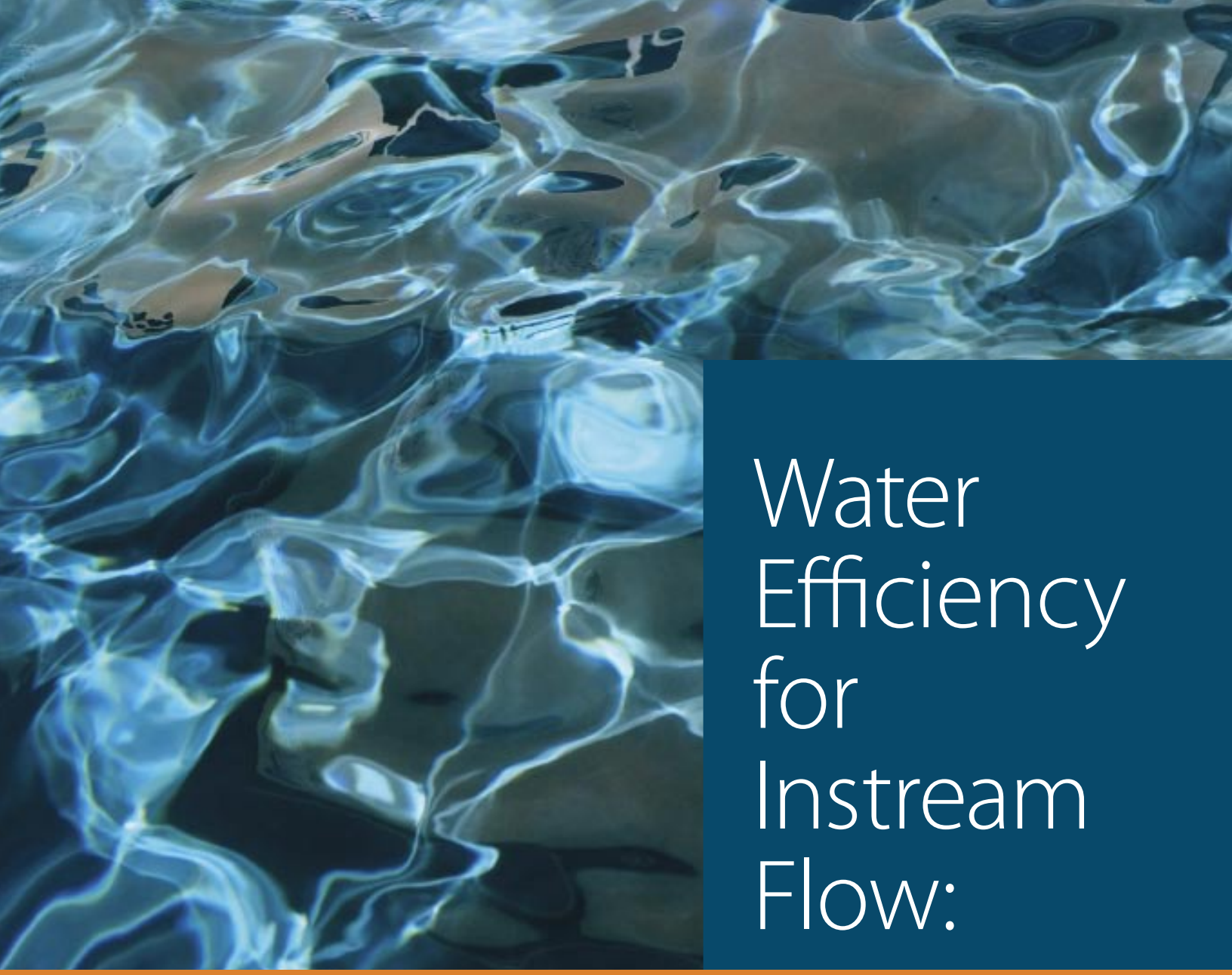


# Water Efficiency for Instream Flow:

# Making the Link in Practice

October 2011

Alliance for Water Efficiency

American Rivers
Rivers Connect Us

Environmental Law Institute

A joint project of the Alliance for Water Efficiency, American Rivers, and the Environmental Law Institute

# Project Partners


Alliance for Water Efficiency
33 N. LaSalle Street, Suite 2275
Chicago, Illinois 60602

**www.allianceforwaterefficiency.org**

## Alliance for Water Efficiency

The Alliance for Water Efficiency (AWE) is dedicated to the efficient and sustainable use of water in the United States and Canada. Based in Chicago, this nonprofit group advocates for water efficient products and programs and provides information and assistance on water conservation efforts. AWE works with over 325 member organizations, providing benefit to water utilities, business and industry, government agencies, environmental and energy advocates, universities, and consumers.


American Rivers
1101 14th Street NW, Suite 1400
Washington, DC 20005

**www.americanrivers.org**

## American Rivers

American Rivers is a conservation organization standing up for healthy rivers so that communities can thrive. With over 65,000 members and supporters, American Rivers works in five key program areas—rivers and global warming, river restoration, river protection, clean water and water supply—to protect our remaining natural heritage, undo the damage of the past and create a healthy future for our rivers and future generations.


The Environmental Law Institute
2000 L Street, NW, Suite 620
Washington, DC 20036

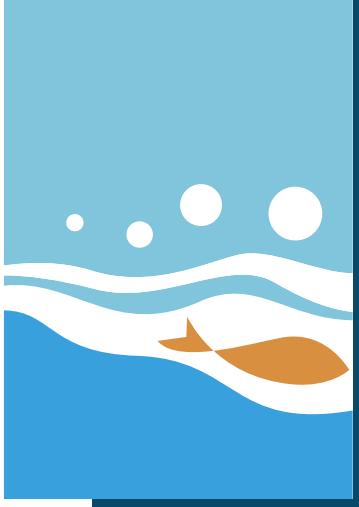
**www.eli.org**

## Environmental Law Institute

The Environmental Law Institute (ELI) is a non-profit, non-partisan research and education organization. ELI's mission is to advance environmental protection by improving environmental law, policy and management. Since 1969, ELI has been a preeminent source of information on federal, state, and local approaches to solving environmental problems. Through its research, practical analysis, and forward-looking publications, ELI informs and empowers opinion makers, including government officials, environmental and business leaders, academics, members of the environmental bar, and journalists.

# Project Team

Mary Ann Dickinson, *Alliance for Water Efficiency*
Cindy Dyballa, *Alliance for Water Efficiency*
Michael Garrity, *American Rivers*
Adam Schempp, *Environmental Law Institute*



# Water Efficiency for Instream Flow:

# Making the Link in Practice

## Contents

October 2011



Separate **Resource Sections** on municipal, state and agricultural water efficiency

Report and Resource Sections online:
**www.allianceforwaterefficiency.org**


## Acknowledgments

The Walton Family Foundation provided funding for this project.

A dedicated and enthusiastic advisory group gave invaluable advice, insights and support. The findings are not endorsed by the advisory group or their organizations:

Larry MacDonnell
*University of Wyoming College of Law*

Steve Olson
*Arizona Municipal Water Users Association*

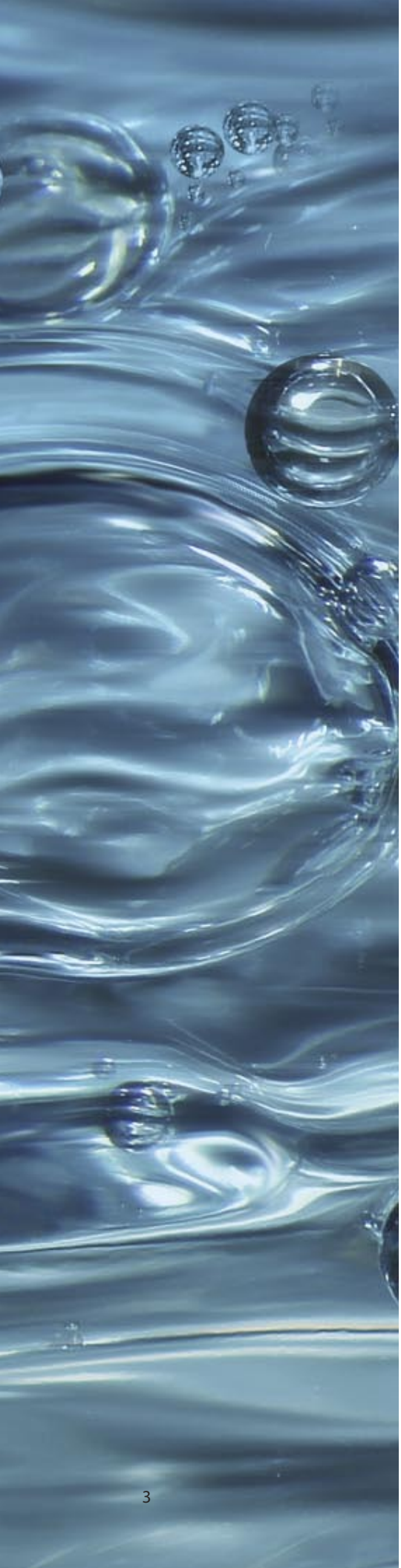
Jay Skinner
*Colorado Division of Parks and Wildlife*

Frances Spivy-Weber
*California Water Resources Control Board*

Brad Udall
*University of Colorado and NOAA Western Water Assessment*

Mike Wade
*Agricultural Water Management Council*

Many throughout the western U.S. provided insights and information through personal interviews, phone conversations and emails, sharing draft reports, or attending a one-day working session of experts. A special thanks to Bill Christiansen and Alexa Loftus, Alliance for Water Efficiency, and Brandon Souza, Agricultural Water Management Council, for assistance with the sections on municipal and agricultural water use efficiency.



# Summary

Throughout the Colorado River basin, with ever-expanding demands for multiple water uses and increasingly uncertain supply, any promising opportunity to do more with less is welcome. The importance of healthy instream flows, as one of these uses, is more pressing than ever. Improved water efficiency can in concept help stretch water supplies and contribute to protection of aquatic environments and the resources and services that they provide.

This report summarizes efforts to explore whether water efficiency efforts can be linked in practice to improved instream flows in areas of the Colorado River basin. In brief, we found that practical possibilities to do this do exist within the current context of the river basin. Given a stream stretch with a clearly identified need for improved instream flows and a realistic opportunity for improving water efficiency, willing partners generally can build the bridges needed to overcome other challenges.

Project partners Alliance for Water Efficiency, Environmental Law Institute and American Rivers, each with a different perspective on the issue, posed several key questions which are addressed in this report:

1. What is the **practical experience in the western U.S.** in achieving greater water efficiencies and applying them to instream flows, and what lessons can we apply to the unique characteristics of the Colorado River basin?

2. What is the **legal setting in each basin state** for applying conserved water to instream purposes?

3. What are the **practical challenges** to using water efficiency programs to improve instream flows in the Colorado River basin?

4. What are the **most promising on-the-ground opportunities**—incentives and strategies, characteristics of success, and approaches to partnership—in the basin?

**The Colorado River basin is perhaps the most challenging river basin in the nation:** water demand now exceeding supply, valued but fragile ecosystems, and support for nearly every type of water-relevant interest. Building on this urgency led to this one-year survey project to explore the link between water efficiency programs and improved instream flows in the Colorado River basin. Much is already known about how to achieve greater water efficiencies in urban and agricultural water use in a given situation. Documented instream flow needs of priority aquatic environments are available in much of the basin.

