



**Reservoir
Rehabilitation****Phase II****Additional
Storage**

Phase II of the study is currently underway and is examining several of the aspects recommended in Phase I, as well as providing preliminary design for the improvements to the dam. The Phase II report is expected to be complete by mid-year of 2008. The study is funded by a grant from the Colorado Water Conservation Board Water Supply Reserve Account. Geotechnical work was performed by Deere & Ault Consultants, Inc. of Longmont, Colorado, the wetlands investigation and biological assessment by Sugnet & Moore Environmental Engineers of Durango, Colorado, and legal and permitting analysis by Whiteing and Smith of Boulder, Colorado.

The geotechnical analysis in Phase I of the study determined that a ten-foot raise is the maximum recommended increase in water level. This would provide approximately 11,000 AF of additional storage at the Reservoir. Under the rehabilitation only option, it is expected that the Reservoir could be operated at more sustained and higher water levels than in the past through different operating practices designed to meet the multiple needs addressed in the study. Estimated cost of the enlargement is approximately \$36 million, while the rehabilitation only option is approximately \$22 million.

IDENTIFIED REHABILITATION/ENLARGEMENT BENEFITS

POTENTIAL BENEFITS OF AN ENLARGED OR REHABILITATED RESERVOIR INCLUDE:

Benefits

- Enhanced dam safety through reduction of seepage, new outlet works and increased emergency spillway capacity
- Providing additional storage space to assist the State of Colorado in administration and management of the Rio Grande under the 1938 Compact to maximize the beneficial use of Colorado's apportionment of the Compact for the benefit of the State, while still meeting Compact obligations (Compact available at the Colorado State Engineer's website: <http://water.state.co.us/wateradmin/compacts.asp>)
- Providing space for the storage and regulation of transmountain water to meet the growing demand for augmentation water for municipal, domestic, and commercial development [Editor's Note: "augmentation plans" are a way for junior appropriators to obtain water supplies through terms and conditions approved by a Colorado water court that protect senior water rights from the depletions caused by the new diversions.]
- Storage and regulation of already developed agricultural water supplies, including direct flow storage, to better meet irrigation demands
- Storage and regulation of high flows to more efficiently recharge the unconfined aquifer in the San Luis Valley
- Re-regulation of flows to better meet recreational and environmental needs, including enhanced instream flows for fish and river habitat
- Re-regulation of flows for flood protection
- Meet objectives outlined in the 2004 Statewide Water Supply Initiative (SWSI, Colorado Water Conservation Board)

PHASE I STUDY**Enlargement
Requirements**

The fatal flaw analysis of Phase I evaluated several key issues related to either enlargement or rehabilitation. The most important issues related to geotechnical issues, potential environmental impacts, and spillway capacity. The geotechnical investigation determined that a maximum ten-foot enlargement of the existing dam crest may be feasible. Such an enlargement would result in an additional 11,000 AF of storage at the Reservoir. Initial field work in the vicinity of the Reservoir indicated that the Reservoir basin may be prone to landslides — this issue was identified for further study in Phase II.

In order to enlarge the dam, significant rehabilitation will be required, including: replacement or major changes to the existing outlet works; lining the upstream dam face; and increasing the emergency spillway capacity. The Phase I report recommended a detailed geologic study and mapping of the area, as well as slope stability analyses on the dam and landslides in the Reservoir area, seepage analysis, and a hydrologic analysis to determine design flood inflows and spillway adequacy. Phase II of the report addresses these recommendations (see below).

Preliminary wetlands investigation performed in Phase I identified approximately 230 acres of wetlands in the vicinity of the Reservoir. However, given that only a ten-foot maximum increase in water level elevation is feasible, only about 10% of those wetlands would be impacted. A formal wetlands delineation was recommended for Phase II of the study.

PHASE II STUDY

Phase II of the study began in late 2007 and is currently underway. The Phase II findings are expected to be published in a report in mid-year of 2008. The following details Phase II findings to date.

Geology and Geotechnical Investigation

The geology of the area surrounding the Reservoir has been mapped through the work of a professional field geologist. Findings indicate that landslides near the Reservoir are mostly slow-moving and non-threatening. There is a larger block spread on the north rim of the Reservoir that is at risk of failure in the event of a larger earthquake. This area is adjacent to the landslide that forms the left abutment. More monitoring and investigation is recommended to assess the risk of failure of this slope. On July 30, 1991, a large, sudden and high-velocity landslide approximately five miles west and upstream of the Reservoir released approximately 10.5 million cubic yards of material to the West Lost Trail Creek valley below. A similar sudden release of material above the Reservoir, under the certain water level and location, and orientation of the slide could create large waves that would overtop the dam. The dam may not be overtopped if the slide happened at the upstream end, or if the resulting waves did not travel directly towards the dam (e.g. waves could head upstream or laterally rather than downstream). However, the geologic investigation concludes that the geology in the West Lost Creek Trail slide area is significantly different than in the Reservoir vicinity, making the probability of such a catastrophic slide low.

Slope stability analyses were performed on both the current dam, proposed enlarged dam and the surrounding rim. The dam meets or surpasses the minimum required factors of safety for both the existing and enlarged configurations. The block-spread slide identified in the geologic investigation as the greatest potential threat of a large catastrophic landslide was analyzed for stability using conservative assumptions. This analysis showed that water level in the Reservoir has little effect on the stability of the block slide, and only a major earthquake would remobilize the block.

Analysis of seepage through the dam and abutments was performed. Seepage through the dam and abutments is the most serious concern related to dam stability. Rates of up to 2,500 gpm have been recorded through the dam at high water levels. The seepage rate is generally 200 gpm below gage height 50 (about half-full), but increases rapidly once the water level increases. Seepage control is important to prevent piping failure and sliding failures of embankments and abutments. Although seepage appears to be controlled by drains under the existing Reservoir operations, a change in operation to a longer period of full storage could change the phreatic surface and make conditions worse. Phreatic surface is the water surface (aka water table), or under confined conditions it is the potentiometric surface. Phreatic surface is the level to which water would rise if not constrained by overlying material. It is a measure of water pressure within water-bearing strata (e.g. rock).

Preliminary design of seepage control includes a grout curtain through the foundation of the dam, jet grouting a portion of the left abutment, potential installation of a clay or synthetic liner over the upstream dam face and a shotcrete liner in the intake tunnel. Grout curtains are thin, vertical, grout walls installed in the ground. They are constructed by pressure-injecting grout directly into the soil at closely spaced intervals. The spacing is selected so that each "pillar" of grout intersects the next, thus forming a continuous wall or curtain. Grout is injected with grouting jets, which use a high-pressure fluid stream (i.e., slurry or water) to erode a cavity in the soil. Shotcrete liner is a lining of a concrete-like material that is applied by spraying it onto the receiving surface. This is how the inlet tunnel, which is currently bored into fracture bedrock, would be sealed.

The jet grouting increases the seepage path through the left abutment, reducing the potential for piping. Lining the intake tunnel with shotcrete will eliminate any short-circuits where water currently may be escaping the tunnel through fractures and entering the dam in the rock-fill portion, bypassing the more impermeable earth-fill section entirely. These options will be examined in greater detail and may be modified during the final design.

Wetlands

Delineation of wetlands in the Reservoir area in accordance with US Army Corps of Engineers guidelines has been completed. Delineation was done for any wetlands falling above the current ordinary high water line (OHWL) and the proposed OHWL with a ten-foot raise in the water level. The delineation identified 24.9 acres of potentially impacted wetlands along with the potential to protect 10.3 acres of these wetlands by future Reservoir operations. Since the Reservoir is rarely filled to capacity, the shorter duration of inundation may not impact wetlands as would a continuous inundation. An example of this discovered through the investigation involves a bog below the current OHWL that has survived periodic inundation over the life of the Reservoir (>90 years). Areas in the upper reaches of the Reservoir may be inundated infrequently, as the Reservoir would have to fill beyond its current 52,500 acre-feet of storage to impact wetlands. A wetlands mitigation assessment report and biological assessment have been completed.

Reservoir Rehabilitation**Landslides****Slope Stability****Seepage Concerns****Seepage Control****Wetlands Analysis**

Reservoir Rehabilitation

Release Flexibility

Outlet Capacity

Flood Modeling

Outlet Works

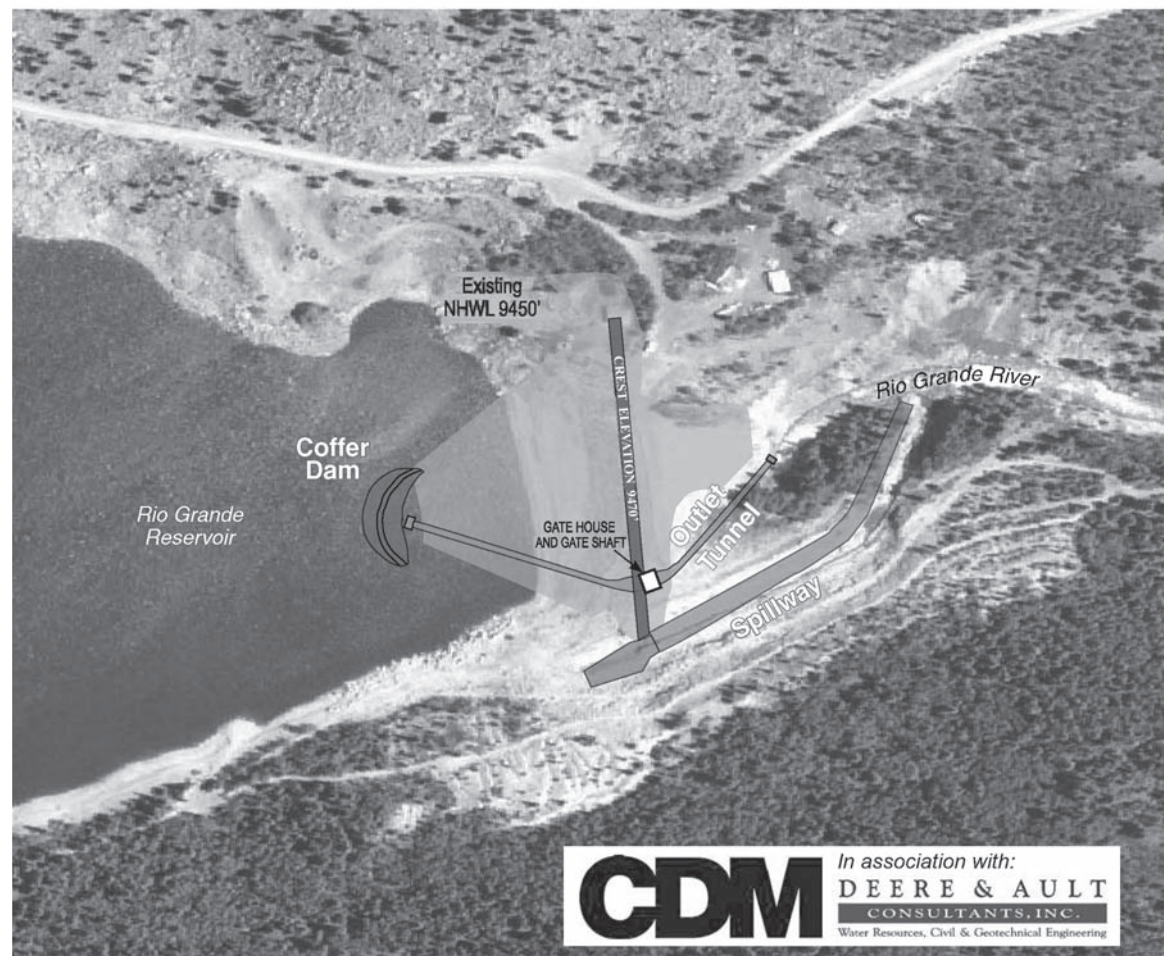
The outlet works have had operational and maintenance issues since original installation in 1914. Several repairs have been made to the outlet works, with varying degrees of success. Currently, flexibility with the rate of release is limited by severe vibrations and pounding that can be felt and heard on the top of the dam crest. A hydraulic jump in the outlet tunnel is thought to be the primary cause of the vibration and pounding. The high velocities that occur at the three outlet gates have also caused erosion in the outlet chamber and caused significant damage to substantial steel plating and reinforcements.

The proposed system is comprised of a new pressurized outlet tunnel with a connection to the inlet tunnel just upstream of the existing gates. A new service gate chamber would be accessible from the existing outlet tunnel. The existing outlet tunnel could also be utilized for emergency releases if rapid draw-down of the Reservoir is required. The new outlet tunnel discharge would be located downstream of the dam toe, near the existing spillway chute terminus. Two 7-foot diameter fixed-end cone (Howell-Bunger) valves would control the release rate. Maximum outlet capacity (with current outlet works in emergency operation) is approximately 4,600 cfs. The capacity of the two Howell-Bunger valves is approximately 2,500 cfs, the rate required by the Colorado State Engineer. The proposed system is modern and reliable and has been utilized on several reservoirs in this country. These options will also be examined in greater detail and may be modified during the final design.

Spillway and Hydrology

In the 1980's, the spillway was deemed inadequate to safely pass the probable maximum flood (PMF). Since that time, the State of Colorado has developed a new tool for estimating probable maximum precipitation to be used in sizing spillways — i.e., the Extreme Precipitation Analysis Tool (EPAT). This tool more accurately depicts design storms in mountainous areas and generally results in smaller PMF calculations. EPAT and Hydrologic Engineering Center – Hydrologic Modeling Simulation (HEC-HMS) modeling were used to analyze the adequacy of the current spillway configuration. HEC-HMS is a standard modeling tool developed by the US Army Corp of Engineers that is used to model streamflows through a

Rio Grande Reservoir Existing Dam Site



CDM In association with:
DEERE & AULT
 CONSULTANTS, INC.
 Water Resources, Civil & Geotechnical Engineering

Reservoir Rehabilitation

Spillway Design

basin. HEC-HMS was used to model a design-storm's passage through a full Reservoir to the spillway to determine the required outflow capacity of both the spillway and the spillway chute.

The results of this modeling indicate that the PMF is significantly reduced from previous estimates, and that the spillway needs relatively minor modifications to safely pass the PMF. The preliminary design for the spillway modifications include parapet walls that increase the hydraulic efficiency of the spillway by more directly training water into the existing spillway plunge basin and chute. Under the enlargement option, the spillway elevation is raised by ten feet by adding an ogee weir structure along the perimeter of the existing spillway weir. Additionally, the existing spillway has experienced significant erosion in the past and may require additional improvements to ensure the safety of the dam. During the final design these options may be modified after they are examined in greater detail.

Multi-Use Benefits Modeling

Modeling and analysis is underway to evaluate potential changes in Reservoir operations to improve recreation, environmental flows, Rio Grande Compact administration, direct flow storage, and storage for Colorado Division of Wildlife (CDOW) and San Luis Valley Water Conservancy District (SLVWCD) transmountain water rights. Results of this modeling may lead to storage agreements between the District and other entities, such as the SLVWCD, CDOW, USFS, or the Division Engineer (Colorado) to formalize some of the use and operational agreements.

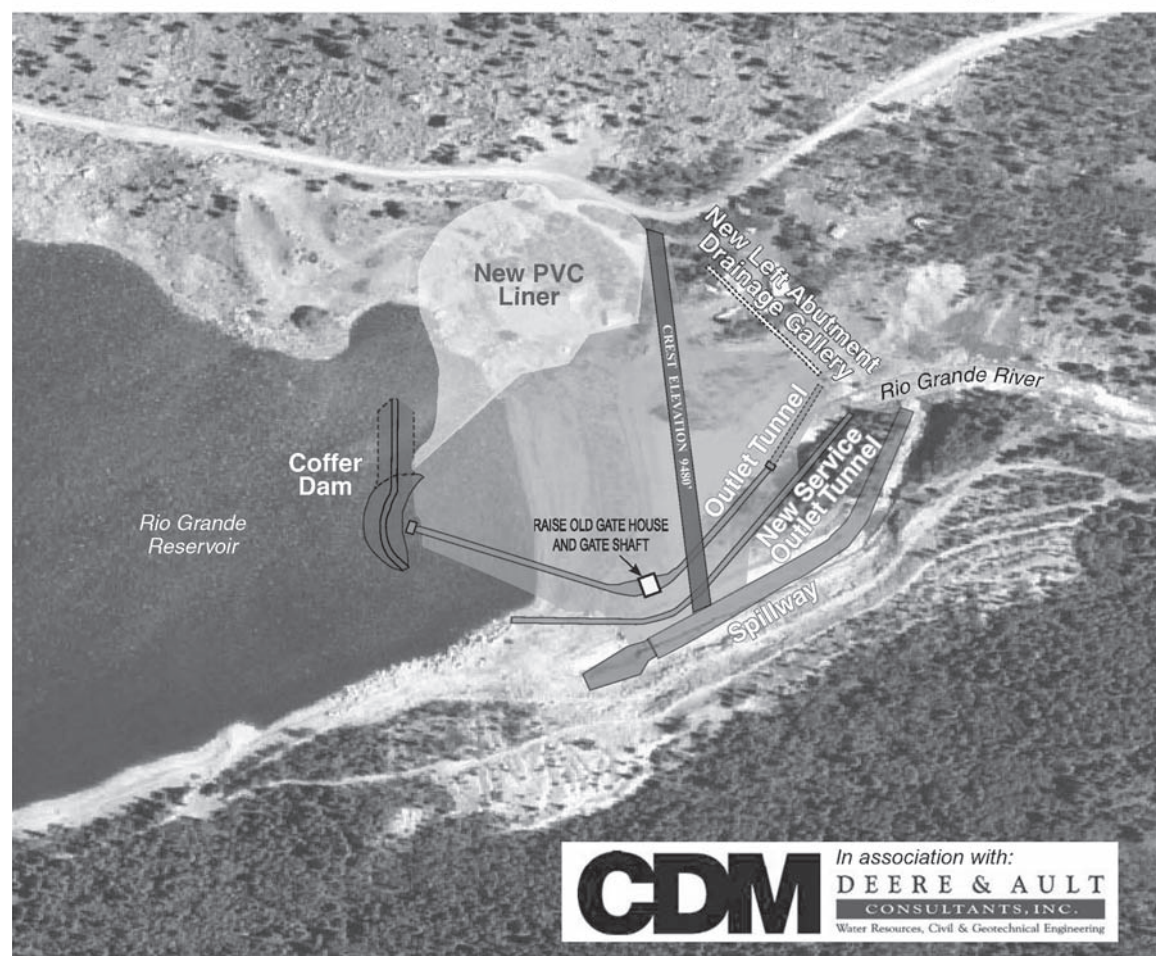
Stakeholder Involvement

Over the course of the study, the District and CDM staff have met with various entities in the Rio Grande basin, including the Water Division No. 3 Engineer, Colorado Division of Wildlife, San Luis Valley Conservancy District, USFS, ranchers and farmers, Colorado Water Conservation Board (CWCB), Rio Grande Water Users Association, municipalities and various environmental advocacy groups, plus US Senator Ken Salazar and US Congressman John Salazar's offices. It is envisioned that collaboration with these entities will continue as the study is concluded later this year.

Reservoir Operations

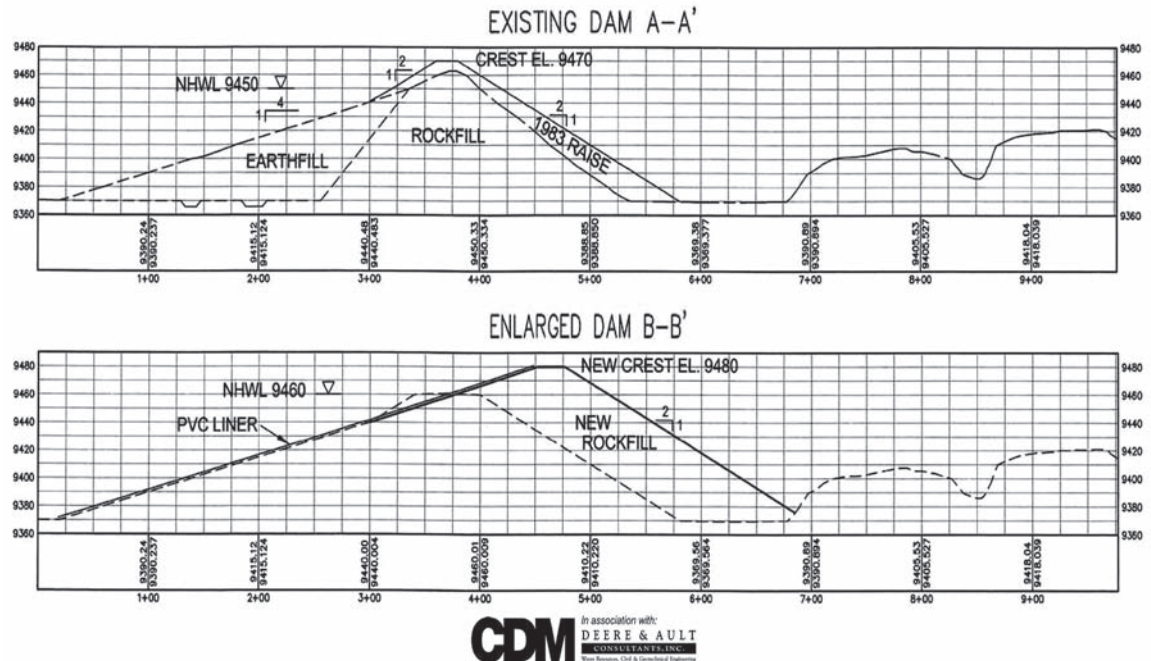
Stakeholders

Rio Grande Reservoir Proposed Dam Enlargement



Reservoir Rehabilitation

Rio Grande Reservoir Dam Cross-Section



Legality Study

Legal Issues

The study included the analysis of the multiple legal issues associated with this project. These issues include NEPA evaluation, Section 404 requirements, 1891 Right-of-Way evaluation, drafting of storage and operation agreements, evaluation of hydropower permitting process and potential issues and other permitting requirements for construction. [See Editor's Addendum - next page]

Costs

COSTS

Phase I Study: \$150,000

Fatal Flaw Analysis (2007), funded by CWCB (complete)

Phase II Study: \$288,000

Further Investigation and Preliminary Design, funded by CWCB \$288,000

Estimated Rehabilitation: \$18,000,000 to \$20,000,000

Estimated Rehabilitation plus Enlargement: \$36,000,000

CONCLUSION

Rio Grande Reservoir is in need of rehabilitation for dam safety purposes. Rehabilitation or enlargement coupled with rehabilitation has the potential to benefit several entities, including the District, the State of Colorado, USFS, DOW, and SLVWCD. Environmental and recreational benefits could be realized without impacting existing water rights and Compact delivery requirements under a well-formulated Reservoir operation plan. This project has the potential to be a model project for cooperative planning and execution for water projects throughout the west, where increasingly, water projects must show benefits not only to one user, but to multiple users of diverse needs and values.