## Experience Across the West

Across the West, water from both agricultural and municipal water efficiency efforts has been used to improve instream flows, often in combination with other water management efforts. Cases from around the West show that while an external legal or regulatory driver, or anticipation of one, can prompt action, cooperation can multiply benefits and aid success. Water efficiency is often just one part of the water management package. Funding often requires creativity and multiple sources. Location and scale of projects vary; successful projects come in all sizes from rural headwaters involving just two partners to major stream stretches involving many parties.

## The Legal Setting

It is possible to apply water from efficiency efforts to enhance instream flows in each Colorado River basin state, but opportunities and legal protections are greater in some states than in others. A wide array of federal and state programs can also affect water management decisions in a single stream as well as across the Colorado River basin, forming a difficult web to navigate.

## The Challenges

A wide range and diversity of challenges arise when people from the Colorado River basin contemplate using water from water efficiency efforts to help improve instream flows. And the obstacles are many: legal, institutional and motivational, economic, and physical.

The traditional characteristics of the prior appropriation system of water allocation can appear to be a formidable barrier, particularly procedures associated with protection of other water right holders and the concept of "use it or lose it." For some, the biggest concern is potential impairment of existing water rights because of the complex interactions between water uses. Polarized water interests exist in many areas. Fear, uncertainty, and a lack of trust can dominate conversations about improved water efficiency and the use of any resulting water.

For others, the biggest question concerns who will pay for these efforts. A disconnect in costs, benefits, and impacts inhibits action. The timing and location of instream flow needs may not match the water that can be made available. Similarly, following the physical drop of water may show that greater water efficiency does not result in additional water in a particular situation. And since all individual efforts take place in a basin context, unintended consequences may result.

## Incentives and Strategies

Yet many of these apparently pervasive challenges can be cooperatively addressed on a local or watershed basis, particularly in cooperation with others. The context is different in each case: the parties, the needs, the concerns, and more. As a result, the approach will vary for each situation. As different incentives motivate different types of willing partners, it is important to identify the challenges in a particular situation and consciously find ways to address and even leverage them.

Attitude, trust, and willingness are the most important keys to success. These can counteract polarization, attitudes, and lack of motivation. Partnerships are key for action—one water right holder can't do this alone—and leadership is key to partnerships.

Initial motivation often comes from outside events, such as anticipated Endangered Species Act actions. While money can really motivate, it is not the only, or often the primary, factor. Motivations to take action

can transcend money—"green" values, water based recreation interests, vista preservation, a sense of legacy for the future.

While it is more difficult in some Colorado River basin states than in others, it is possible to link water resulting from efficiency measures to streamflow improvement in each state. Where conserved water can be protected from forfeiture or transferred to an instream flow use and protected from other water users, there is greater incentive to link efficiency and flow. It is important to distinguish between what the law allows and the perception of what is legally possible. Clarifying this can be an important strategy in fostering this link.

## Promising Opportunities

Practical possibilities for linking water efficiency efforts and instream flows exist within the current institutional context of the Colorado River basin. Given a stream stretch with a clearly identified need for improved instream flows and a realistic opportunity for improving water efficiency, willing partners generally can build the bridges needed to overcome other challenges. Creative funding, a defined legal path, and short-term or pilot efforts are other indicators of likely success.

With a champion or catalyst, willing partners, and a locally tailored approach, more efficient water use can be linked to improved instream flows in areas of the Colorado River basin. To forge this link on the practical level, incentives and approach are best designed separately for each specific situation. Different incentives tailored to motivate various types of willing partners are required: for communities, water suppliers, agricultural water districts, farmers and ranchers, nonprofit organizations, government partners, and others.

Nonprofits and government agencies can choose to begin short term efforts that set the stage for local action, and strengthen the link between local instream flow needs and water efficiency efforts. These efforts can work squarely within existing institutions.

Opportunities can take the form of:

- An upstream farmer or rancher working with a nonprofit with an interest in streamflow protection;
- A community with a direct connection to a stream stretch;
- An agricultural district seeking to modernize its water management systems in a way that can also reduce or relocate diversions from a river;
- Three-way arrangements for water use, such as trades among agriculture, streamflow, and a state fish and wildlife agency;
- A nonprofit with strong local relationships willing to take the lead; and
- Multiple partners collaborating in a stream stretch to anticipate an upcoming environmental need, whether physical or regulatory.

# Overview

Throughout the Colorado River basin, with ever-expanding demands for multiple water uses and increasingly uncertain supply, any promising opportunity to do more with less will allow the many uses that the river supports to continue. The importance of healthy instream flows, as one of these uses, is more pressing than ever. Improved water efficiency can in concept help stretch water supplies and contribute to better protection of aquatic environments and the resources and services that they provide.

Much is already known about how to achieve greater water efficiencies in urban and agricultural water use in a given situation. Documented instream flow needs for priority aquatic environments are identified in much of the Colorado River basin. But addressing these needs with water made available through water efficiency programs has not been adopted as a ready, common solution, either in the basin or elsewhere.

The Colorado River basin, a watershed of 246,000 square miles, poses perhaps the greatest water management challenges of any river basin in the nation: water demand exceeding supply, valued but fragile ecosystems, and support for nearly every type of water-relevant interest. Water must serve multiple purposes as it travels from headwaters at high mountain elevations to the delta at the Gulf of California. Millions make use of Colorado River water resources, many of them outside the physical boundaries of the basin. Uses range from water for agriculture and rangelands, residential and commercial development, industrial manufacturing, mining, energy production, and Native American communities, to ecosystem services for water-dependent recreation and tourism, endangered and other water-dependent species, wetland health, water quality, broader ecosystem health, and more.

Over the past few years, a wide range of groups has called for innovation in addressing these often conflicting water uses. Building on this urgent appeal led to this one-year survey project to explore the practical link between water efficiency programs and improved instream flows in the Colorado River basin.

Project partners Alliance for Water Efficiency, Environmental Law Institute and American Rivers each bring a different perspective and expertise to this issue—water efficiency, western water law, and river protection. We posed several questions:

1. What is the **practical experience in the western U.S.** in achieving greater water efficiencies and utilizing the resulting water for instream flows, and what lessons can we apply to the unique characteristics of the Colorado River basin?

2. What is the **legal setting in each basin state** for applying conserved water to instream purposes?

3. What are the **practical challenges** to using water efficiency programs to improve instream flows in the Colorado River basin?

4. What are the **most promising on-the-ground opportunities**—incentives and strategies, characteristics of success, and approaches to partnership—in the basin?

This report summarizes what we found. In brief, practical possibilities for linking water efficiency efforts and instream flows exist within the current context of the Colorado River basin. Given a stream stretch with a clearly identified need for improved instream flows and a realistic opportunity for improving water efficiency, willing partners generally can build the bridges needed to overcome other challenges.

## About This Report

This report is a practical assessment, presenting options for localized action, not a firm set of policy recommendations. It is intended for a diverse audience, but may be most useful for municipal and agricultural water agencies and utilities, state and federal water policy decision makers, and nonprofit organizations working in water policy and water resources management in the basin.

This report first highlights current municipal and agricultural water efficiency efforts, to illustrate


# The Colorado River Basin

the range of common practice and identify what works and what doesn't, regardless of the purpose for these efforts. It also summarizes availability of information about high-priority streamflow needs in the basin. This report uses a very broad concept of "water use efficiency" and "water conservation" since these terms are defined differently across states and contexts.

Six case studies follow in **Chapter 2**, drawn from over 40 candidate examples documented by the project team, to illustrate the link between water efficiency programs and improved instream flows around the West. Lessons are drawn from this range of experience, based on personal interviews with those involved in the highlighted cases, and available materials. **Chapter 3** presents an analysis of the law relevant to using conserved water for instream purposes in the basin.

The challenges and incentives—legal, institutional and motivational, economic and financial, physical and environmental, and water use—to linking more efficient water use and improved streamflows in the basin are presented in **Chapter 4**. These were developed from over 60 interviews of knowledgeable individuals throughout the basin and the West, along with a one-day working session of selected basin experts. The promising opportunities identified, in terms of both characteristics of success and promising approaches, are the result of analysis and synthesis of all this information.

While the focus is on local, practical opportunities with willing partners within the existing basin context, we also include what we heard about how states and nonprofits can potentially set the stage for more local activities. Separate **Resource Sections** contributed by water efficiency experts lead the reader to more information on state level water efficiency initiatives and examples of current experience with municipal and agricultural water efficiency programs.

# More Efficient Water Use: Common Practice

Many communities, agricultural water districts, farmers and industries across the U.S. have significant experience in increasing the efficiency of their water use to meet a variety of water supply and environmental challenges. Much is already known about how to achieve these greater water use efficiencies, the range of successful practices, and what's best in a given municipal or agricultural situation.

## Municipal Water Efficiency

Many municipalities throughout the U.S. face a wide range of water supply and water resource challenges. This is particularly true in the arid West and among the states withdrawing water from the Colorado River, where environmental concerns are prominent and limited water resources are already spread thin. Even when a municipality has sufficient freshwater resources to meet present needs, forecasts may reveal a future demand that grows beyond an existing and perhaps less reliable supply. This imbalance can be partly or fully addressed through water demand management strategies such as water efficiency programs, which are often also called water conservation programs even though the terms are technically different. Water "efficiency" refers to the efficient flow rate of a fixture or device, such as a showerhead; water "conservation" refers to the behavior of the customer that is using that efficient device, as in taking shorter showers. However, at the municipal program level, the terms are usually used interchangeably.

Municipal water efficiency programs are a successful way to deal with a wide variety of needs, and our collective experience with them spans over three decades. Typically most water utilities first target residential customer end uses such as toilet flushing, clothes washing, showering, faucet use, lawn irrigation, and other outdoor water use. Water efficiency programs are also designed to target specific problems in growing consumer demand: commercial and industrial water use, peak season demand and the growing phenomenon of outdoor water use, or leakage in the water delivery system itself. Municipalities and their water utilities usually employ education and outreach programs, ordinances, and conservation rate structures as part of their efforts.

Motivations behind the implementation of efficiency programs vary, but two common reasons are to facilitate population and economic growth without greatly increasing the need for new or expanded water supplies and to avoid infrastructure expansion projects such as building new treatment and storage facilities for water supply or wastewater. In addition, environmental concerns and state regulatory requirements can be driving forces behind water efficiency programs. And it's worth noting that just as motivations for undertaking water efficiency efforts differ, so do the results, in terms of reduced surface or groundwater withdrawals, the balance of water supply sources for a specific water utility, and the impact on streamflows.