FOR ADDITIONAL INFORMATION:

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Matt Bliss is a water resources engineer for CDM, Inc. in Denver, Colorado. He is experienced with groundwater and surface water planning and modeling. He has collaborated on several groundwater models, groundwater sustainability studies, and surface water planning studies including water rights evaluations and decision support system tools.

Reservoir Rehabilitation

Enlargement v. Rehabilitation

Wetlands Inundation

Impact on Streamflows

Storage Seniority

Decree Protection

Editor's Addendum on Legal Issues: This addendum is edited/condensed from the legal analysis included as Section 8 in the Phase I report (prepared by the firm of Whiteing & Smith of Boulder, Colorado).

Legal issues were identified that may impact the District's ability to carry out enlargement of the Reservoir. The extent to which further analyses and coordination with governmental agencies is required depends on the extent to which the Reservoir may be enlarged and the area of additional inundation.

Review Under NEPA (42 U.S.C. § 4321 et seq.)

The scope of National Environmental Policy Act (NEPA) review will be determined by the scope of the project ultimately proposed. Raising the dam, storing additional water, and inundating additional land may result in a major federal action with significant environmental impacts, requiring preparation of an environmental impact statement (EIS). A determination to rehabilitate the existing dam structure, and improve the outlet works and spillway, may not require major federal action in light of the fact that the dam location and immediately surrounding area is owned by the District and is not USFS land. NEPA review may be required if the impacts of rehabilitation affect USFS lands in the vicinity and immediately downstream of the dam or USFS instream flows below the Reservoir. Moreover, NEPA review will be required if federal funds are authorized for rehabilitation of the existing structure and outlet works. It is anticipated that the lead federal agency in any NEPA review would be USFS.

USACE Clean Water Act Section 404 Permit

The need for Section 404 permitting is dependent upon the scope of the project determined in the pre-design phase of the study. If there is an enlargement of the dam, a Section 404 Permit may be required for raising the dam, which will inundate wetlands located at the upper reaches of the Reservoir. The District will have to develop a mitigation proposal for any wetlands that may be lost.

If the scope of the project is limited to rehabilitating the existing structure and fixing the outlet works and spillway, a Section 404 permit may not be required. A Section 404 permit was not required for prior repair and rehabilitation of the dam outlet works and spillway. Under 33 C.F.R. 323.4(a)(2), "maintenance, including emergency reconstruction of recently damaged parts, of currently serviceable structures such as...dams" is not regulated under Section 404. It does not appear that rehabilitation work will involve any modifications that change the character, scope, or size of the original fill design. Rehabilitation work also may fall within the scope of Nationwide Permit No. 2, for maintenance activities related to the repair, rehabilitation, or replacement of any previously authorized, currently serviceable, structure or fill.

Minimum Stream Flows

The Colorado Water Conservation Board (CWCB) has minimum instream flows on Ute Creek, West Lost Trail Creek, and Weminuche Creek. The minimum stream flows run from each creek's confluence with the Reservoir to points upstream. An enlargement of the dam may cause some inundation of these creeks at their confluences with the Reservoir when it stores near its enlarged capacity. If the potential inundation is confirmed during the pre-design phase of the study, discussions will be initiated with CWCB.

Federal Reserved Water Rights Decree for Instream Flows in the National Forest

On March 30, 2000, the District Court, Water Division No. 3, entered a stipulated decree granting water rights for instream flows to the US for those portions of the Rio Grande and Gunnison National Forests in Water Division No. 3 (the "Decree"). The Reservoir's 1903 storage priorities pre-date the creation of the National Forest in 1905. Particularly important to the Reservoir Enlargement Study are the terms and conditions in the Decree protecting existing storage in and operation of the Reservoir.

Instream Flows Below the Reservoir

The instream flow quantification point below the Reservoir is located approximately 2.4 miles upstream of the confluence of Texas Creek with the Rio Grande. The low monthly base flow is 64.2 cubic feet per second (cfs) in January and the high monthly base flow is 633.5 cfs in June.

The Decree's Protections for the Operation of Rio Grande Reservoir

The Decree recognizes the seniority of the District's storage rights totaling 51,113 acre-feet (AF). The right to store this amount of water annually cannot be curtailed by the instream flows. Current Reservoir operating practices may continue up to a total storage amount of 51,113 AF per year.

THESE PRACTICES INCLUDE:

- Storage under the District's decrees
- Compact storage
- Direct flow storage under the decrees in Case Nos. W-3979 (Rio Grande Canal), W-3980 (SLVID), and 95CW18 (Empire Canal)
- Exchanges between the three reservoirs decreed in Case No. 90CW42, an exchange between the Closed Basin Project and the Reservoir decreed in Case No. 90CW45, and the exchange from the Fun Valley Trailer Park to the Reservoir decreed in Case No. 97CW10
- Future decreed direct flow storage with certain limitations

Reservoir Rehabilitation	<p>These provisions effectively protect current Reservoir operations and future decreed direct flow storage from curtailment to meet the downstream instream flows.</p> <p>On page 89, the Decree states:</p>
Additional Storage Benefits	<p>The effect of the operations of the reservoir as described above is predominantly to dampen or redistribute peak flows, but typically extend, the duration of seasonal high flows by reservoir releases. Reservoir operations consistent with the Reservoir's storage rights, the Compact Storage Agreement, and the decreed exchanges and the existing decrees allowing storage of downstream water rights in the reservoir, or future decrees allowing storage of such senior downstream water rights have no material adverse impact on the reserved instream flow water rights for National Forest purposes provided that (1) no more than 51,113 acre-feet are diverted and stored in any one water year, November 1 through October 31...</p> <p>The effect of the regulation of additional water in an enlarged Reservoir on USFS instream flows will require additional study in the proposed preliminary design phase. Initial indications are that regulation can further extend the seasonal high flows as well as provide much needed flow during the winter months. The re-distribution of some flows may, therefore, provide additional water for instream flows during periods of current greatest need. The legal effects of any storage above 51,113 AF and the re-distribution of that additionally stored water during the later part of the irrigation season and the subsequent winter and early spring months will be further evaluated during the second phase of the study. That work will be coordinated with representatives of USFS, and environmental and recreational interests in the Basin.</p>
Instream Flow Limit	<p>Storage of Transmountain Water</p> <p>Paragraph 26 of the Decree provides: "The United States does not claim and is not entitled to call for or require any water from any reservoir, or any transmountain, imported, foreign, or nontributary water source in Colorado Water Division No. 3 to be used to quantify or satisfy instream flows for National Forest purposes." This would include transmountain water stored in the Reservoir by the Conservancy District and the Colorado Division of Wildlife (DOW).</p>
Expanded Storage	<p>Flows to Meet Downstream Instream Flows</p> <p>Water stored in the Reservoir in excess of 51,113 AF during a water year (not including carryover), may be subject to release if the downstream minimum base flow is not being met. Further analysis during the proposed preliminary design phase will provide additional information on the timing and effect, both legal and physical, of storing water for delivery later in the irrigation season and during the subsequent winter and early spring.</p>
1891 Right-of-Way	<p>The District's 1891 Act Right-of-Way</p> <p>The District owns the land where the dam is located and holds a right-of-way for the actual reservoir under the Act of March 3, 1891, 43 U.S.C. § 946-949. That Act provided: "The right of way through the public lands and reservations of the United States is hereby granted to any canal ditch company, irrigation or drainage district formed for the purpose of irrigation or drainage, and duly organized under the laws of any State or Territory,...to the extent of the ground occupied by the water of any reservoir and of any canals or laterals, and fifty feet on each side of the marginal limits thereof..."</p>
1898 Amendment	<p>The 1891 Act was subsequently amended in 1898 to include other uses of water in the right-of-way grant: "Rights of way for ditches, canals, or reservoir heretofore or hereafter approved under the provisions of sections 946-949 of this title may be used for purposes of a public nature; and said rights of way may be used for purposes of water transportation, for domestic purposes, for the development of power, as subsidiary to the main purpose of irrigation or drainage." So long as the Reservoir's primary use is storing water for irrigation, it can be used to store water for: (1) other purposes of a public nature; (2) domestic purposes; and (3) the development of power. See <i>Kern River Co. v. United States</i>, 257 U.S. 147, 154 (1921): [I]t is a use which the section permits only where it is subsidiary to irrigation); <i>Zelph S. Calder</i>, 81 ID 339, 342-43 (June 20, 1974) (Subsidiary use must be a public use); <i>United States v. Tujunga Water & Power Company</i>, 18 F.2d 120, 122 (S.D.CA 1927) (The supplying of communities...with water for domestic and yard irrigation, is fairly within the main object to be accomplished.); <i>Fleming, P., Vested Pre-FLPMA Rights of Way for Water Conveyance Facilities</i>, 25 Colo.Law 83, 84-85 (1996).</p>
Allowed Uses	<p>Public purposes would include storing water for the augmentation of domestic development in the Basin, the maintenance of a conservation pool in the Reservoir for use of the public, DOW's use in maintaining its public reservoirs and wildlife habitat, and the storage of Compact water to assure that Colorado retains its full Rio Grande share of Colorado's apportionment for use within the state. It also would include the regulation of flows to support the fishery and riparian habitat. Whether the Reservoir is enlarged or only rehabilitated, its primary purpose will remain storage for irrigation. So long as that remains the Reservoir's primary use, each of the other potential uses fall within the District's 1891 Act right-of-way (as amended in 1898).</p>
Public Purposes	

Water Reuse Decisions

Analytic Tools

Effective Communication

Reuse Purposes

Water Supply

WATER REUSE PLANNING

GRAPHICAL TOOLS TO CLARIFY DECISIONS: A WATER REUSE CASE STUDY

by John Scott Thomas, Ph.D., Senior Scientist, Stetson Engineers, Inc. (Diamondhead, MS)

Introduction

“Everything must be made as simple as possible, but not one bit simpler.”

- Albert Einstein -

Einstein’s admonition is particularly apropos when a consultant or staff specialist presents technical alternatives to a decision-maker. Clear communication of the most important issues is the essence of an effective presentation and we often blunder in this regard. Complex subjects are sometimes rendered unnecessarily difficult to comprehend.

Esoteric analytical tools can offer much by way of slicing a problem into manageable pieces and promoting scientific examination of components. Unfortunately, such tools seldom simplify the overall “picture” for upper management. Our ability to explain how all the values in a spreadsheet were derived does not magically transform the spreadsheet into an effective presentation tool.

However, basic graphical tools can clarify issues and present a conceptual framework for analyzing the value and efficiency of project decisions or policy implications. This article uses a case study involving water reuse planning to examine how decision-appropriate graphical representations can be used to simplify alternatives analysis.

The Context: Water Reuse

Water reuse consists of recycling treated wastewater for beneficial purposes. Water is sometimes reused onsite, such as industrial facilities where recycled water is used for cooling processes or vehicle washing. More commonly, recycled water is “reclaimed” from municipal wastewater. Recycled water is most commonly used for non-potable purposes such as irrigation of agriculture, landscape, public parks, and golf courses. Other non-potable applications include cooling towers, industrial process water, toilet flushing, dust control, construction activities, concrete mixing, and artificial ponds and lakes (CDPH, 2001 and 2007; USEPA and USAID, 2004). Table 1 describes various water reuse categories.

TABLE 1. WATER REUSE CATEGORIES

Categories	Specific Uses
Irrigation	Row crop agriculture; orchards; nurseries; streetscape; parks & recreation areas; lawns.
Domestic	Flushing of toilets in homes.
Commercial & Industrial	Cooling; washing of equipment, vehicles, aircraft, and facilities; manufacturing processes; construction uses including concrete mixing and dust mitigation; flushing of toilets and urinals in hotels and commercial buildings; street cleaning; firefighting.
Groundwater Recharge	Indirect potable reuse; prevent seawater intrusion.
Habitat Maintenance	Wetlands irrigation; treatment wetlands; lake or stream augmentation.