## Targeting the Most Cost-Effective Strategies

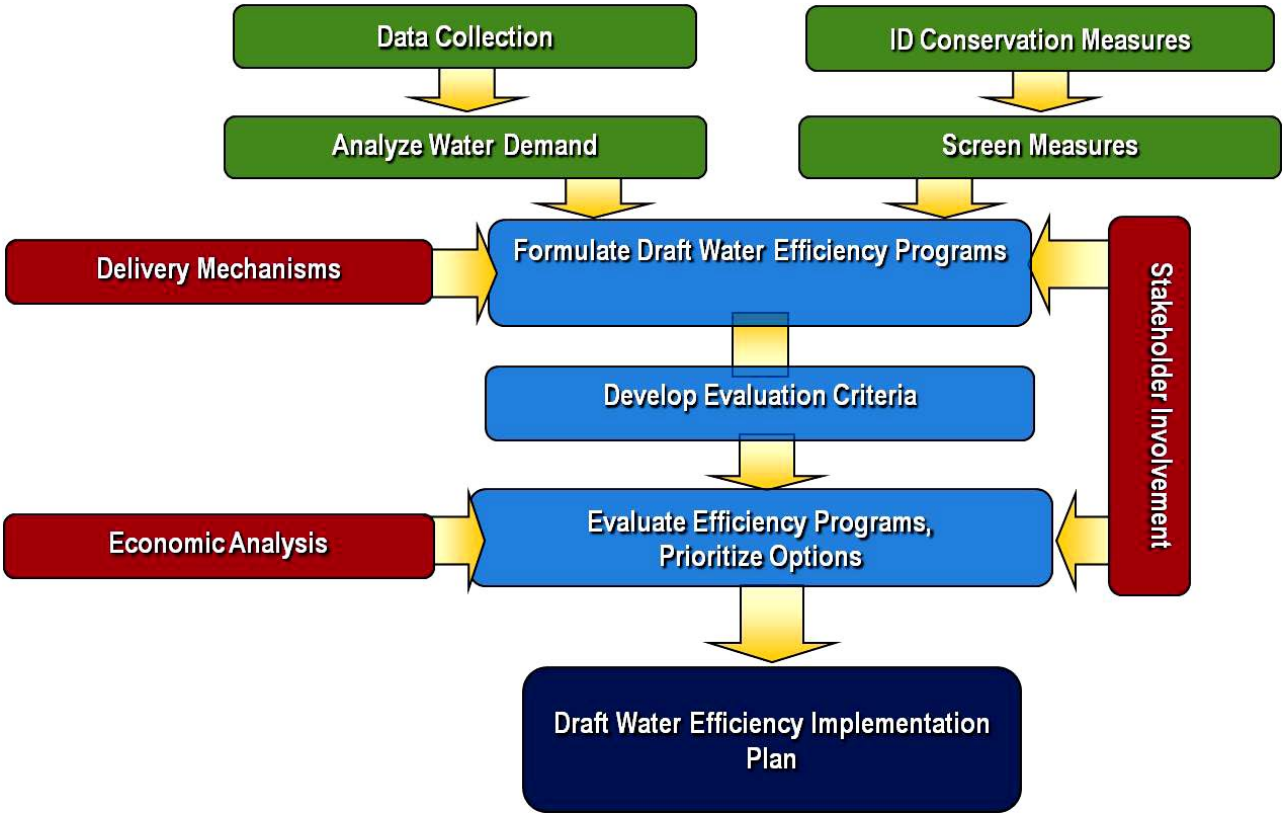
How do water utilities target specific end uses and reduce water consumption in their service area? They can undertake active water efficiency programs, conduct education and outreach activities, and adopt ordinances affecting specific water uses. One of the most popular efficiency program strategies for water utilities is the product rebate. Customers are given a monetary incentive for purchasing an efficient toilet, showerhead, clothes washer, smart irrigation controller, or other water using device. Sometimes water utilities offer a direct installation program; or in the case of toilets or irrigation systems, may require a licensed plumber or contractor to conduct the installation. This insures the device is installed properly and will perform as it should. Site surveys or audits are also used to identify water saving opportunities. It is a great way to engage customers, and is very effective in commercial and industrial applications due to the great variations in water use in those sectors.

Methodical planning for water efficiency programs is essential. This process is outlined in the diagram on the next page. It is important that a water utility have an accurate understanding of its supply situation, how its customers use water, and how both of these things will change in the future. When the need for efficiency programs is documented and understood, targets and goals can be made. Following this, conservation measures that are suitable for the service area can be identified and evaluated. At the core of the evaluation process is the benefit-cost analysis, where the designed programs are evaluated to ensure that they will save a unit of water more economically than it can be purchased or produced through new supply creation. One exception to this rule is the water efficiency education and outreach program. While the savings attributable to these specific programs are difficult to separate out from other program efforts, educating and interacting with the community is the backbone of any water efficiency portfolio.

## Successful Municipal Programs

**Resource Section 1** details successful municipal water efficiency programs from 18 communities in 11 states coast to coast. These examples illustrate what is possible, and indeed practical, among municipalities. These can be used as a reference to identify and understand the wide range and diversity of best practices in urban water efficiency, associated costs and savings, and the types of communities that have undertaken water efficiency efforts. Information on program offerings and reported water savings was drawn primarily from each utility's own website and printed materials. Programs target mostly residential customers, unless otherwise noted.

In order to assist municipalities in planning cost-effective water conservation programs, AWE developed a specialized model. The AWE Water Conservation Tracking Tool is an Excel-based model that can be used to evaluate the water savings, costs, and benefits of municipal conservation programs. **Resource Section 2** illustrates the water efficiency program planning process for a hypothetical Colorado River basin community using this tool.




Source: AWWARF Project 2935: Water Efficiency Programs for Integrated Water Management, A&N Technical Services, Inc.

It demonstrates that water utilities can plan to save a targeted amount of water and that this effort can be cost effective, meaning the the benefits outweigh the costs. This example provides estimated changes in service area water demand from a sample group of water efficiency programs and discussion regarding the results.

## State Initiatives and Policies

In October 2009 AWE completed a review of existing state-by-state municipal water efficiency requirements and initiatives in the U.S.[1] Information from the survey for the seven Colorado River basin states is appended in **Resource Section 3**. In summary, all of the basin states provide technical assistance for implementing water efficiency measures. Five of the seven states require municipal water conservation planning and implementation of water efficiency measures for water utilities. And all but one offer some form of financial assistance. In California, both municipal water utilities and agricultural water districts signed agreements committing to implement a suite of appropriate best management practices. Since the time of the survey, California has adopted additional water conservation legislation, with a sweeping target of 20 percent reduction in per person urban water use by 2020, with additional requirements for both urban and agricultural water suppliers, which will lead to more efficient water use in the state.[2]

[1] A summary of findings for all 50 states is posted in the AWE Resource library: **http://a4we.org/water-efficiency-US.aspx**. An update is planned for spring 2012.

[2] California Water Conservation Act of 2009 (Senate Bill X7-7).

# State Water Conservation Initiatives and Requirements for Colorado Basin States, 2009

| | Arizona | California | Colorado | Nevada | New Mexico | Utah | Wyoming |
|---|---|---|---|---|---|---|---|
| Does the state require preparation of drought emergency plans by water utilities or cities on any prescribed schedule? | Yes | Yes | No | Yes | No | No | No |
| Does the state have a mandatory planning requirement for drinking water conservation separate from drought emergency plans? | Yes | Yes | Yes | Yes | No | Yes | No |
| Does the state require implementation of conservation measures as well as preparation of plans? | Yes | Yes* | Yes | Yes | No | Yes | No |
| Does the state have the authority to approve or reject the conservation plans? | Yes | Yes | Yes | Yes | No | No | No |
| Does the state have minimum water efficiency standards more stringent than federal or national requirements? | Yes | Yes | Yes | Yes | No | No | No |
| Does the state regulate drinking water supplies and require conservation as part of its permitting process or water right permit? | Yes | Yes | Yes | No | Yes | No | No |
| Does the state allow funding for conservation programs under a state revolving fund? (drinking water) | Yes | Yes | Yes | No | Yes | No | Yes |
| Does the state allow funding for conservation programs under a state revolving fund? (wastewater) | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Does the state offer other financial assistance? Bonds? Appropriations? | Yes | Yes | Yes | Yes | Yes | Yes | No |
| Does the state offer direct or indirect technical assistance? | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Does the state provide statewide ET microclimate information? | Yes | Yes | Yes | No | No | No | No |

Source: Alliance for Water Efficiency State Survey, Oct. 2009 at **http://a4we.org/water-efficiency-US.aspx**

* While California does not literally require specific measures, its mandatory water use reduction goals cannot be met without action.

# Agricultural Water Use Efficiency

There's great experience, and interest, in both on-farm and delivery system water efficiency. Water use efficiencies in agriculture can be achieved both with refined on-farm distribution practices and improvements to district-wide water management and delivery systems. Managing farm water is more than simply watering the crop once a week. Many factors influence how much water it takes to produce a crop, including soil type, soil salinity management, temperature, the delivery schedule of irrigation water and the type of irrigation system being used. Variables within each of these factors make irrigation management a challenging and often difficult task for farmers.

## How Agricultural Water Use Efficiency Differs from Municipal Water Conservation

Many agricultural districts and farmers, like urban communities, have experience with efforts to use water more efficiently or to reduce the amount of water that they are consuming. Farmers use water to produce food and fiber for the public to consume, much as factories might use steel to manufacture goods. But as noted above, different factors influence irrigation management and efficient agricultural water use. In agriculture, using more or less water than optimal can have serious consequences for production and the health of the crop.

## Agricultural Water Conservation

Water conservation in agriculture may take the form of changes to the characteristics of agricultural water supply and demand. The Agricultural Water Conservation Clearinghouse at Colorado State University provides a broad definition of agricultural water conservation as including any of the following:

- Increased crop water use efficiency
- Improved irrigation application efficiency
- Increased capture and utilization of precipitation
- Decreased crop consumptive use
- Increased irrigation water diversion and delivery efficiencies
- Reduced water use through adoption of conservation measures and new technologies for water management[3]

## Agricultural Water Use Efficiency

There are a number of methods commonly used to help estimate or quantify on-farm water use efficiency. One common method is to consider the amount of water it takes to produce a certain amount of plant growth, a method often referred to as "crop per drop."

The "crop per drop" method, also known as agronomic water use efficiency, recognizes that different crops serve different needs, and values the improvement of growing practices to ensure that farmers are matching water use to the specific needs of their situation. Those needs are met through a number of factors.

"Crop per drop efficiency" includes a factor known as distribution uniformity, or the uniform distribution of water across an entire field. This in turn affects efficiency. A field may have different soil characteristics from one end to another or may not be perfectly level, which could reduce the potential distribution uniformity of the irrigation water applied to the field. Low distribution uniformity increases water use and in some cases the energy needed to pump the water to produce a crop.

[3] Agricultural Water Conservation Clearinghouse at Colorado State University, at **http://agwaterconservation.colostate.edu/**.

## How Evapotranspiration Affects Water Use

Many farmers use the reference evapotranspiration requirements of their crop to determine how much water to apply during an irrigation cycle and to gauge efficient water use. Reference evapotranspiration (expressed as ETo) is the amount of water that evaporates from the soil and is used (transpired) by the plant. The reference ETo is divided by the distribution uniformity of the field to determine the amount of water to apply to meet all of the crop's water needs.

Farmers are able to check actual irrigation conditions against known crop ETo to determine their level of water use efficiency, using a standard formula that calculates irrigation water use efficiency and comparing the results to known ETo:

$$\text{Inches of water applied} = \frac{9.63 \cdot T \cdot Q}{A}$$

T = hours
Q = flow in gallons per minute
A = area in square feet

## Economic Water Use Efficiency

Water use efficiency can also be defined as the monetary value of crop production as compared to the amount of water used to produce it. Some crops have less value per acre, and water use by crop varies widely as well. Farmers make decisions on which crops to grow based in part on whether there is a market to sell them. Other factors affect farmers' crop choice decisions, including the need to rotate crops for soils management or to support other agricultural efforts such as milk and beef production or respond to federal subsidy rules. Switching from one crop to another may produce more dollar value for the amount of water applied but it may use the same amount of water or even more to produce the higher economic return.

Irrigation water is particularly important to the value of U.S. agriculture, whose irrigated acreage produces nearly half of the total production value but occupies only 16 percent of harvested farmland. Efforts to advance farm water efficiencies have resulted in real benefits to production and water use. For example, in California's diverse agriculture industry, production values have increased dramatically while actual water use has declined. According to the California Department of Water Resources, from 1967 to 2007 the value of California's agricultural output more than doubled while during the same time period applied water declined by 14 percent. In 1967 the gross value (in 2007 dollars) of crop production per acre-foot of applied water was $638. In 2007 that figure was $1,373 per acre-foot, a 115 percent increase since 1967.[4]

## Consumptive and Non-Consumptive Water Use

Water efficiency measures in agriculture most directly affect non-consumptive water use—water not actually used by the plant for its growth and production but often valuable to sustain long-term production such as soils quality and salinity management. In practice, consumptive use generally refers to water actually 'used' by the crop through evapotranspiration. Both on-farm and delivery system efficiencies affect location and timing of diversions and return flows for farm water use. While reducing diversions does not necessarily reduce consumptive use, it can have significant influence on stream flows and long-term water supply. Type of crop, number of acres, evaporative field losses, and deficit irrigation can all affect consumptive use. Similarly, return flows after crop water use often wind up in surface or ground water in a different location; their timing, volume and quality all affect how the efficiencies impact instream flows. The diagram on page 14 of the interaction of natural and irrigation systems for Colorado agricultural water applies west-wide.

## Effects of Improved Water Use Efficiency on Instream Flows

Due to the complexity of the hydrologic and water use system, it is difficult to gauge what effects improving agricultural water use efficiency methods might have on instream flow, particularly when looking more broadly than site-by-site. In order to assess the potential impacts in a specific situation, it is not enough to look only at efficient irrigation and distribution methods, but also their effect on withdrawals, the crop, return flows, and downstream use and reuse of diverted water. Return flows after crop water use often meet the stream in a different location than the point at which that water was originally diverted from the stream. Changes in the timing, volume and quality of those return flows are the primary impacts that water use efficiencies have on streamflow. Reductions in the amount of water diverted can improve instream flows to the traditional point of return flow, but significant reductions in return flows can mean less water in the river below the return flow point than previously

[4] California Water Plan Update 2009, Volume IV-Reference Guide, California Dept. of Water Resources, 2009.

available. The legal complexities resulting from these effects of agricultural water efficiencies are addressed in **Chapter 3**.

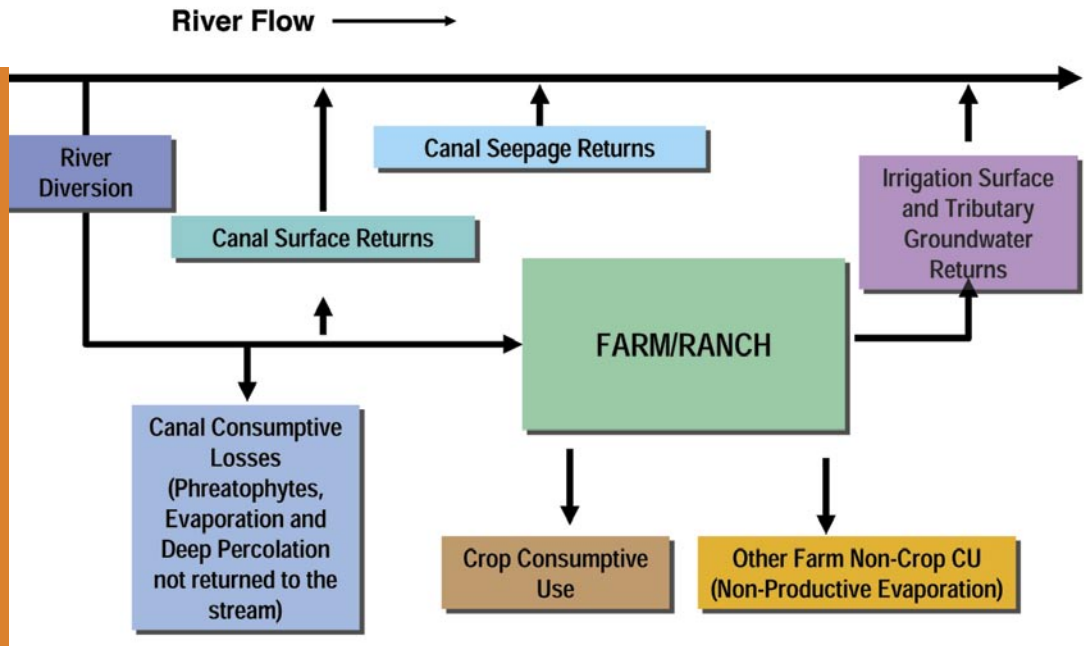
Effects of improved agricultural water use efficiency on instream flows depend on many variables, each having the potential to substantially impact the instream flow through their effects on water system management. Potential changes to water use efficiency practices in agriculture on instream flows may have unintended consequences, including changes in the timing and volume of water initially diverted for agriculture, the potential for increased direct diversions for downstream use, alterations to the quality and quantity of return flows both positive and negative, as well as potential repercussions for conjunctive groundwater management.

## Practical Experience with On-Farm and District Water Efficiency

Experience with both on-farm and district water efficiency for different types of crops and different western U.S. climates and soil types is extensive. Agricultural water managers can turn to several government and nonprofit sources of information, as well as private sector experts, such as those cited in this section. Several western states have identified agricultural practices for water management and efficient use. California, for example, has adopted a list of "efficient water management practices" for water districts, while the Texas State Soil and Water Conservation Board has a guidebook on best management practices for both on-farm water use and for water delivery systems.[5]

Both the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture and the U.S. Bureau of Reclamation define and support agricultural water efficiency efforts. The NRCS Agricultural Water Enhancement Program (AWEP), part of the Environmental Quality Incentives Program (EQIP), provides financial and technical assistance to farmers to plan and implement conservation practices on agricultural land in project areas that more efficiently use surface and ground water and improve water quality. The Agricultural Management Assistance (AMA) provides cost share assistance to agricultural producers to voluntarily incorporate new conservation

[5] Texas State Soil and Water Conservation Board, 2004 at **www.tsswcb.state.tx.us/files/contentimages/water_conservation_bmp.pdf.**




Source: Meeting Colorado's Future Water Supply Needs: Opportunities and Challenges Associated with Potential Agricultural Water Conservation Measures, Sept. 2008, Colorado Agricultural Water Alliance

activities into their farming operations, including water management or irrigation structures.[6] The U.S. Bureau of Reclamation (USBR) supports its west-wide and California-specific lists of best management practices with two sources of technical assistance and funding for implementation—the Water Conservation Field Services Program and the WaterSHARE effort.[7]

Non-profit, public benefit organizations also exist to help water suppliers and farmers improve water use efficiency. For example, in California the Agricultural Water Management Council provides a voluntary approach to efficient water management practices for agricultural water suppliers and a system for determining which practices are most likely to provide local benefit, as well as providing information and resources to farmers working to improve water use efficiency.[8]

## Summary

Efforts by agricultural water suppliers and farmers to improve water use efficiency in agriculture can be successful but require consideration of both the possible benefits and impacts in a particular location. While the potential for improving agricultural water use efficiency to effect change on instream flows in general is undetermined, it has worked to enhance streamflows in specific situations (see for example case studies in **Chapter 2**). Improving agricultural water use efficiency intelligently can provide opportunities to maximize water use potential while managing for the numerous variables that exist.

Wise agricultural water use efficiency and conservation choices will also maintain flexibility in farmers' crop selection. Farmers in irrigated regions of the western U.S. often must make annual changes to their cropping choices to respond to water availability, market demands, and other factors. Three examples of on-farm and water district efficiency efforts drawn from California, contributed by the Agricultural Water Management Council, are available in **Resource Section 4**. These illustrate not only the range of possibilities in creatively managing water use but also provide some indication of the range of variables that can be accommodated through intelligent water use efficiency programs.

# Instream Flow: How Much Is Needed and When

This report does not attempt an evaluation of the highly complex science of streamflow assessment. But some points are clear: not just the volume, but the timing, duration, variation, and location of flows are important factors in a particular stream reach. Almost every state has its own methodologies for developing flow recommendations for localized stream segments. The legal context of instream flow rights and protections is somewhat unique in each state as well (see **Chapter 3** beginning on page 35). Several Colorado River basin states have begun statewide or regional efforts to identify streamflow needs, including developing ranking systems to assist in identifying the most critical stream stretches. For pursuing the intersection of water efficiency efforts and instream flow needs, these reaches and these efforts may be the most relevant.

The Arizona Department of Water Resources final volume of its state water atlas, for example, presents a water sustainability evaluation of Arizona water, highlighting (or ranking) the most important environmental water resources needs by geographic area (groundwater basin) in Arizona.[9] A separate University of Arizona Environmental Water Needs Assessment describes the geographic location and

---

[6] NRCS programs are accessed at **http://www.nrcs.usda.gov/programs/.**

[7] Agricultural Water Planning Guidebook, 2000, USBR at **http://www.usbr.gov/uc/progact/waterconsv/pdfs/Guidebook2000.pdf.**

USBR's Mid-Pacific Region agricultural water conservation criteria at **http://www.usbr.gov/mp/watershare/documents.html.**

DOI's WaterSMART website features projects funded by the program at **http://www.doi.gov/watersmart/html/index.php.**

[8] Agricultural Water Management Council at **www.agwatercouncil.org/.**

A statewide Memorandum of Understanding on agricultural water efficiency provides guidelines for water management plans and implementation of cost-effective efficient water management practices. A 2009 state law sets additional goals for all water users, including agriculture.

[9] Arizona Department of Water Resources, Arizona State Water Atlas at **http://www.azwater.gov/AzDWR/StatewidePlanning/WaterAtlas/default.htm.**

focus of nearly 100 studies of environmental water needs in Arizona, to identify environmental water needs for some rivers and the connection between water availability and ecological health.[10]

State fish and game agencies have also reviewed instream flow needs. The Wyoming Game and Fish Department five-year plan is one example.[11] California's Fish and Game Department's Instream Flow Program develops scientific information on the relationships between flow and available stream habitat, to determine what flows are needed to maintain healthy conditions for fish and wildlife.[12]

Two related efforts are underway in the state of Colorado. Phase two of the Statewide Water Supply Initiative identified environmental needs (2007). And nine regional roundtables (groups of stakeholders) for each sub-basin provide input to the State's nonconsumptive water needs assessments (both environmental and recreational water needs) for each sub-basin.[13] Similarly, some of New Mexico's 16 locally developed regional water plans address environmental water needs.[14]

California is embarking on a more complex watershed-based approach to making the link in one watershed (outside the Colorado River basin) between quantifiable instream flow objectives, water quality standards and criteria, and water rights administration. The State Water Resources Control Board, in consultation with Fish and Game, developed a list in late 2010 of instream flow studies for 138 rivers statewide, as required by state legislation. In August 2010 the Board adopted a flow study for the Sacramento/San Joaquin Delta ecosystem. The Board is now doing the work to set flow objectives for the San Joaquin, focusing on the lower river; a draft is anticipated by early 2012 with flow objectives for the Delta and Sacramento River, formal adoption, and a water rights proceeding for the entire ecosystem to follow. Water users in each tributary river will need to find ways to get to that target objective, including water efficiency measures.[15]

A wealth of other information is available from public sources, for those interested in a specific location. Main stem Colorado River flows are driven by federal reservoir management and by endangered species needs. Federal habitat conservation plans for endangered or threatened aquatic species can identify critical stretches. Biological opinions and environmental impact statements for federally sponsored projects can provide reach-specific information. The Upper Colorado River endangered fish recovery program has compiled available technical reports for flow recommendations by river (Gunnison, etc). And several states have active instream flow programs and policies that secure these flows once needs are defined. One is Colorado's Instream Flow Program that obtains and holds water rights (mostly junior) for instream flows in specific stream stretches.