The Example: Case Study of Water Reuse on Camp Pendleton

Marine Corps Base Camp Pendleton, located in southern California, comprises approximately 125,000 acres (~200 square miles) (Figure 1). As the only base on the west coast where Marine Corps amphibious operations can be performed, Camp Pendleton is vital to the Marine Corps’ national security mission.

Camp Pendleton Water Use

A dependable water supply is essential to Camp Pendleton. The base obtains over 99% of its water supply from its own aquifers. Over the past 20 years, the base has initiated a number of water conservation measures. However, plans to build additional housing and training facilities are driving water resource managers to plan for new loading to potable and wastewater utilities. Camp Pendleton faces the challenge

Water Reuse Decisions

Sewage Effluent

of ensuring its water supplies are reliable and environmentally sustainable. The groundwater supply, reliant upon wet-season percolation of surface water, is susceptible to drought. An additional concern is economical and regulatory compliant disposal of treated sewage effluent.

The Base treats and disposes of over 4,000 acre-feet per year (AFY) (approximately 1.3 billion gallons) of sewage effluent from its five sewage treatment plants (Thomas, 2008). This treated effluent represents both a liability and an asset. In that effluent must be safely disposed of, it is an expensive liability requiring manpower, facilities, and oversight. In that treated effluent can be reused, it is a valuable resource in dry southern California.

Water Planning Considerations

“There is nothing worse than a sharp image of a fuzzy concept.” - Ansel Adams

To address the challenges of growth, reliability, sustainability, and compliance, Camp Pendleton is planning how best to reuse water. In presenting options and recommendations to Camp Pendleton

water resource and facilities managers, Stetson Engineers used graphical tools to frame planning considerations related to landscape irrigation, prevention of seawater intrusion, aquifer replenishment, replacement of domestic use, commercial and industrial uses, habitat support, and other miscellaneous uses of recycled water.

There are many competing uses of recycled water across the sprawling Marine base, so planners must devise methods for sorting and prioritizing the uses based upon some criteria. Family housing on the base is spread out in a series of developments, while barracks for bachelor troops are concentrated near training facilities. Irrigation opportunities include landscape, athletic fields and a golf course, horse pasture, and leased agricultural lands. The agriculture fields are currently irrigated with raw, untreated groundwater. Other irrigation uses treated, potable water (Thomas, 2008).

Important planning considerations include determining relative water conservation values (for example substituting reclaimed for potable water provides conservation value). Other criteria include engineering considerations such as: consistency of demand; geographic concentration; and efficiency of development (for example re-plumbing is less efficient than plumbing during initial construction). Applying infrastructure, policy, geographic, and engineering constraints to a list of potential uses, the author developed Figures 2 and 3 as planning aids to facilitate a clear, intuitive understanding of the planning considerations. Figure 2 arranges the reuse opportunities along two axes: relative consistency of demand and water conservation value. Figure 3 does so for concentration of use and relative efficiency of development.

FIGURE 1

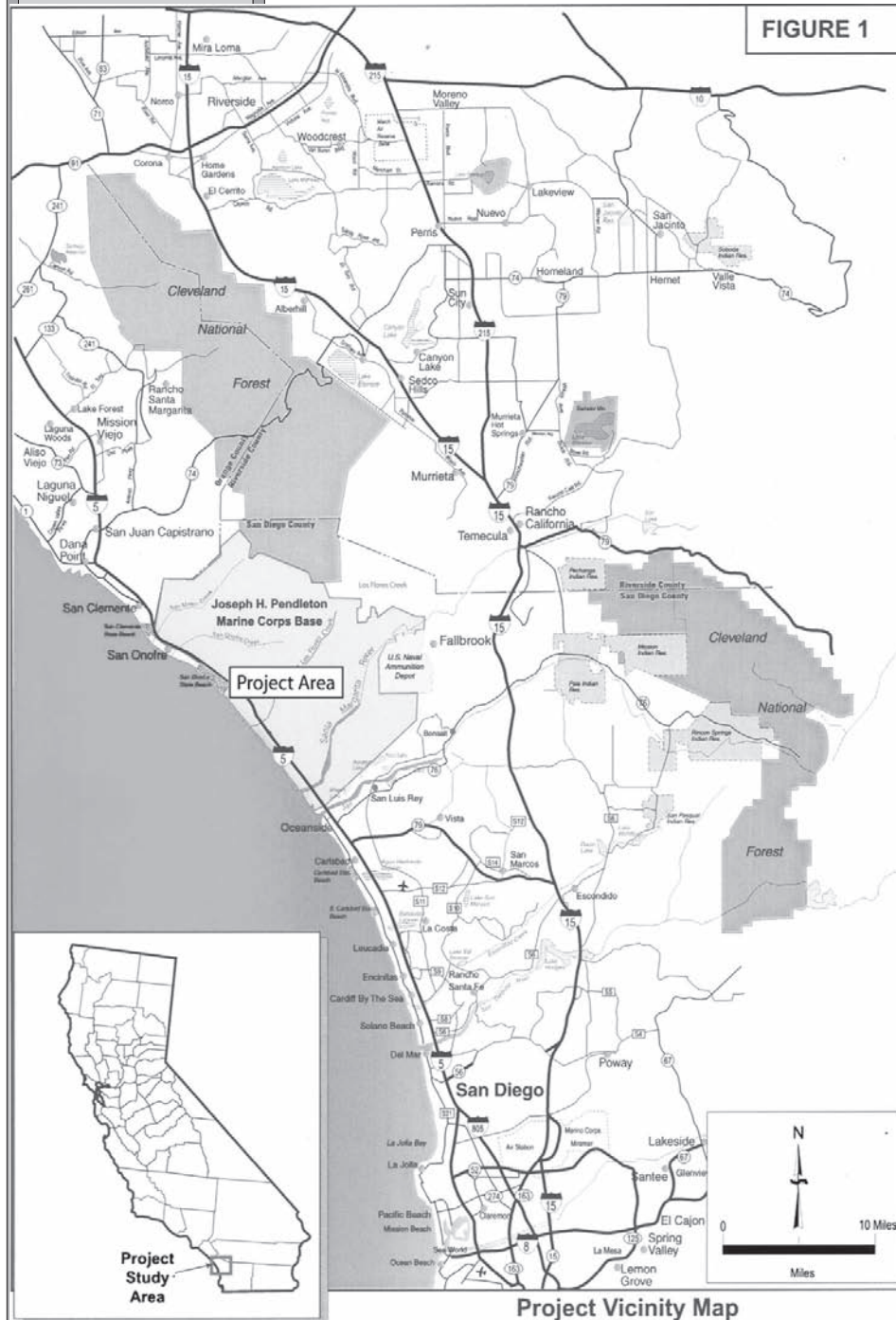


Figure 2. Graphical Analysis of Demand Consistency and Conservation Value

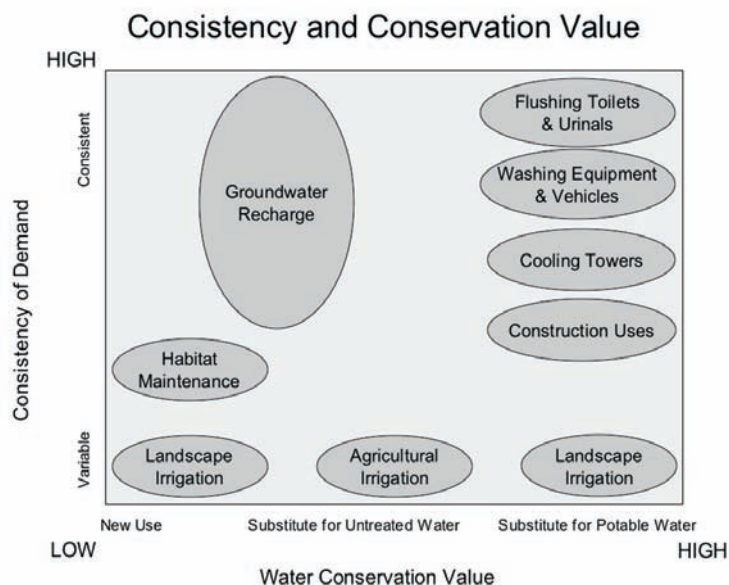
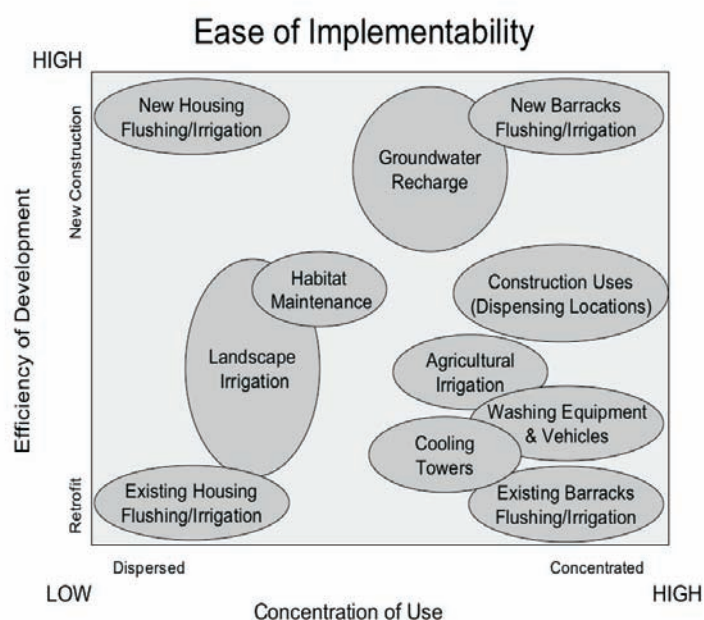


Figure 3. Graphical Analysis of Implementation Efficiency



Following the rationale that the most valuable reuse opportunities are those that substitute for current potable water uses, those uses on the right side of Figure 2 are superior and should be considered first. Additionally, those uses that offer consistent demands are more dependable, require less seasonal storage, and are therefore superior - these uses are found on the upper half of the figure. The graphic suggests that, all other factors being equal, the most efficient implementation strategy is to move from upper right to lower left within Figure 2. Consistent substitution for potable water is superior to variable new uses.

Following the rationale that the most efficient reuse opportunities are those requiring the least amount of retrofitting, the uses located in the upper portion of Figure 3 are superior and should be considered first. Likewise, the geographically concentrated uses on the right portion of the figure are less expensive to develop and service and are therefore superior. The graphic suggests that, all other factors being equal, the most efficient implementation strategy is to move from upper right to lower left within Figure 3. Concentrated new construction is superior to dispersed retrofitting.

Water Reuse
Decisions

Conservation

Implementation

Reuse
Opportunities

Water Reuse Decisions

Additional Factors

Tool Utility

The graphical tools simplify comparison and enable decision-makers to envision how their options relate to one another. The visual display also provides a mnemonic device that elevates understanding and subsequent communication about the options — managers can “keep the picture in mind” as a basis for discussing how resources and constraints impact their ability to prioritize the upper right corner of the graphics.

Other major considerations are distance from, and elevation relative to, the nearest treatment plant or existing storage and conveyance facilities. Another consideration is the overall scale of the project. One should determine whether the demand (or water conservation savings) is great enough to make the investment in conveyance and distribution systems economically feasible. As these considerations are quantified, they too can be represented graphically.