[10] Arizona Environmental Water Needs Assessment Report, Joanna Nadeau and Sharon B. Megdal, University of Arizona, 2011 at **http://ag.arizona.edu/azwater/pdfs/AZEWNA_Assessment-Mar8-flat.pdf.**

[11] Water Management Unit Five-Year Plan 2006–2010, Wyoming Game and Fish Department, April 2006 at **http://gf.state.wy.us/downloads/pdf/Fish/5yearplan2006.pdf.**

[12] California Department of Fish and Game maintains a website with instream flow information at **http://www.dfg.ca.gov/water/instream_flow_docs.html** and has made recommendations on 22 priority streams at **http://www.waterplan.water.ca.gov/docs/cwpu2009/0310final/v4c10a04_cwp2009.pdf.**

[13] These Colorado efforts, including specific reports, are described at **http://cwcb.state.co.us/environment/non-consumptive-needs/Pages/main.aspx**.

Statewide initiative reports are found at **http://cwcb.state.co.us/public-information/publications/Pages/StudiesReports.aspx.**

[14] New Mexico information is at **http://www.ose.state.nm.us/isc_regional_plans.html.**

[15] Personal communication with Frances Spivy-Weber, California Water Resources Control Board, August 2011. The State Water Board has regulatory authority over both water rights and water quality; its nine regional boards over water quality only, which includes instream flow levels.

# Lessons from Experience: Cases from Around the West

A wide ranging search for practical experience in the western U.S. linking water efficiency and instream flow protection yielded over 40 candidate case studies, from individual on-farm water efficiency measures to major city-wide conservation programs and large-scale agricultural district efficiencies. We gave particular attention to several cases that we feel shed the most light on this link and best illustrate the range of possibilities.

Along with our featured cases we describe other, similar efforts that are also instructive, among them canal modernization projects in Washington, Montana and California; several projects of Washington's Office of the Columbia River; on-farm projects in Montana, Utah, and Idaho; and multi-party municipal efforts in California.

**Cedar River, Washington** (metropolitan Seattle)
**Impact of long-term municipal conservation**

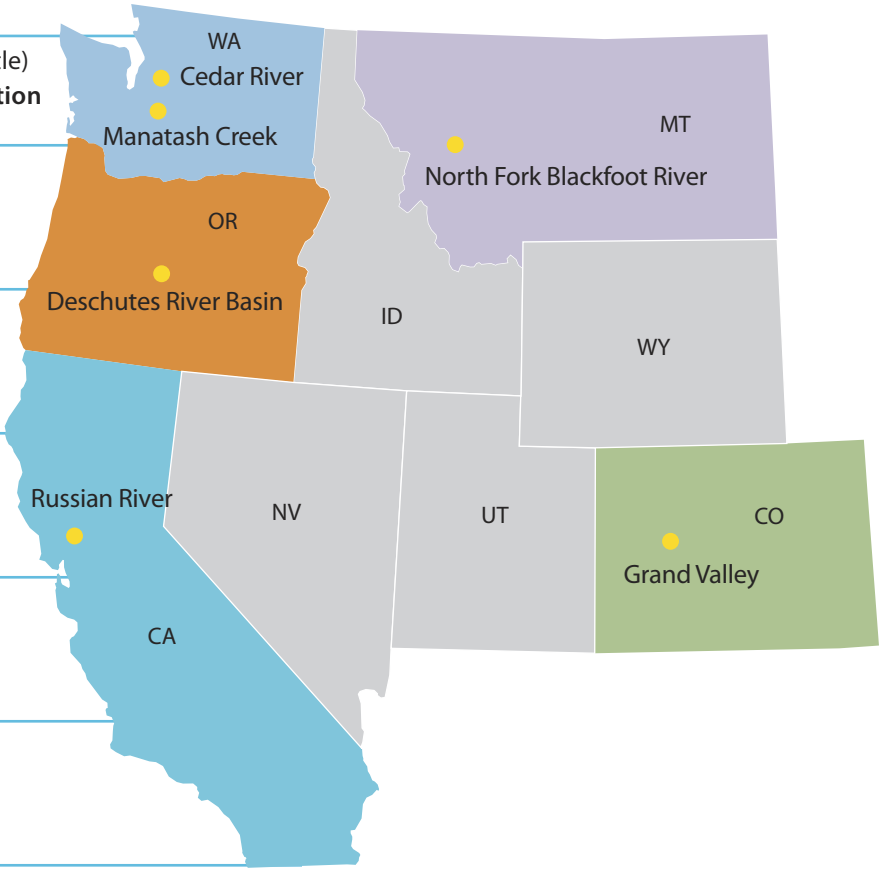
**Deschutes River Basin, Oregon**
(irrigation district and municipal efforts)
**Role of the non-profit**

**Grand Valley, Colorado River, Colorado**
(Government High Line Canal)
**Modernizing irrigation diversions**

**Manastash Creek, Yakima River Basin, Washington** (Creek Restoration Project)
**Impact of agricultural efficiencies**

**North Fork Blackfoot River, Montana**
(Weaver Farm)
**Individual on-farm efforts**

**Russian River, California**
(Sonoma County Water Agency)
**More natural flows**



While there are many successful water efficiency programs west-wide, if a program had no link to instream flow, however indirect, we did not include it. Likewise, we opted to focus on cases with demonstrable results rather than models and policies that are as yet untested. **Appendix 1** describes our criteria and lists the cases we considered. Separate resource sections give examples of successful water efficiency programs undertaken for other purposes.

# What This Experience Tells Us

Several lessons emerge from this wealth of experience about what works and what doesn't in the application of water efficiency efforts to improved instream flows. The approach or model adapts to the situation, the participants and their water management goals. While an external legal or regulatory driver, or anticipation of one, can prompt action, cooperation can multiply benefits and aid success.

Water efficiency is often just one part of the water management package. Funding often requires creativity and multiple sources. Location and scale of projects vary; successful projects come in all sizes from rural headwaters involving just two partners to significant river stretches involving many partners. Urban and agricultural water efficiency efforts are practical and can result in water available for other purposes, including instream flows.

## External Drivers Often Prompt Action

### Federal environmental requirements can serve as a driver of action.

The Endangered Species Act (ESA) has forced or provided incentives for many of the instream flow projects that rely in part or entirely on water from increased efficiencies. This influence can come from litigation or its threat, or from requirements of habitat conservation plans (HCPs) or biological opinions. In some cases, water management actions have been undertaken in anticipation of such pressures.

Other federal laws that could serve as drivers include the Clean Water Act, Federal Power Act, Federal Energy Regulatory Commission (FERC) relicensing procedures, and U.S. Bureau of Reclamation (USBR) project authorities, though such drivers are not seen in the cases reviewed.

**Cases:** Many, including Grand Valley, Manastash, Russian

### State water rights decisions can prompt the development of a project.

Water right adjudications have prompted agreements that include water conservation measures and instream flow benefits. Some cases involve a legal change in water rights; others occur despite such opportunities in law not being available.

**Cases:** Sunnyside

## Key Lessons and Cases That Illustrate Them

| Case | External driver | Funding | Cooperation | Package | Scale |
|---|---|---|---|---|---|
| Cedar | ● | | | ● | medium |
| Deschutes | ● | ■ | ■ | | medium |
| Grand Valley | ■ | ● | ● | ■ | large |
| Manastash | ■ | ● | ● | | small |
| North Blackfoot | ● | ■ | ● | | small |
| Russian | ■ | | ● | ■ | medium |

■ **major factor** ● **factor**

# Funding Is Critical to Success

## Funding often requires creativity and multiple sources.

Funding needs for implementing efficiency measures range widely. But at least half the cases involve several funding sources and some financial creativity. Water efficiency projects often involve upfront investments. When these investments are not individually financially rational from the water user view, water right users often are unwilling if not unable to absorb the entire cost. This may be especially true of agricultural district costs for technological improvements.

**Cases:** Deschutes, Grand Valley, Columbia Basin Project and many smaller projects such as the North Fork Blackfoot

## Funding for fisheries improvements can be tapped for conservation.

The ESA not only creates legal pressure to improve flows, but it often brings along a funding source. Cases we reviewed have tapped funding from the Upper Colorado Recovery Program, Bonneville Power Administration (BPA) Fish and Wildlife Program/ Columbia Basin Water Transactions Program, ESA Section 6 (habitat conservation) money, Washington Department of Ecology's Columbia River Water Management Program, and the Pacific Coastal Salmon Recovery Fund. Mitigation funds independent of the ESA can also be used to boost flows—some BPA money goes to mitigate for species affected by the federal Columbia River dams, not just fish and wildlife listed under the ESA, though they are generally prioritized. Even funding for relatively small scale projects undertaken by non-profits can come from fisheries mitigation funds—Montana's Clark Fork Coalition, Oregon's Freshwater Trust, the Washington Water Trust and Trout Unlimited's (TU) Water Projects in western states all depend in part on BPA money to work with farmers on farm water efficiencies. Though our cases did not illustrate this, potential exists in tribal settlements and FERC relicensing that funded instream flow improvements in other settings, though not necessarily from water efficiency measures.

**Cases:** Deschutes, Manastash, North Fork Blackfoot

## Federal and state funding sources for water efficiency can assist streamflow.

USBR WaterSMART programs, for example, have funded agricultural water delivery system improvements, including more efficient district water management. In some cases this has resulted in streamflow improvements, though flows are not the major focus of these projects. Other federal and state programs targeted at water efficiency efforts could also be utilized in this manner.

**Cases:** Sunnyside, Los Molinos, Yellowstone (all WaterSMART projects)

## Funds can be raised with the promise of fisheries or environmental improvements.

The raising of capital to support projects that improve instream flows, including those that do it through water efficiency efforts, can have the added benefit of reducing water demand if donations are at least in theory linked to actual domestic water use. In this way, environmental or fishery improvements can promote water efficiency. Even where there are not ESA-listed species, it can help nonprofit groups to raise money when their projects benefit rare but non-listed fish like Bonneville cutthroat.

**Cases:** Bonneville Water Restoration Certificates, Conserve to Enhance

# Cooperation Can Multiply Benefits and Aid Success

## Multiple parties can work effectively together.

Given the complexity of some of these projects, the various benefits that result, and the funding needed, the involvement of multiple parties in the development and execution of projects can be vital and has proved successful in a number of cases. While law and funding play integral roles in allowing and incentivizing projects, little is possible without water right holders amenable to the changes. The less encouraging the circumstances of law and funding, the more critical it is to be working with an interested water right holder.

**Cases:** North Fork Blackfoot and similar cases, Manastash, Grand Valley, Central Oregon

### Multiple benefits of a project, to multiple parties, can move it along.

Most cases involve cooperation, coordination, and/or negotiation amongst different parties who must first identify and then act on common interests. Streamflow improvement may only be one of those interests. Small hydroelectric projects, water for development, stream restoration, and other results may also be a part of the plan. The multiple benefits can bring additional partners and money and may actually be the primary reason for the project. While the other benefits have the potential to adversely affect the instream flow results, these cases show it's possible to do both.