Summary

Graphical tools are useful for clarifying complex topics and communicating relationships between choices. We sometimes complicate our explanations by attempting to describe relationships orally or by using spreadsheets or lists. The specialist’s task is to make complex issues understandable. Just because we can explain how all the values in a spreadsheet were derived does not make the spreadsheet the most effective tool for imparting a message. We sometimes mistake our audience’s ability to follow, and at any rate, decisions should be reached only after managers fully understand an issue.

“A picture is worth a thousand words” to laypersons, managers, and specialists, alike. Diagrams may therefore be the most useful means for specialists to communicate complex concepts to managers or mixed audiences. Diagrams also provide useful visual context for an audience, generating questions that may provide opportunities to explain difficult issues and impart further meaning. Simple graphical tools can clarify issues and present a conceptual framework to decision-makers for analyzing the value and efficiency of project decisions or policy implications.

FOR ADDITIONAL INFORMATION:

SCOTT THOMAS, PhD, Stetson Engineers, Inc. (Diamondhead, MS), 228/ 342-0239 or email: Scotttt@stetsonengineers.com
Stetson Engineers’ San Rafael, CA, Office: 228/ 342-0239

References

- California Department of Public Health. 2007. Groundwater Recharge Reuse Regulations (DRAFT). (22 CCR, Division 4 – Environmental Health, Chapter 3 – Recycling Criteria). Sacramento, CA
- California Department of Public Health.. 2001 California Health Laws Related to Recycled Water: The Purple Book. CA Department of Health Services, Recycled Water Unit. Sacramento, CA
- Thomas, J. S. 2008. Investigation of Water Reuse Opportunities on Marine Corps Base Camp Pendleton. Stetson Engineers. San Rafael, CA
- United States Environmental Protection Agency and U.S. Agency for International Development. 2004. Guidelines for Water Reuse. Washington, DC

Scott Thomas is an ecologist with Stetson Engineers. He specializes in watershed planning, environmental planning and permitting, and water quality. His research interests include methods to improve the efficiency and effectiveness of institutional and collaborative natural resource planning and management. He has developed an operational framework for adaptive management and collaborative partnering by military bases, forests, parks, and wildlife refuges. Dr. Thomas has served as an environmental manager and Director of Water Resources for Marine Corps Base Camp Pendleton in California. Dr. Thomas is coordinator of the Santa Margarita River Water Quality Monitoring Group and facilitates the Watershed Stakeholders Advisory Committee. He obtained his Ph.D. in Environmental Biology and Public Policy from George Mason University, an MA in Business and Management from Webster University, and a BA in History from Hampden-Sydney College.

WATER BRIEFS

HEALTHY RIVERS ACT **CO**
INSTREAM FLOWS

Governor Bill Ritter signed House Bill 1280, known as the Healthy Rivers Act, into law on April 21. The Act encourages water right owners to lease or loan rights to the Colorado Water Conservation Board (CWCB) for environmental purposes to protect instream flows in rivers and streams. Numerous environmental group and many water providers, including Denver Water, supported the bill, which passed the House 59-6 and the Senate 32-2. "This new law will strengthen Colorado's 35-year-old Instream Flow Program and ensure that water rights leased or loaned" to CWCB "for environmental purposes will not be weakened, lost or considered abandoned," according to Governor Ritter.

Rep. Randy Fischer, who sponsored the bill with Sen. Gail Schwartz, said "For too long, ranchers and farmers could lose their water rights if they didn't use all the water they were given annually. We live in a large, dry Western state that's susceptible to drought, and it's time we reward — not punish — those who conserve. This legislation gives landowners an important incentive to turn off the tap!" **For info:** Evan Dreyer, Governor's Office, 720/ 350-8370 or email: evan.dreyer@state.co.us

CALFED GRANTS **CA**
URBAN & AG EFFICIENCY

The Bureau of Reclamation (Reclamation) has announced the availability of approximately \$1.5 million in federal funds for the California Central Valley CALFED Water Use Efficiency Grants Program. The funds are to implement urban and agricultural water use efficiency projects. Proposals are now being accepted from entities wishing to receive financial assistance. Proposals may include any type of implementable water use efficiency project that has measurable benefits to CALFED Bay-Delta Program objectives. Projects will be selected through a competitive process, and priority consideration will

be given to those projects that achieve the goals of the CALFED Bay-Delta Program on a State-wide basis.

Reclamation can fund up to 50 percent of approved projects, not to exceed \$300,000. This Request for Funding Opportunity for the CALFED Water Use Efficiency Grant Program is available online. The deadline for submitting proposals is June 2, 2008. **For info:** Mary Sims, Reclamation, email: msims@mp.usbr.gov or website: www.grants.gov (keyword search: CALFED Water Use Efficiency; opportunity number search 08SF00028).

DELTA SMELT **CA**
ESA RULING

In mid-April a US District Court judge in Fresno ruled that the biological opinion under which the state and federal projects operate in California is inadequate and out of compliance with the federal Endangered Species Act. Judge Oliver Wanger found several flaws with the opinion and the level of protection afforded winter- and spring-run Chinook salmon and Central Valley steelhead.

Wanger ruled in a separate case in December, 2007, that the biological opinion was not adequately protecting Sacramento River Delta smelt and ordered new protections that are reducing water deliveries through the Delta by 30% this year.

A new biological opinion already is being drafted for the projects and is expected to be complete by end of 2008. The judge scheduled a status conference for April 25 to discuss a schedule for developing interim remedies to protect salmon and steelhead.

Association of California Water Agencies (ACWA) Executive Director Timothy Quinn said the latest ruling is likely to complicate what already is shaping up to be a challenging year for water agencies.

"When you factor in existing constraints on water supply operations in the Delta and now the possible addition of new constraints on storage above the Delta, it underscores the need for a comprehensive solution that can meet the co-equal needs of the

environment and the economy," Quinn stated. "We have to invest in a system that can accomplish both objectives."

For info: The ruling is available at ACWA's website: www.acwa.com/issues/order_re_msj4-16-08.pdf

MINE RESTORATION **MT**
DAM REMOVAL

On April 25, state and federal officials announced a \$37 million settlement of litigation with Atlantic Richfield Co. (Arco) and ASARCO LLC (ASARCO) to remove the aging Mike Horse Dam and the contaminated tailings behind it, and to clean up and restore the Upper Blackfoot River and Mining Complex. The settlement agreement was filed April 25 with the bankruptcy court in Texas and lodged with the US District Court in Helena, Montana. In July 2007, the US Forest Service (USFS) released an action memorandum calling for the removal and disposal of the dam, mine tailings and wastes.

Under the terms of the settlement, ASARCO and Arco will each pay the state \$8 million. The state will also receive a \$19.77 million allowed claim in the ASARCO bankruptcy, and USFS will receive \$1 million to oversee the state's implementation of the project and a \$230,000 allowed claim for past costs. Director Richard Opper of Montana's Department of Environmental Quality noted that 300,000 tons of mine waste will be removed from the area. Opper said another provision of the settlement calls for ASARCO to remain responsible for some repositories, water treatment and work on some parts of the site, including some mine adits. ASARCO continues to own those areas.

Mike Horse Dam was built across Beartrap Creek in 1941. In 1975, heavy rains caused a partial failure of the dam and high creek waters eroded contaminated tailings into Beartrap Creek and the Upper Blackfoot River. The Blackfoot was made famous by Norman Maclean's story of family and fly fishing, *A River Runs Through It*, which Robert Redford made into a movie. The dam sits in a floodplain at the headwaters of the Blackfoot River,

WATER BRIEFS

and the tailings behind it will be moved to a repository on higher ground on ASARCO property. The project will also include cleanup of tailings along the Upper Blackfoot River, Beartrap Creek and Mike Horse Creek and the state hopes to restore those streams to eventually bring back westslope cutthroat and bull trout.

The settlement depends on final court approval of the agreement, which Montana Attorney General Mike McGrath said may happen as soon as late June or July of this year. The settlement agreement is subject to a 30-day public comment period following publication in the Federal Register, which will likely occur around May 5. Comments may be sent via e-mail or U.S. mail to the US Department of Justice. Once the settlement is approved by the bankruptcy court and the federal court, work can begin on removing the dam. Construction would likely start after 2010.

Copies of the settlement, USFS action memorandum and other background information are available on the website listed below.

For info: Jayson O'Neill, Montana AG's Office, 406/ 444-9844 or website: www.doj.mt.gov/

TRIBAL GUIDANCE US CONTAMINATION RISK

Scientists from tribal governments and Oregon State University (OSU) have developed new guidelines for evaluating health risks stemming from contamination of native lands. Researchers at OSU collaborated with tribal scientists to create a risk-assessment guidance manual featuring "exposure scenarios" for tribes in different eco-regions. EPA provided funding for the project.

What makes the manual unusual, experts say, are its targeted users. Unlike EPA standards, which are based mainly on urban and suburban lifestyles, the "Traditional Tribal Subsistence Exposure Scenario and Risk Assessment Guidance Manual" is aimed at tribal members who pursue, or wish to pursue, ancestral lifestyles close to the land, according to Anna

Harding, a professor of public health at OSU and co-investigator in the study. Harding pointed to EPA guidelines for fish consumption as an example. "EPA estimates that the average adult will consume about 17.5 grams of fish a day," she said. "But studies suggest that the average for Native Americans in areas where subsistence fishing is practiced may be more than a pound a day. So the EPA exposure scenario will underestimate risks for these people. And if the fish happen to come from a water source that is contaminated, the health risks may be much greater than currently accounted for."

Using historical and archaeological sources, as well as oral teachings, the research team recreated traditional natural resource use specific to the local environment. From there, they assessed not only diet, but also level of exposure to soil, water and air through skin, mouth and lungs. "There are many potential exposure pathways that are unique to Native Americans but are not accounted for in scenarios developed for the general public," said the study's principal investigator Barbara Harper, manager of the environmental health program for the Confederated Tribes of the Umatilla Indian Reservation and an associate professor affiliated with OSU's Department of Public Health.

Harding emphasized that searching for pollutants was not a project objective, nor was evaluating the health of tribal members. "Our goal was to describe the exposure scenarios for different ecosystems that would then enable the tribes to determine their own exposure risks," she said. "Contaminants are site-specific. Each tribe must make that assessment for itself."

Modern tribal diets and lifestyles, while significantly different from the average suburban resident, are likely not as healthy as they once were, Harper pointed out. "Our approach is to reconstruct original diets and lifestyles that reflect tribal health and natural resource restoration goals," she said. "The manual will enable tribes to evaluate risks based on their current resource-intensive lifestyles, as well as on their fully traditional lifestyles.

There are certain exposures that are potentially underestimated for a broad cross-section of tribal members."

The researchers developed scenarios for four ecosystems in the West. For each scenario, they described key natural resources along with traditional diets and activities such as hunting and fishing, gathering foods and medicines, making material items, farming, gardening with irrigation, raising livestock, and pursuits associated with cultural heritage and identity, such as sweat lodge ceremonies.

On average, Harding says, Native Americans who engage in subsistence activities eat more game and fish, drink more water, and consume more native plant and animal foods than the average American. "These differences become critical when assessing the risks of environmental contaminants," Harding said.

Exposure scenarios were developed for the following tribes located in various eco-regions of the US: Confederated Tribes of the Umatilla Indian Reservation, located in eastern Oregon and Washington, categorized as "lower Columbia Basin plateau"; Spokane Tribe, eastern Oregon and Washington, "lower Columbia Basin plateau"; Elem (Pomo) Tribe, near Clear Lake, California, "Northwest forest/Mediterranean California;" and Washoe Tribe, northern California, "Sierra Nevada Mountains/Great Basin."

For info: Printed copy or CD of the Guidance Manual available from Anna Harding, email: anna.harding@oregonstate.edu, or Barbara Harper, email: bharper@amerion.com

WATER TREATMENT AZ ADEQ REVOLVING FUND

Director Steve Owens of the Arizona Department of Environmental Quality announced on April 25th that ADEQ will provide an estimated \$800,000 to fund the construction and operation of a water treatment system for Valle Verde Water Company (Valle Verde) in Nogales. ADEQ is providing the funds from its Water Quality Assurance Revolving Fund (WQARF), which addresses soil and groundwater contamination.

WATER BRIEFS

In January 2007, customers of Valle Verde, located east of Interstate 19, were informed by the water company of the detection of tetrachloroethylene (PCE), an industrial solvent, at concentrations above the maximum contaminant level of 5 micrograms per liter in samples collected from Wells 1, 2, 4 and 7 in Valle Verde's system. As a result, alternate drinking water supplies were provided. ADEQ has been working with Valle Verde and the City of Nogales since that time to address the PCE contamination and establish a permanent solution for the water supply problem.

The WQARF funding will be used for construction and operation expenses for a granular activated carbon (GAC) treatment system at site of Valle Verde Well #2. The system will consist of two GAC contact vessels where contaminated water will flow through and PCE will be absorbed by the carbon. Storage tanks also will be constructed at Valle Verde Wells #2 and #3 to aid in distribution of treated water. The construction is expected to take about one year. In addition to construction of the water treatment system, ADEQ is working with Valle Verde and the City of Nogales to construct a pipeline connection between their two systems which could be used by Valle Verde during potential future water supply emergencies. Such interconnection agreements are common between neighboring water supply systems.
For info: ADEQ, 602/ 771-2215 or email: communications@azdeq.gov

TRIBAL SETTLEMENTS NW

COLUMBIA RIVER

The Columbia Basin Fish Accords (Accords) were signed on May 2, representing agreements between the federal action agencies — Bonneville Power Administration (BPA), the US Bureau of Reclamation (Reclamation), and the US Army Corps of Engineers (Corps) — and four Columbia Basin Indian tribes, the Confederated Umatilla Tribes, Confederated Warm Springs Tribes, the Yakama Nation and the Confederated Tribes of the Colville Indian Reservation, as well as the

Columbia River Inter-Tribal Fish Commission. The Accords are designed to supplement biological opinions for listed salmon and steelhead and the Northwest Power and Conservation Council's fish and wildlife program. They provide firm commitments to hydro, habitat and hatchery actions, greater clarity about biological benefits and secure approximately \$900 million in funding, primarily from BPA, for 10 years for tribal projects.

The signing of the Accords culminates two years of extensive negotiations, at the behest of US District Court of Oregon Judge James Redden, among Indian tribes and the three federal action agencies that have responsibilities for operating and maintaining the Federal Columbia River Power System (FCRPS), as well as for selling the power from these facilities. FCRPS is comprised of 14 federal multi-purpose hydropower projects. Judge Redden has presided over years of litigation involving FCRPS and various biological opinions that he ruled were invalid. NOAA Fisheries was preparing to release its latest biological opinions for the US District Court of Oregon (scheduled for May 5, 2008).

The tribes and federal agencies plan to immediately move forward with new projects as well as continuing existing projects throughout the Columbia River Basin. In addition, the federal agencies have also reached agreement with the states of Idaho and Montana that includes funding of \$65 million for Idaho over the next 10 years and \$15.5 million for Montana, bringing the total bill to nearly \$1 billion. The state of Washington has announced its support for this partnership approach. Under the agreements, the federal agencies and tribes will work together as partners "on the ground" to provide tangible survival benefits for salmon recovery — by upgrading passage over federal dams, restoring river and estuary habitat, and by creative use of hatcheries. While the Accords address the needs of salmon and steelhead, they also focus on non-listed species such as Pacific lamprey; the Corps plans to work to implement adult and juvenile passage improvement measures for lamprey.

As part of the Accords, the tribes have agreed that they will not support in any manner Endangered Species Act, Power Act, Clean Water Act or Administrative Procedures Act lawsuits against the federal agencies regarding the FCRPS or Upper Snake BiOps. In addition, the tribes agreed that dam breaching will not occur during the 10-year term of the agreement and that they will not advocate for breaching dams covered by the FCRPS and Upper Snake Biological Opinions during the term of the Agreement. There is a provision that "If, after the June, 2015 comprehensive review, the status of Snake River ESUs is not improving and the Tribes review of Diagnostic Performance Framework indicates contingent actions are needed, the Tribes may advocate that actions to implement Snake River dam breaching after 2017 should be initiated."

Earlier press reports indicated that Oregon Governor Ted Kulongoski, and some fishing and conservation groups, were opposed to the agreements as not doing enough to address the problems of salmon recovery. Governor Kulongoski's comments to the MOUs, submitted on April 22, stated that "Unless the final biological opinion, expected on May 5, contains a revised analysis and reasonable and prudent alternatives that are fully responsive to Oregon's stated concerns, that opinion will be the subject of a new round of legal proceedings. The MOA cannot shield the federal government's legal liabilities under ESA."

For info: Details of the Accords available at: www.critfc.org and www.salmonrecovery.gov; Comments to the Accords at: www.bpa.gov/applications/publiccomments/CommentList.aspx?ID=24

COOLING WATER INTAKE US

SUPREME COURT TO REVIEW RULE

The US Supreme Court (Court) will hear arguments on an EPA rule that the electric power industry estimates could cost it tens of billions of dollars. The case involves cooling water intake systems used in up to 550 coal and nuclear power plants nationwide. In July 2004, EPA adopted a rule to

WATER BRIEFS

regulate water intake structures at large existing power plants. Clean Water Act, Section 316(b) provides that the standard for intake structures “reflect the best technology available for minimizing adverse environmental impact.” EPA’s rule set forth five compliance alternatives and left open the possibility of using a cost-benefit analysis for selecting among them. Notably, the rule did not require that power plants adopt closed-cycle cooling systems.

Environmental groups, states and industry associations challenged the rule. In *Riverkeeper, Inc. v. U.S. EPA*, 475 F.3d 83 (2d Cir. 2007), the Second Circuit struck down the rule, holding in part that Section 316(b) did not allow a cost-driven solution instead of a technology-driven solution. The court limited the consideration of costs to a “cost-effectiveness” analysis. The court held that EPA could still consider whether the costs of a particular technology were significantly more expensive than another technology that achieves essentially the same level of protection of the environment.

Earlier this month, the Court granted certiorari on the question of whether Section 316(b) authorizes the EPA to engage in a cost-benefit analysis when determining the best technology available for minimizing the adverse environmental impact of cooling water intake structures. Since at least four justices must agree that a lower court decision should be reviewed in order for the Court to address the case, the fact that certiorari was granted is significant. The case is to be argued in the October 2008 term.

For info: Perkins Coie Law Firm, Jessica Hamilton, 503/ 727-2266 or Tom Lindley, 503/ 727-2032

SE WATER PLAN US RECLAMATION PROPOSAL

The US Army Corps of Engineers (Corps) proposed a new Southeast water sharing plan (“Proposed Action”) on April 15th that addresses storage in upstream reservoirs and releases for minimum streamflows in the lower Apalachicola River that eventually

flows into Apalachicola Bay, Florida. Negotiations among the governors of Alabama, Florida and Georgia to come up with their own plan were unsuccessful, which prompted US Secretary of the Interior Dirk Kempthorne to ask the Corps to provide a plan for the region.

The Corps’ Mobile District operates five federal reservoirs on the Apalachicola-Chattahoochee-Flint (ACF) as a system, and releases made from Jim Woodruff Dam in Florida under the proposed action reflect the downstream end-result for system-wide operations measured by daily releases from that dam into the Apalachicola River. Buford Dam impounds water at the upstream end of the system, creating Lake Lanier in Georgia.

The Proposed Action modifies the current Interim Operations Plan, providing for minimum releases based on basin inflows, threshold levels for specific seasons (spawning, non-spawning and winter), and composite storage thresholds. The proposed action also incorporates a drought contingency operation (or drought plan) that does not exist in the current IOP. “The drought plan...specifies a minimum release from Jim Woodruff Dam and temporarily suspends the other minimum release and maximum fall rate provisions until composite storage within the basin is replenished to a level that can support them.” (Proposed Action, p.7) Based on “composite storage” in the system, the proposal would set minimum releases from Jim Woodruff Dam during dry periods of 4,500 cfs (down from the current minimum of 5,000 cfs).

The Corps also sent a letter to the US Fish and Wildlife Service (USFWS) on April 15th to initiate formal Section 7 consultation under the Endangered Species Act (ESA). The consultation involves the Corps’ proposed modifications to the current IOP at Jim Woodruff Dam in support of federally listed species and critical habitat on the Apalachicola River. In the letter to USFWS, the Corps recognized that the “proposed modifications to the current IOP are likely to adversely affect” ESA-listed species and their designated critical habitat. The Corps

went on to state that it “is understood that our consultation discussions over the coming weeks could identify additional modifications to the current IOP that could provide for additional minimization of harm to the species.” The Corps requested USFWS to provide a biological opinion. The Corps also left the door open for “additional modifications or temporary drought contingencies” if “severe drought conditions persist for additional years or more severe droughts than modeled occur...” in the region.

The Georgia Environmental Protection Department (GEPD) also made a request to extend minimum flow reductions that seeks to preserve storage in Lake Lanier. The pending request asks the Corps for a temporary flow reduction from 750 cfs to 650 cfs through May 31st, measured at Peachtree Creek. According to GEPD, 650 cfs is the “minimum flow required at Peachtree Creek confluence on the Chattahoochee River to provide for waste water assimilation in the river.” The Corps previously granted a similar request by GEPD for the same flow reduction for the month of April.

For info: Lisa Coghlan, Corps, 251/690-2505 or email: lisa.a.coghlan@sam.usace.army.mil; Proposed Action, Letter to USFWS and Press Release on GPED Request are available on the Corps’ Mobile District website: www.sam.usace.army.mil/

CRYSTAL MT. OIL SPILL WA EPA \$471,900 PENALTY

The US Department of Justice, on behalf of EPA, recently signed a “Stipulated Order of Settlement” with Puget Sound Energy (PSE). Central to the settlement is PSE’s agreement to pay a \$471,900 EPA penalty, which will resolve the Agency’s federal Clean Water Act claims against the Bellevue-based energy company. The government alleged that the violation occurred on November 3, 2006, when an above-ground tank at Crystal Mountain ski area’s emergency generator overflowed and discharged approximately 18,000 gallons of diesel

WATER BRIEFS

fuel. The Washington Department of Ecology (Ecology) and EPA concluded that the spill occurred after an electrical malfunction. A large portion of the 18,000 gallon spill eventually entered nearby Silver Creek, tributary of the White River, and contaminated the adjoining shoreline. Silver Creek is spawning and rearing habitat for Chinook, pink, chum and Coho salmon, as well as rainbow, steelhead and cutthroat trout. Both Silver Creek Basin and the White River Watershed are designated drinking water sources. As a precautionary measure, PSE provided bottled drinking water to downstream residents until the drinking water could be confirmed as safe for consumption.