**Cases:** Sunnyside (more reliable water supply), Manastash (habitat restoration), Rock Creek (habitat restoration), Deschutes (hydropower)

### Recreation and fishing interests can motivate resource protection.

Beyond ecological function or any sense of intrinsic value of or obligation to nature, human interest in instream flows for recreation, fishing, or aesthetics can motivate action. More abstract concerns over future municipal water supplies and how human needs will be met under such conditions can also motivate water efficiency projects that have the effect of increasing flows.

**Cases:** Little Bear Creek, North Fork Blackfoot and similar cases, Manastash, Cedar River

### Technical support and participation of non-water user organizations and states can help.

State and/or federal participation, or at least agreement, beyond funding was part of all but the smallest on-farm projects. Resource agencies can play a special role by providing information and science. In most cases, a local nonprofit or some other entity had a role to play as a broker for cooperation and source of funds. And especially with smaller projects, step by step external assistance with the legal and technological aspects of developing the project improves its feasibility and likelihood of success.

**Cases:** Little Bear Creek, North Fork Blackfoot, and other similar projects

### Success breeds success.

Neighboring farms and communities are more likely to borrow ideas and believe they can achieve results if success is achieved nearby.

**Cases:** Little Bear

## Water Efficiency Is Often Just One Part of the Package

### Multiple efficiency and water management measures can net instream flow support.

Water for flows need not arise from a single action for a given project. A combination of water efficiency and water management measures, meeting the objectives of various participants, can result in more flow and reduce the burden on a single water user or one aspect of water use.

**Cases:** Manastash, Cedar, North Fork Blackfoot, Little Bear, Nine Mile, Badger Creeks, Mono Lake, and others

### Agricultural district water management improvements can help streamflow.

These agricultural district cases involve measures that meet a broad definition of agricultural efficiency, and some do not involve any on-farm efficiency practices. Many involve a package of water management actions, of which water efficiency (municipal or agricultural) is just one part. Water leasing and transfers are common project partners. Agricultural district efficiencies achieved through modernization of conveyance infrastructure and undertaken for reasons other than streamflow, while perhaps not reducing consumptive use, still allow water to remain in a stream stretch and rewater it for biological benefit.

**Cases:** Grand Valley, Sunnyside, Los Molinos, Yellowstone, Manastash

### Municipal efficiency measures for other purposes can help streamflow.

Municipal water conservation is often more about reducing the need to develop new supplies rather than improve instream flows. But in some instances conservation has not only stretched the viability of existing water supplies well into the future and in the face of population growth but also allowed for more flexible operation of water storage dams for the benefit of instream flows and native fish like salmon and steelhead.

**Cases:** Cedar, Russian

## Scale and Location Are Site-Specific

### Appreciable instream flow benefits are possible with small amounts of water.

In smaller rivers, tributaries and headwaters, a small amount of water can make a meaningful difference for flows and the viability of local native fish populations in a particular stream stretch or watershed. This is true even where there are challenges with flows further downstream, as will often be the case in an overappropriated river basin such as the Colorado.

**Cases:** North Fork Blackfoot, Manastash, Little Bear

### Larger rivers benefit from multiple approaches.

On bigger rivers, achieving more than incremental progress toward instream flow improvements often requires actions on not just a farm here and there, but for entire systems of agricultural water distribution and use, such as modernization of irrigation conveyance systems to operate with less water diverted, or major municipal water conservation programs.

**Cases:** Grand Valley, Sunnyside, Yellowstone

### Law can influence the location of the project.

When conserved water can be changed to another purpose of use, including instream flows, there is greater security in protection of the conserved water from other potential users. When such protections are not available under state law, geography matters more: areas with more distance between headgates reduces the chance of immediate diversion and hence better ensures flow restoration for a larger stretch of stream. Therefore, more isolated areas are often targeted.

**Cases:** Little Bear, Grand Valley, Badger

### De facto instream flows matter for a particular stream stretch.

Protecting conserved water instream is a challenge. Sometimes "de facto" instream flow protection—protection through improved streamflows in practice if not as an altered water right—works for a considerable distance downstream. This suggests a focus on getting smaller volumes into specific, targeted stream stretches. Tributaries and headwaters hold the most promise.

**Cases:** Grand Valley to UT border; Cedar, a short river where Seattle is the only major diverter; Manastash from farms to Yakima River

### Defining streamflow needs for a particular stretch is an essential step to action.

ESA protections for individual species have served in many of these cases as a way to define where, when, and how much streamflow improvement is needed. Often, streamflow needs of individual endangered or threatened aquatic species serve as a surrogate for a more complex development of ecological streamflow needs. More broadly, regional or statewide assessments of streamflow needs can identify potential areas to target for improved streamflows.

**Cases:** Deschutes, Manastash, Russian

# Lessons from West-Wide Experience

| Theme | Lesson | Cases that illustrate this |
|---|---|---|
| **External Drivers** | ESA | Grand Valley, Manastash, Russian |
| | State water rights | Sunnyside |
| **Funding** | Creativity | Deschutes, Grand Valley, Columbia Basin, North Fork Blackfoot |
| | Fisheries | Deschutes, Manastash, North Fork Blackfoot |
| | Water efficiency | Sunnyside, Los Molinos, Yellowstone |
| | Fundraising | Bonneville Certificates, Conserve to Enhance |
| **Cooperation** | Multiple partners | North Fork Blackfoot, Manastash, Grand Valley, Deschutes |
| | Multiple benefits | Sunnyside, Manastash, Rock Creek, Deschutes |
| | Recreation interests | Little Bear, North Fork Blackfoot, Manastash, Cedar |
| | Outside groups | Little Bear, North Fork Blackfoot |
| | Nearby success | Little Bear |
| **Efficiency Package** | Multiple measures | Manastash, Cedar, North Fork Blackfoot, Little Bear, Nine Mile, Badger, Mono Lake |
| | Agricultural management | Grand Valley, Sunnyside, Los Molinos, Yellowstone, Manastash |
| | Municipal efficiency | Cedar, Russian |
| **Scale and Location** | Small volume | North Fork Blackfoot, Manastash, Little Bear |
| | Larger rivers | Grand Valley, Sunnyside, Yellowstone |
| | Law's influence | Little Bear, Grand Valley, Badger |
| | Defacto flows | Grand Valley, Cedar, Manastash |
| | Defined needs | Deschutes, Manastash, Russian |

# Cedar River, Washington: Long-Term Municipal Conservation

The Cedar River drains the Cascade Mountains east of Seattle before flowing into Lake Washington, which in turn flows into Puget Sound through the Hiram M. Chittenden Locks. The Cedar is Seattle's largest source of water, providing about 70 percent of the drinking water delivered by Seattle's regional water supply system, a system that's the primary supply for some 1.3 million people in and around Seattle.[1] In the 1990s Seattle had already demonstrated successful municipal water conservation programs. But Seattle's water supply remained vulnerable to future constraints after Puget Sound chinook salmon were declared federally threatened in 1999.[2] This was one of many drivers that motivated Seattle to significantly ramp up its conservation programs in year 2000.

Between 1966 and 1995, Seattle Public Utilities' diversion from the Cedar River averaged 23 percent of the river's total flow. Although the upper two-thirds of the watershed is municipally-owned and virtually pristine, the Cedar's native anadromous fisheries, which include ESA-listed chinook salmon and steelhead trout, have struggled. The relative significance of various factors in the decline of the fishery continue to be debated—changes in water quality, impacts of urban development, a formerly impassable diversion dam, disease and genetic issues, ocean conditions, overfishing, predation—but one factor is changes in river flow.

The Cedar River was re-plumbed by the U.S. Army Corps of Engineers to provide increased water for the operation of navigational locks connecting Lake Washington to Puget Sound. Until 1916 the Cedar River flowed into the Black and Duwamish Rivers and then into Puget Sound, bypassing Lake Washington entirely.

The Cedar River is a mid-elevation watershed that is "transitional" between being rain and snow dominated. It receives abundant precipitation in winter and little precipitation in the summer. Transitional watersheds have been predicted to become more rain dominant in a number of climate change scenarios. These scenarios point to reduced natural water storage in the mountain snowpack and will likely leave watersheds like the Cedar more vulnerable to low late summer and early fall flows.[3]

In anticipation of, and eventually in response to, the ESA listing of chinook, various stakeholders (including the City of Seattle, Seattle Public Utilities, Seattle City Light, the Muckleshoot Indian Tribe, and various state and federal agencies) began negotiating an Instream Flow Agreement and Habitat Conservation Plan. All parties except for the Tribe signed these in April 2000. The Tribe instead filed a lawsuit in December 2003 against NOAA's National Marine Fisheries Service (NOAA Fisheries) alleging that it lacked, among other things, sufficient information about the impacts of Seattle's existing and future water withdrawals on chinook salmon. The City of Seattle joined NOAA Fisheries as a co-defendant, and settlement negotiations commenced.

A settlement between NOAA Fisheries, Seattle, and the Muckleshoots was reached in March 2006. In exchange for the Tribe's agreement to drop the litigation, among other things, Seattle agreed to:

- Limit withdrawals from the Cedar to no more than 124 million gallons per day as an annual average and a ten year rolling average not to exceed 114 mgd. That compares to a historic peak annual diversion of 144 mgd;
- Comply with the terms of the Instream Flow Agreement including meeting minimum flows and supplemental flows beyond the 50-year term of the HCP; and
- Transfer any perfected portion of its claim that exceeds 124 mgd to Washington State's trust water rights program for instream purposes.[4]

---

1 Personal communication, Al Dietemann, Seattle Public Utilities, July 2011. Also **www.cityofseattle.net/util/About_SPU/Water_System/Water_Sources_&_Treatment/Tolt_River_Watershed/index.asp**.

The Cedar River is managed conjunctively with other sources of Seattle's supply (the Tolt River and Highline well field comprise the other 30 percent). Some individual member utilities have other sources of supply as well.

2 **www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Chinook/CKPUG.cfm**.

3 **https://digital.lib.washington.edu/dspace/bitstream/handle/1773/16529/Lundquist.pdf?sequence=2**.

4 Integrated Approaches to Riverine Resource Stewardship: Case Studies, Science, Law, People, and Policy, Instream Flow Council, Chapter 3 "Cedar River, Washington," 2008, pp. 62-63.

The settlement agreement also included continued water conservation efforts to help ensure that flows would remain adequate for salmon and steelhead and to allow Seattle to grow in population without violating the water quantities specified in the settlement agreement.

The City of Seattle has implemented aggressive rate structure and water conservation programs, including a variety of rebates on appliances for single and multi-family residential and commercial buildings. The city has also implemented a program to cap neighborhood reservoirs to reduce system losses due to cleaning, flushing, and evaporation. (See **Resource Section 1**.)

The long term water regional water conservation programs in the City of Seattle and a group of 17 neighboring utilities also using water from Seattle's Cedar River diversion have played a significant part in the reductions in 2009 water consumption of 41 mgd or 24 percent since 1990, while population increased 18 percent during that same period. On a per capita basis, water consumption was reduced from 152 to 98 gallons per day.[5] Most importantly for the health of the Cedar River and its imperiled fisheries, the river has consistently met its instream flow commitments under the Agreement and Plan.[6]

[5] Regional 1% Water Conservation Program 2009 Annual Report, pp. 2, 4 **http://www.savingwater.org/docs/2009%20Annual%20Report.pdf.** Five utilities that were part of the 1% Program left the program in 2004 and are pursuing conservation on their own.