PSE incurred over \$15 million in spill response cleanup costs and paid for Crystal Mountain Generating Station repairs to minimize the possibility of a similar spill in the future. Under the supervision of Ecology, EPA and the US Forest Service, PSE responders and contractors spent more than a month cleaning up the site. Of the estimated 18,000 gallons of diesel fuel spilled, responders estimate that more than half was eventually recovered. The incident was the largest oil spill affecting surface water in Washington since June 10, 1999, when a 277,000-gallon gasoline spill and explosion from the Olympic pipeline rocked Whatcom County. The settlement will be subject to a public comment period before it becomes final.

For info: Laura Davis, EPA, 206/553-2857 or email: davies.lauris@epa.gov; EPA's Oil Spill website: www.epa.gov/oilspill

SMALL WATER SYSTEMS US

EPA MANAGEMENT TOOL

EPA is rolling out an important management tool for small drinking water and wastewater systems. On April 21, EPA Administrator Stephen L. Johnson announced the availability of Check Up Program for Small Systems (CUPSS). This user-friendly computer-based program assists owners and operators in developing and using plans for maintaining their systems and providing service to their customers.

The program uses information provided on the system's assets, operation and maintenance activities and financial status to produce a prioritized asset inventory, financial reports and a customized asset management plan. Asset management programs support informed budget discussions, boost efficiency of the utility, and improve customer service by ensuring clean and safe water at competitive prices. The CUPSS program and all supporting materials are available for immediate download. Kits including the material will also be available in May.

For info: CUPSS website: www.epa.gov/cupss; EPA website for small public water systems: www.epa.gov/safewater/smallsystems

BROWNFIELD PROJECT CA

SUPERFUND TIE-IN

GROUNDWATER PROTECTION

EPA recently finalized a "landmark" agreement with Target Corporation (Target) to allow for redevelopment of land adjacent to the Frontier Fertilizer Superfund site in Davis, California, while keeping cleanup of the site on track. Under the agreement, Target Corporation, with EPA oversight, will fund and perform movement of eight groundwater monitoring wells at privately-owned parcels lying to the north and west of the Frontier Fertilizer Site. EPA uses the current wells to monitor the cleanup. As part of the Target development, EPA will find locations for new wells that can take their place. "EPA is committed to ensuring that redevelopment near this Superfund site will not in any way hinder our clean up process," said Keith Takata, Superfund Division director for the EPA's Pacific Southwest region. "Modifications to the monitoring wells have been carefully planned so as to not disrupt our first priority — clean up of the Frontier Fertilizer site."

EPA touted the settlement as a "landmark agreement" since it is the first of its kind in California and contains some unique provisions. Target Corporation guarantees that it has sufficient funds to complete the

modification of eight groundwater monitoring wells, and agrees to pay for EPA's oversight costs to make sure the work is being done properly. It also provides protections for both the buyer performing the cleanup and future buyers who purchase portions of the property.

The Frontier Fertilizer Superfund Site is located near the eastern boundary of Davis, California. Soil and groundwater beneath the site were contaminated by improper disposal of pesticides during the 1970's and 1980's. Contaminated surface soil from the site was removed and treated in 1985, while groundwater has been continuously pumped and treated since 1993.

For info: Mary Simms, EPA, 415/947-4270, email: simms.mary@epa.gov or website: <http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/vwsoalphabetic/Frontier+Fertilizer?OpenDocumentWetlands>

CWA VIOLATIONS ID

EPA ENFORCEMENT ACTION

Robin S. Behrens, Charles E. Kramer and C.E. Kramer and Contracting, Inc., of Bonner County, Idaho have reached a \$40,000 settlement with EPA for alleged violations of the Clean Water Act. The violations involved filling wetlands on Robin Behrens' property near Lake Pend Oreille without a permit. According to EPA, in the fall of 2005, the property owner and contractor discharged fill material into a half-acre of wetlands located on Robin S. Behrens' property. The parcel is adjacent to Lake Pend Oreille near Ponderay, Idaho. The illegal action was reversed in May 2006, when the property owner and contractor repaired the damage and restored the site under the direction of the US Army Corps of Engineers. "Protecting Idaho's shrinking wetlands is a top priority for EPA, especially around Lake Pend Oreille," said Jim Werntz, EPA's Idaho Operations Director.

For info: John Olson, EPA Wetlands Program, 208/378-5756 or email: olson.john@epa.gov; EPA wetlands website: <http://epa.gov/owow/wetlands>

The Water Report

CALENDAR

May 14-16 TX
Hydrogeology of Karst Aquifers Course, San Antonio. For info: NGWA, 800-551-7379 or website: www.ngwa.org

May 14-16 CO
Colorado Water Workshop: Mining, Energy & Water in the West (33rd Annual), Gunnison. Western State College. For info: Brandon Boyd, 970/ 943-3038, email: bboyd@western.edu or website: <http://western.edu>

May 15 GA
Water Rights Conference, Atlanta. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

May 15-16 CA
California Water Law Seminar, San Francisco. For info: CLE International, 800/ 873-7130 or website: www.cle.com

May 15-16 ID
Idaho Water Law Seminar, Coeur d'Alene. Coeur d'Alene Golf & Spa Resort. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com, or website: www.lawseminars.com

May 18-22 NJ
Sixth National Monitoring Conference, Atlantic City. Sheraton Convention Center. Sponsored by the National Water Quality Monitoring Council (NWQMC). For info: Laura Hughes, Water Education Foundation, email: Monitoring2008@wef.org or NWQMC website: <http://lists.wefnet.org:80/t/48085/9999830/799/0/>

May 18-23 NV
ASFP 2008 Conference: Living River Approach to Floodplain Management, Reno-Sparks. Sponsored by the Association of State Floodplain Managers. For info: ASFP website: www.floods.org

May 19-20 CO
Colorado Wetlands Seminar, Denver. For info: CLE International, 800/ 873-7130 or website: www.cle.com

May 19-22 TX
Planning Community of Practice Conference 2008: Developing Sound Water Resources Solutions, San Antonio. Crown Plaza Hotel Riverwalk. Sponsored by the US Corps of Engineers. For info: Bruce Carlson, Corps, email: bruce.d.carlson@usace.army.mil or Corps website: www.usace.army.mil/

May 20-22 AZ
5th National Environmental Conflict Resolution Conference, Tucson. For info: ECR website: <http://ecr.gov/ecr.asp?Link=604>

May 21 CA
Updates in Environmental Issues Seminars, Oakland. Marriott City Center. RE: Stormwater Compliance for Construction & PCBs, Greenhouse Gases & Human Health Risk Assessment, etc; Sponsored by Brown & Caldwell. For info: Ellie Mizuno, B&C, 925/ 210-2283, email: emizuno@brwnclad.com or website: informatics.brwnclad.com/mcle/

May 21
Risk Management, Mitigation & Technologies: Insurance to Sophisticated Finance Conference, Teleconference. Sponsored by American Bar Association & ACORE. For info: ABA Section on Environment, Energy & Resources, 312/988-5724 or website: www.abanet.org/environ/

May 21 WA
Solar Power: Projects & Permitting, Seattle. Red Lion Hotel on 5th. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

May 21 OR
Water Rights Bootcamp: A Seminar on Water Law in Oregon, Pendleton. Umatilla County Extension Office. Sponsored by Water for Life. For info: Helen Moore, WFL, 503/ 375-6003, helen.moore@waterforlife.net or website: www.waterforlife.net

May 21-22 WA
Low Impact Series Course 1: Bioretention and Soil Management - Civil and Environmental Engineering Professional Development Course, Seattle. For info: College of Engineering website: www.engr.washington.edu/epp/cee/

May 22 OR
Ecosystem Markets: Taking Action Conference, Portland. Sponsored by Northwest Environmental Business Council, OSU Institute for Natural Resources, and the Willamette Partnership. For info: NEBC, 800/ 985-6322, email: sue@nebc.org or website: www.nebc.org

May 22-23 WA
Ocean Law Conference, Seattle. RE: Environmental, Energy & Commercial Developments Impacting Ocean and Coastal Resources. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com, or website: www.lawseminars.com

May 22-23 WA
Measuring Environmental, Social and Economic Performance: Triple Bottom Line Reporting Course, Seattle. REI-Downtown Seattle. For info: Renata Sobol, NW Environmental Training Center, 206/ 762-1976 or website: www.nwetc.org

May 23 CO
Moving Mountains Symposium, Telluride. RE: Global Water Crisis. For info: Website: www.mountainfilm.org

May 26-30 D.C.
Society of Wetland Scientists Annual Conference, Washington. Wardman Park Hotel. For info: SWS website: www.sws.org

May 28 WA
Sound Synthesis Workshop, Seattle. Washington State Convention & Trade Center. Sponsored by Puget Sound Partnership. For info: PSP, 800/ 547-6863, email: actionagenda@psp.wa.gov or website: www.psp.wa.gov

May 28 CA
Watershed Modeling With HEC-HMS: Overview & Applications Workshop, Sacramento. City Hall Council Chambers. Sponsored by the California Water & Environmental Modeling Forum. For info: CWEMF website: HECHMStechworkshop@cwemf.org

May 28-29 CA
Border Water Infrastructure Conference, San Diego. Mission Valley Hilton. RE: Infrastructure Needs, Funding, Financing Alternatives, Rehabilitating or Replacing Aging Facilities. For info: Water Education Foundation, 916/ 444-6240 or website: www.water-ed.org

May 28-29 OR
Eminent Domain Seminar, Portland. World Trade Center. RE: Land Valuation Litigation, 2007 Initiative Restricting Eminent Domain (Ballot Measure 39), USPAP Changes, Opinion evidence & Appraisal Exchange Requirements. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

May 28-29 OR
NEPA: Writing the Perfect EA/ FONSI or EIS Course, Portland. Ecotrust Jean Vollum Natural Capital Center, Billy Frank Room (2nd Fl), 721 NW Ninth Avenue. For info: Renata Sobol, NW Environmental Training Center, 206/ 762-1976 or website: www.nwetc.org

May 28-31 AZ
Urbanization of Irrigated Land and Water Transfers: U.S. Committee on Irrigation and Drainage (USCID) Water Management Conference, Scottsdale. For info: Larry Stephens, USCID, 303/ 628-5430, email: stephens@uscid.org or website: www.uscid.org/08conf.html

May 29-30 OR
Oregon Water Resources Commission Meeting, TBA. For info: Cindy Smith, WRD, 503/ 986-0876 or website: www.wrd.state.or.us

May 30 OR
Final Report to the Governor - A Framework for Addressing Rapid Climate Change Presentation, Portland. TBA. For info: David Ashton, Port of Portland, 503/ 944-7090 or email: david.ashton@portofportland.com

May 31 WA
Chronic Effects and Toxicity of Contaminants to Organisms in Aquatic and Marine Systems, Seattle. Northwest Environmental Training Center Course. For info: NWTEC website: <http://www.nwtec.org>

June 2-3 CA
Endangered Species Act Conference, San Diego. For info: CLE International, 800/ 873-7130 or website: www.cle.com

June 3-4 LA
National Corrective Action Conference, New Orleans. RE: Hazardous Waste Cleanup. Sponsored by EPA. For info: Nick Stone, EPA, 214/ 665-7226, email: stone.nick@epa.gov or website: www.epacaconf.com/

June 3-6 NV
New MODFLOW Course: Theory and Hands-on Application, Las Vegas. For info: NGWA, 800-551-7379 or website: www.ngwa.org

June 4 WA
Recertification of Certified Erosion and Sediment Control Lead, Shoreline. Shoreline Conference Center. For info: College of Engineering website: www.engr.washington.edu/epp/cee/

- June 4-6** **CO**
Shifting Baselines and New Meridians: Water Resources, Landscapes and the Transformation of the American West Conference, Boulder. University of Colorado Law School. Natural Resources Law Center's 29th Annual Conference. For info: NRLC website: www.colorado.edu/law/centers/nrlc/
- June 5-6** **WA**
Clean Water and Stormwater Seminar, Seattle. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com, or website: www.lawseminars.com
- June 6** **OR**
Oregon Department of Fish and Wildlife Commission Meeting, Salem. For info: Director's Office ODFW, 503/ 947-6044, email: odfw.commission@state.or.us, or website: www.dfw.state.or.us
- June 9** **MT**
Environmental Law A to Z Seminar, Missoula. DoubleTree Hotel. For info: NBI, 800/ 930-6182 or website: www.nbi-sems.com/
- June 9-10** **CO**
Environmental Forensics: Methods & Applications Course, Greenwood Village. For info: NGWA, 800-551-7379 or website: www.ngwa.org
- June 9-12** **NM**
The WINTERS Centennial: Will Its Commitment to Justice Endure? 100th Anniversary Conference, Santa Ana. Pueblo of Santa Ana Hyatt Tamaya Resort. Sponsored by The Utton Center and the American Indian Law Center. For info: Ruth Singer, UNM, 505/ 277-5655, email: singer@law.unm.edu or Utton Center website: <http://uttoncenter.unm.edu/>
- June 10-11** **MT**
Montana Water Policy Interim Committee Meeting, Helena. For info: Krista Lee Evans, Lead Staff, 406/ 444-1640; Committee website: leg.mt.gov
- June 11** **WA**
Underground Storage Tank Installation Training, Seattle. For info: Renata Sobol, NW Environmental Training Center, 206/ 762-1976 or website: www.nwetc.org
- June 11** **WA**
Instream Values Symposium, Lacey. Lacey Community Center, 6729 Pacific Ave. SE, 8am-5pm. Sponsored by the Dept. of Ecology. For info: Tryg Hoff, Ecology, 360/ 407-6631, email: thof461@ecy.wa.gov or website: www.ecy.wa.gov
- June 12** **CO**
Climate Change Adaptation Workshop for Natural Resource Managers, Silverton. For info: Koren Nydick, Mountain Studies Institute, 970/ 247-7071, email: koren@mountainstudies.org or website: www.mountainstudies.org
- June 12-13** **WA**
Underground Storage Tank Inspection Training, Seattle. For info: Renata Sobol, NW Environmental Training Center, 206/ 762-1976 or website: www.nwetc.org
- June 13** **WA**
Hydropower Relicensing Conference, Seattle. For info: The Seminar Group, 800/ 574-4852, email: info@theseminalgroup.net, or website: www.theseminalgroup.net
- June 13** **CO**
Streamflow Workshop: Animas River Management, Durango. Fort Lewis College. For info: Koren Nydick, Mountain Studies Institute, 970/ 247-7071, email: koren@mountainstudies.org or website: www.mountainstudies.org
- June 16-17** **CA**
Land Use & Climate Change Seminar, Los Angeles. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com, or website: www.lawseminars.com
- June 16-20** **OR**
Water Governance and Conflict Management Course, Corvallis. OSU. For info: OSU website: <http://oregonstate.edu/conferences/watergovernance2008/>
- June 16-21** **Italy**
4th European Centre for River Restoration (ECRR) International Conference on River Restoration, Venezia. RE: Hydrology, Geomorphology, Ecology & Economics. For info: Website: www.ecrr.org/pagina/documents/ecrr4conf.pdf
- June 17** **OR**
Managing Carbon: Policy & Practice Conference, Portland. Sponsored by Northwest Environmental Business Council, Lovinger Kaufmann LLP, and Oregon Business Association. For info: NEBC, 800/ 985-6322, email: sue@nebc.org or website: www.nebc.org
- June 17-18** **DC**
River Action Day, Washington D.C. Sponsored by American Rivers. For info: Josh Klein, AM, 202/ 347-7550 or website: www.americanrivers.org
- June 17-18** **WA**
Low Impact Development Series Course 2: Permeable Pavements Course, Seattle. For info: College of Engineering website: www.engr.washington.edu/epp/cee/
- June 18-20** **WA**
Introduction to Channel Migration Zone Delineation Course, Spokane. For info: NWTEC website: www.nwetc.org
- June 19-20** **OR**
Oregon Environmental Quality Commission Meeting, Portland. For info: Wendy Simons, DEQ, 503/ 229-5301 or website: www.deq.state.or.us
- June 19-20** **WA**
Introduction to Aquatic Toxicology: Understanding Impacts of Organic Chemicals and Metals on Aquatic Ecosystems Course, Bellingham. Emerald Bay at the Bellingham Yacht Club. For info: NWTEC website: <http://www.nwetc.org>
- June 22-25** **MD**
Sustainability 2008-Green Practices for the Water Environment Seminar, National Harbor. Gaylord National on the Potomac. For info: WEF, email: registration@wef.org or website: www.wef.org/Sustainability
- June 23-27** **France**
River Restoration: Fluvial-Geomorphic and Ecological Processes Course, Provence. Beaumont du Ventoux. For info: Institut Beaumont website: <http://institutbeaumont.com/>
- June 24** **AZ**
The Importance of the Colorado River for Arizona's Future, Phoenix. Arizona Biltmore Resort. Sponsored by the Arizona Water Resources Research Center. For info: Sharon Megdal, WRRRC, email: smegdal@cals.arizona.edu or website: www.cals.arizona.edu/AZWATER
- June 24** **FL**
Clean Water Act and the National Pollutant Discharge Elimination System (NPDES) Workshop, Orlando. RE: Clean Water Act, Scope of the NPDES Program, other water regulations (e.g., SPCC, Wetlands), case studies and more. For info: Trinity Consultants, 800/ 613-4473 or website: www.trinityconsultants.com
- June 24-27** **OR**
Air & Waste Management Association's Annual Conference, Portland. Oregon Convention Center. For info: A&WMA website: www.awma.org/ACE2008/
- June 26-27** **NV**
Law of the Colorado River Conference, Reno. Grand Sierra Resort & Casino. For info: CLE International, 800/ 873-7130 or website: www.cle.com
- June 26-27** **NV**
National Wetlands Conference, Reno. For info: CLE International, 800/ 873-7130 or website: www.cle.com
- June 29-July 1** **UT**
Adaptive Management of Water Resources II, Snowbird. Snowbird Resort. Sponsored by the American Water Resources Assoc.. For info: AWWA, 540/ 687-8390 or website: www.awra.org
- June 29-July 3** **AK**
Permafrost on a Warming Planet: Impacts on Ecosystems, Infrastructure and Climate, AWRA Conference, Fairbanks. University of Alaska. For info: AWWA, 540/ 687-8390 or website: www.awra.org
- June 30-July 2** **VA**
Riparian Ecosystems and Buffers: Working at the Water's Edge, 2008 Summer Specialty AWRA Conference, Virginia Beach. Founder's Inn and Spa. For info: AWWA, 540/ 687-8390 or website: www.awra.org
- July 6-9** **Australia**
1st International Conference on Technologies and Strategic Management of Sustainable Biosystems, Perth. RE: Technical Aspects of Sustainable Biosystems and Their Integration into Society. For info: Website: www.etc.murdoch.edu.au/IOBB2008
- July 8-10** **OR**
Wetland Demystified! Navigating the Complicated World of Wetland Delineation, Regulation, and Restoration Course, Troutdale. For info: NWTEC website: <http://www.nwetc.org>
- July 9-11** **ND**
Summer 157th Council Meeting (Western States Water Council), Medora. AmericInn Hotel. For info: Cheryl Redding, WSWC, 801/ 561-5300, email: credding@wswc.state.ut.us or website: www.westgov.org/wswc/J208
- July 14-18** **CA**
Hydro Vision 2008 Conference, Sacramento. Convention Center. For info: HCI website: www.hcipub.com

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July 14-18 UT
Short Course: Principles and Practice of Stream Restoration, Part I, Logan. Utah State University. For info: USU website: <http://uwrl.usu.edu/streamrestoration/default.htm>

July 16-18 CA
4th Young Water Professional Conference, Berkeley. Clark Kerr Campus of the University of California. For info: Email: floodoc@pacbell.net or website: www.iwa-ywpc.org

July 16-20 UT
Stream Restoration Short Courses, Logan. Utah State University. For info: College of Natural Resources, 435/ 753-9152 or email: laelp@cc.usu.edu

July 17 OR
Solar Power: Projects & Permitting Seminar, Portland. World Trade Center. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

July 17-18 OR
Oregon Department of Fish and Wildlife Commission Meeting, Prineville. For info: Director's Office ODFW, 503/ 947-6044, email: odfw.commission@state.or.us, or website: www.dfw.state.or.us

July 17-18 NM
Natural Resources Damages Litigation Seminar, Santa Fe. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com, or website: www.lawseminars.com

July 17-19 CO
Rocky Mountain Mineral Law Institute 54th Annual Meeting, Snowmass/Aspen. For info: RMMLF, 303/ 321-8100, email: info@rmmlf.org, or website: www.rmmlf.org

July 18 OR
Northwest Water Marketing & Trading Conference, Portland. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

July 18 OR
"Water, Wetlands, Carbon and Biofuels: Creating Environmental Capital" Seminar, Portland. World Trade Center. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

July 20-25 Brazil
International Wetlands Conference, Cuiaba. For info: Conference website: www.cppantanal.org.br

July 24-25 CA
CEQA Conference, Sacramento. For info: CLE International, 800/ 873-7130 or website: www.cle.com

July 28-29 CA
Environmental Resource Litigation, San Francisco. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com, or website: www.lawseminars.com

July 31-August 1 NM
New Mexico Water Law Seminar, Santa Fe. The Eldorado Hotel. For info: CLE International, 800/ 873-7130 or website: www.cle.com

August 4-5 AZ
Arizona Water Law Conference, Phoenix. For info: CLE International, 800/ 873-7130 or website: www.cle.com

August 4-5 CA
California Climate Change, San Francisco. For info: CLE International, 800/ 873-7130 or website: www.cle.com

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

August 6-8 TX
20th Annual Texas Environmental SuperConference, Austin. Four Seasons Hotel. For info: Texas Enviro & Nat. Res. Law Section, email: textenrls@gmail.com or website: www.textenrls.org/calendar.html

August 8 OR
Oregon Department of Fish and Wildlife Commission Meeting, Salem. For info: Director's Office ODFW, 503/ 947-6044, email: odfw.commission@state.or.us, or website: www.dfw.state.or.us

August 10-15 CA
Short course: Geomorphic and Ecological Fundamentals for River and Stream Restoration, Truckee. Sagehen Creek Field Station. For info: Field Station website: <http://sagehen.ucnrs.org/courses/geomorph.htm>

August 11 TX
Water Sales & Transfers Seminar, Corpus Christi. For info: Lorman Education Services, 866/ 352-9539 or website: www.lorman.com/seminars/

August 11-12 WA
TMDLs in the Pacific Northwest, Seattle. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com, or website: www.lawseminars.com

August 12-13 MT
Montana Water Policy Interim Committee Meeting, TBA. For info: Krista Lee Evans, Lead Staff, 406/ 444-1640; Committee website: www.leg.mt.gov

August 14-15 CA
CEQA Conference, Los Angeles. For info: CLE International, 800/ 873-7130 or website: www.cle.com

August 15 HI
National Environmental Policy Act & Hawai'i EIS Law Seminar, Honolulu. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com, or website: www.lawseminars.com

August 15 HI
NEPA and Hawai'i EIS law, Honolulu. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com, or website: www.lawseminars.com

August 16-20 ON
American Fisheries Society Annual Meeting, Ottawa. For info: AFS website: www.fisheries.org/afs/



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