[6] **http://www.seattle.gov/util/groups/public/@spu/@ssw/documents/webcontent/spu02_015213.pdf.**

# Deschutes River Basin, Oregon: Role of the Nonprofit

Central Oregon's Deschutes River basin, which includes the cities of Bend and Redmond, has an unusual and extensive array of innovative agricultural and municipal conservation programs underway. The Deschutes showcases the combined power of agricultural and urban conservation and efficiency efforts occurring in the same part of the same river basin, and the role of a nonprofit in these efforts. Efforts to restore and protect streamflows in the Deschutes have been motivated in part by a need to protect the health of Endangered Species Act (ESA)-listed steelhead trout downstream. But they are also about maintaining the Deschutes basin's quality of life and extensive recreational opportunities, which include fishing, hiking, and rafting.

The Deschutes River Conservancy (DRC) has played a key coordinating and funding role in virtually all of the efforts to improve instream flows in the Deschutes and its tributaries. The non-profit DRC formed in 1996 by a broad range of agricultural, governmental, municipal, tribal, and water and energy utility interests to restore streamflows and improve water quality in the Deschutes Basin using collaborative and market based techniques. Through a combination of water leases, permanent acquisitions and efficiency projects, the DRC's programs have returned 160 cubic feet per second (cfs) to the Deschutes River and its tributaries.[7] The DRC has helped local irrigators apply for money for water conservation projects or water leases from a variety of sources, including the Bonneville Power Administration's water transactions program, the Oregon Watershed Enhancement Board, and the Natural Resources Conservation Service (NRCS) Agricultural Watershed Enhancement Program.[8]

[7] **http://www.deschutesriver.org/About_Us/History/default.aspx**. The DRC's 29 member board operates by 100 percent consensus.

[8] Personal communication with Zach Tillman, DRC, Dec. 2010.

The Deschutes projects are often cited by others in the west as examples of success. The somewhat unique geology and hydrology of the Deschutes (local volcanic soils absorb an unusually high proportion of water from unlined irrigation ditches, for example[9]) means that instream benefits can more easily accrue from conservation and efficiency projects. Water protected in the upper Deschutes is generally protected to the point of return flows, which is generally Lake Billy Chinook, a downstream reservoir.

We highlight below several projects involving irrigation conveyance systems and on-farm irrigation. We also describe a municipal program in Bend and a Bonneville Environmental Foundation program that funds water leasing rather than conservation and efficiency, but which could be refined to fund conservation and efficiency projects as well or match residential conservation program savings with instream flow improvements as outlined in the University of Arizona Conserve to Enhance concept.[10]

## Central Oregon Irrigation District Piping Project

The Central Oregon Irrigation District (COID) piped 2.5 miles of open ditch to reduce diversions by 19.6 cfs in the upper Deschutes north of Bend. This water is protected instream through Oregon's Conserved Water Program,[11] which promotes the conservation of water, maximizes beneficial use of water, and enhances streamflows by requiring that at least 25 percent of water saved by a water conservation project be protected permanently instream. As an added incentive to the project, the pipe includes a hydroelectric generator capable of producing 5 MW. The project cost $24 million and was funded from several sources—the DRC, US Bureau of Reclamation (USBR), Oregon Water Enhancement Board, Oregon Department of Environmental Quality (Clean Water State Revolving Fund) and Oregon Department of Energy.[12] COID, primarily an agricultural water provider, also supplies industry and municipal use in the basin.

## Three Sisters Irrigation District Piping and On-Farm Projects

Similar to the COID project described above, the Three Sisters Irrigation District (TSID), located northwest of Bend near the town of Sisters, is in the process of a multiphase project, converting 5,200 feet of its existing unlined main canal to buried pipeline, installing four new automated fish screen weir gates, and putting into place a Supervisory Control and Data Acquisition (SCADA) system. Over 30 miles of the 60-mile system is now piped. The project is expected to result in 2,550 acre-feet of water savings annually in the upper Deschutes. All 2,550 acre-feet has been or will be purchased by the DRC (which also helped pay for the project) for a protected instream right, complementing habitat restoration efforts in Whychus Creek for threatened steelhead and bull trout and other fish species. In addition to improving the efficiency of its irrigation conveyance system, TSID is working with 30 of its member farms to switch from rill and wheel line sprinklers to center pivot sprinkler systems. These on-farm conservation efforts were financed by the NRCS's Agricultural Watershed Enhancement Program.[13]

While the instream benefit of this on-farm conservation has neither been quantified nor legally protected, it complements efforts to boost streamflows and improve water supply reliability achieved through piping the district's conveyance system. As a result of these efforts by the district and its partners there is a permanently protected minimum flow in Whychus Creek of 15.6 cfs. 14.26 cfs of this flow has a priority dating to 1895 or earlier. The on-farm deliveries have increased as much as 25 percent at the same time that instream flows have increased.

---

9 **http://www.deschutesriver.org/What_We_Do/Streamflow_Restoration/Water_Conservation/default.aspx**.

10 **http://www.ag.arizona.edu/azwater/conserve2enhance.html**.

11 In order to put conserved water to a new use, you must go through Oregon's Conserved Water Program (otherwise, it's enlargement of the water right). Conserved water that is used instream is protected to the point of return flows; in this example, this is generally Lake Billy Chinook.

12 Personal communication with Steven Johnson, COID, Oct. 2010 and Zach Tillman, June 2011.

13 Personal communication with Marc Thalacker, TSID, Jan. 2011. **http://www.tsidonline.org/**, **http://www.deschutesriver.org/What_We_Do/Streamflow_Restoration/Water_Conservation/default.aspx** and **http://www.or.nrcs.usda.gov/programs/awep/2009_Project_Areas/fy09/index.html**.

## Avion Water Company's Blue Water Program

The Avion Water Company, one of two private municipal suppliers in the Bend area, partnered with the DRC to create the Blue Water program, which provides Avion customers an opportunity to support DRC efforts to increase flows in the Deschutes River through donations automatically added to each month's water bill. Funds raised through the Blue Water program are allocated to the DRC's streamflow enhancement efforts (leases only). A total of $14,589 has been raised through the program since 2007. Through 2008, Blue Water funds had been used to pay for 1,470 acre-feet of water leases, and another 1,668 acre-feet of instream flows were expected to be leased in 2009.[14]

The City of Bend provides residential water conservation information, but no formal conservation programs. The City's residential irrigation regulation controls outdoor watering.

## Bonneville Environmental Foundation's Water Restoration Certificates

Unlike the Blue Water program in the Bend area, anyone living anywhere can purchase a "Water Restoration Certificate" from the non-profit Bonneville Environmental Foundation (BEF). The program accepts any donation amount, but one option is to donate an amount based on a calculation of one's home or business water use and donate funds that "offset" that water use by stream restoration in another location. The program also provides information about more efficient water use. The Deschutes is one of three river basins (the others are the Rogue River in southern Oregon and Prickly Pear Creek in Montana) that receive funding from this BEF program.[15] Restoration projects are screened and selected by the National Fish and Wildlife Foundation. Together in FY10 these programs restored over 11,000 acre-feet of water to critically dewatered streams in Oregon and Montana.

[14] **http://www.deschutesriver.org/Blue_Water/default.aspx** and **http://ag.arizona.edu/azwater/files/SecuringWaterfortheEnvironment_IJS-final.pdf**.

[15] **http://www.b-e-f.org/water/cert** and personal communication with Zach Tillman, DRC, June 2011.

## Conserve to Enhance Model

### Pilot Project in Tucson, Arizona

University of Arizona researchers have proposed to link residents' concern for environmental protection with more efficient residential water use. Interest in this innovative model is high west-wide. The approach is being pilot tested for the first time in Tucson in 2011.

A participant can dedicate a portion of the dollar savings on their water utility bill, earned from more efficient water use, to a specific stream restoration project in the community. A local advisory board defines criteria and selects specific restoration projects. This pilot program design transfers money, not actual water.

While the current focus is on residential water users, the program could apply across the municipal sector, to business and industry.

For more information see **www.cals.arizona.edu/azwater/conserve2enhance** and **http://watershedmg.org/c2e**.

# Grand Valley, Colorado River, Colorado: Modernizing Irrigation Diversions

The Government Highline Canal in Colorado is perhaps the most prominent example of the modernization of a large-scale irrigation diversion canal in a manner that has led to significantly reduced diversions and corresponding improvements in instream flows. Similar projects, most of which have yet to be completed, are underway across the West. Together these examples show that while the cost of canal modernization projects can vary considerably depending on scale and complexity, improved instream flow in a stream stretch is possible as one result of the project.

The Government Highline Canal is part of the US Bureau of Reclamation (USBR) Grand Valley Project in western Colorado. It is located near Grand Junction and the Colorado River's confluence with the Gunnison River. As part of the multi-agency Upper Colorado River Endangered Fish Recovery Program, this project was undertaken to retrofit operation of the Government Highline Canal to better match water diversions with on-farm demand. These reduced water diversions leave more water in the main stem of the Colorado River to benefit the endangered razorback sucker, Colorado pikeminnow, humpback chub, and bonytail.[16]

Modernized canal infrastructure and systems, including SCADA computerized control systems, in-system storage (seven new and modified check dams), and new operational procedures, were projected to reduce diversions by 28,500 acre-feet of water per year.[17] In practice, the project has exceeded that goal, reducing irrigation diversions by an average of 36,463 acre-feet per year over the 2002 to 2010 period of operation. Reducing irrigation diversions also provides the basis for delivery of stored water in Green Mountain Reservoir to augment instream flows.[18]

The project improves flows in the biologically important but historically depleted 15 mile reach of the Colorado upriver of its confluence with the Gunnison. But these flows, once released from upriver storage at Green Mountain Reservoir in compliance with the Orchard Mesa Check Case[19] and the Green Mountain Reservoir Historic Users Pool,[20] are protected by local circumstances rather than by law. Colorado water law makes it very difficult to protect conserved water for instream flow purposes, but the fact that there are no other diversions in that stretch of river means that prohibiting others from using that water is not generally necessary. In some water short years, however, saved water may prove vulnerable to being intercepted by other water users absent future legal protection.[21] Water rights in the Grand Valley Water Users Association (GVWUA) have been allocated to the lands through agreements dating from the early 1900s between the GVWUA and owners of irrigable lands; when land ownership changes, the water stays with the land and cannot be sold separately.

The project cost was approximately $8 million in capital costs and $1.25 million in capitalized annual cost, or $11.73 per acre-foot per year.[22] Capital costs were financed by the Upper Colorado River Endangered Fish Recovery Program, which is funded through federal appropriations, Colorado River Storage Project hydropower revenues, and cash and in-kind contributions from non-federal entities (primarily the states of Colorado, Utah, and Wyoming). This amounts to approximately a 50-50 federal/non-federal cost share. The increased annual operations and maintenance costs of the project are funded through a grant from the Colorado Water Conservation Board to the GVWUA.[23] Additional flow improvements in the 15 mile reach are planned for the near future. A similar irrigation canal modernization project for the Orchard Mesa Irrigation District

[16] "Uilenberg and Norman, Grand Valley Water Management Project" p. 3.

[17] **http://www.itrc.org/reports/highline/highline.pdf** and Uilenberg and Norman, "Grand Valley Water Management Project" sent via email.

[18] Personal communication with Brent Uilenberg, USBR, May 2011.

[19] The Orchard Mesa Check Case was the result of a federal application for an appropriative right of exchange water right in Colorado water court (Case No. 91CW247). Personal communication with Brent Uilenberg, USBR, May 2011.

[20] Uilenberg and Norman, "Grand Valley Water Management Project" sent via email.

[21] Personal communication with Dick Wolfe and Adam Martellaro, Colorado Division of Water Resources, 2011.

[22] Uilenberg and Norman, "Grand Valley Water Management Project" sent via email.

[23] Personal communication with Brent Uilenberg, USBR, May 2011.

on the opposite side of the river from Grand Valley is being funded through the American Reinvestment and Recovery Act, and it is expected to yield another 17,000 acre-feet per year in instream flow benefits. Construction is expected to commence on the Orchard Mesa project by federal fiscal year 2012.[24]

The Grand Valley Water Management Project is now widely considered a "win-win" for farmers and the environment, but it didn't start off that way. Initially, there was resistance among irrigators to examining water use and concern with the ability of the SCADA technology to achieve its promise of more precise and timely water deliveries. Irrigators now largely embrace the enhanced precision of the new system. While the flow benefits from the Grand Valley Water Management Project are clear, the listed species in the 15 mile reach of the Colorado still face barriers to recovery, among them the unaddressed proliferation of non-native fish species.

Similar irrigation diversion canal modernization projects include:

## Sunnyside Irrigation District, Yakima River, Washington (Planned)

The Sunnyside Canal Improvement Project is the result of a settlement agreement between the USBR, the Washington Department of Ecology (Ecology), the Yakama Indian Nation, and the Sunnyside Division Board of Control in the Yakima Basin Water Rights Adjudication. Under the agreement, Sunnyside Valley Irrigation District will reduce its annual diversion by 19,450 acre-feet (two-thirds of the water saved by the project) to benefit instream flows and will retain 9,712 acre-feet (one-third) annually to improve the availability of water supplies for irrigation.

The project is expected to cost about $32.6 million in year 2000 dollars over a nine year period. Federal WaterSMART grant funds will cover 65 percent of total project costs with Ecology and Sunnyside each picking up 17.5 percent. The federal Yakima River Basin Water Enhancement Program requires that two-thirds of the saved water goes instream, which is placed in trust under Washington's trust water rights statute.

## Lower Yellowstone, Montana (Planned)

The Lower Yellowstone Irrigation Project Board of Control in Montana will install or improve water control structures, including spillway structures, pumping stations, and monitoring stations, to provide SCADA communications with 17 key sites along the applicant's 330-mile distribution system. A new diversion structure that can accommodate fish screens will also be installed as part of the Pallid Sturgeon Recovery Program. The project is expected to reduce the Lower Yellowstone Irrigation Project's diversions from the Yellowstone River by 40,000 acre-feet annually. This water will remain in the Yellowstone River. The project is expected to cost $596,826.

## Los Molinos Mutual Water Company, California (Planned)

The Los Molinos Mutual Water Company, located in the upper Sacramento Valley near Red Bluff, California, will install computer management systems, a custom Geographic Information System, and SCADA data loggers to more effectively manage its delivery system. The system modernization and conservation project is expected to result in water savings of approximately 3,000 acre-feet annually. Conserved water will remain in Mill Creek to benefit chinook salmon and steelhead migration. The entire project is expected to cost $222,675.

[24] Personal communication with Brent Uilenberg, USBR, Jan. 2011.

# Manastash Creek, Yakima Basin, Washington: Agricultural Efficiencies

Manastash Creek begins in the eastern foothills of the Cascade Mountains and heads northeast where it flows into the Yakima River near Ellensburg, Washington. The Manastash Creek Restoration Project is working to improve instream flow, fish screening and passage in the lower six miles of the creek that are affected by irrigation diversions and infrastructure. The Project is governed by the Manastash Creek Steering Committee comprised of Manastash Creek Irrigators, Washington Department of Fish and Wildlife, Bonneville Power Administration, Department of Ecology, Yakama Nation, Washington Environmental Council, and NOAA Fisheries. A 2007 plan to restore flows and habitat in Manastash Creek combines various agricultural water delivery system efficiencies with improved on-farm efficiency and a "reverse auction" to purchase instream flow rights on a willing seller basis.

The creek was historically home to steelhead trout and coho salmon, but steelhead became rare due to factors both within and outside of the Manastash watershed, and coho were extirpated when diversions made the creek go dry by early summer. Local farmers irrigate high-grade hay that is sold abroad, as well as sweet corn, wheat and oats in rotation with hay. The area also provides pasture for commercial and smaller scale livestock.

In 2001, the Washington Environmental Council (WEC) sent a letter of intent to sue to Manastash Creek irrigators for a "take" of Manastash Creek steelhead, which are part of a larger steelhead population that is listed as threatened under the Endangered Species Act. WEC alleged that unscreened, impassable, and inefficient water diversions were directly responsible for killing the fish. The letter resulted in a meeting in early 2001 that led to a multi-year collaborative process. That process brought about the restoration plan backed by funding from the Washington State Legislature. In 2003, Jay Manning, then a lawyer in private practice who until recently served as Chief of Staff to Washington Governor Christine Gregoire, said of the Manastash, "[t]his project is about making real, on-the-ground efforts to conserve water and protect fish habitat, all the while maintaining water use for farmers." [25]

In 2007, the Manastash Steering Committee signed the "Manastash Creek Restoration Project Instream Flow Enhancement Implementation Plan" which aims to enhance flows and habitat in Manastash Creek with the ultimate goal of reducing the length and duration that the 3.25 mile stretch is dewatered. The project involves converting ditches to pipe, consolidating four irrigation diversions into one, improving on-farm efficiency (mostly rill irrigation to sprinkler irrigation), and a "reverse auction" to purchase instream flow rights on a willing seller basis. One of the keys to success is providing better fish passage through the lower five miles of the Manastash Creek, where passage was historically poor due to low (or no) flows and physical barriers such as a diversion dam. Above that point, the stream has more than 20 miles of high quality fish habitat.

The on-farm improvements and water acquisition have cost $2,429,357.85 [26] to date and have put 6.4 cfs back in the creek, meeting the project's Phase One goal of 6 cfs. Of the 6.4 cfs secured to date, about half is the result of on-farm conservation (converting rill to sprinklers). The rest has come from a "reverse" water rights auction conducted by Washington Rivers Conservancy (now the Washington Water Project of Trout Unlimited).[27] Additional project components will pipe approximately 3,000 feet of unlined district

[25] "Partnership Launched Between WEC and Farmers, WEC Newsletter, Autumn 2003.

[26] Email correspondence with Sherry Swanson, Kittitas Conservation District, May 2011.

[27] Personal communication with Sherry Swanson, Kittitas County Conservation District, February 2011 and with Lisa Pelly, Trout Unlimited, April 2011.

ditch with a net water savings of 0.8 cfs. In addition, there are currently pending acquisitions of another 3–5 cfs of water. These efforts have the potential to re-wet a portion of the stream that is typically dry during the summer and early fall.

According to a biologist with NOAA Fisheries, Manastash Creek could provide habitat for more than 50 spawning pairs of steelhead per year and potentially more than 1,000 coho salmon.[28] The project has been funded by the Washington Water Project of Trout Unlimited, Kittitas County Conservation District's Bonneville Power Instream Flow grant, the Washington Dept. of Ecology and its Columbia River Water Management Program, Bonneville Power's Columbia Basin Water Transactions Program, WSCC Irrigation Efficiencies Grant Program and the NRCS Agricultural Watershed Enhancement Program.[29]

Washington's Office of the Columbia River, which is helping fund piping of an unlined irrigation ditch that will improve flows in Manastash Creek, was created by an innovative 2006 state water management law. The law has broken a gridlock between water users seeking new water rights or more certain water supplies on one hand, and environmentalists and tribes seeking flow improvements for salmon and steelhead, on the other. New water rights are now being issued, and there are several projects completed or underway to improve streamflows, particularly in tributaries of the Columbia River. The law provided $200 million in funding to be split among new surface and aquifer storage, re-operation of existing reservoirs, and conservation and efficiency projects.

In addition to contributing to more efficient irrigation conveyance in the future at Manastash Creek, the Office of the Columbia River is funding the completion of two large efficiency projects with benefits for streamflows:

## Barker Ranch, Yakima River, Washington

This project involved canal piping to a restored wetland refuge that depends on irrigation water. Between 3.5 and 10 cfs, depending on the month, is conserved, totaling 6,436 acre feet/year on the water-short lower Yakima River at a cost of $5.6 million.[30] The wetlands on Barker Ranch support at least 175 different species of birds as well as other terrestrial wildlife like coyotes, badgers, and deer. [31]

## Columbia Basin Project Irrigation Districts, Columbia River mainstem, Oregon/ Washington

This project of three related irrigation districts (East, South, and Quincy) involves piping and lining of open ditches to save 5,450 acre-feet of Columbia River water. The water is not left instream, rather it is spread to a groundwater-dependent area that is running out of water and would otherwise require more water from the Columbia River or would need to convert to dryland farming. The cost of the project is $3 million.[32]

---

[28] **http://www.cbwtp.org/jsp/cbwtp/stories/stories.jsp**.

[29] Personal communication with Sherry Swanson, Feb. 2011.

[30] **http://www.ecy.wa.gov/programs/wr/cwp/barker.html**.

[31] See **http://www.ecy.wa.gov/programs/wr/cwp/crwmp.html** and **http://www.ecy.wa.gov/programs/wr/cwp/images/pdf/projectmap.pdf**.

[32] **http://www.ecy.wa.gov/programs/wr/cwp/CBID.html**.

# North Fork Blackfoot River, Montana: Individual On-Farm Efforts

A growing number of cases around the West partner individual farmers and ranchers with non-profit organizations to make their irrigation practices more efficient, often in combination with other restoration work. A prime example of this sort of project involves John and Irene Weaver, long-time ranchers near Ovando, Montana who worked with the Montana Water Project of Trout Unlimited (TU) to make the irrigation supply for their pasture much more efficient. The project has significantly benefited ESA-listed bull trout.

Prior to being approached by TU, the Weavers had obtained their irrigation water by diverting 20 cfs into an old, leaky canal well upstream of their property. The canal took a lot of work to maintain, and the prospect of a lower maintenance, higher efficiency system appealed to the Weavers.[33] By replacing the canal and upstream diversion with a two cfs pump directly from the river and by converting from wheel-line sprinkler irrigation to a center pivot sprinkler, the Weavers were able to execute a 30-year lease of 18.5 cfs to TU for instream purposes.

The instream flow improvement has made a big difference to local bull trout, which now are able to reach upstream spawning grounds. Trout Unlimited funded the project and walked the landowners through the process. The Weavers are happy to have been involved in the project for its streamflow benefits, and have found the new system to be easier to operate and maintain. "Every year, it took us about four to five days of dang tough work to clean that ditch," said John Weaver. "I've wanted to get off that ditch for years. Because of the financial help, I finally got it done."[34] Funding partners on this project included the US Fish and Wildlife Service (FWS), the Big Blackfoot Chapter of TU, the Columbia Basin Water Transactions Program, and the Weavers.

Partnerships have been the key to the success of the Blackfoot Project. Partnerships take many forms including technical expertise, financial assistance, materials, in-kind labor, and moral support. Key partners include private landowners, TU and other nonprofits, Montana state agencies, several federal agencies, North Powell Conservation District, several foundations, Plum Creek Timber Company, Montana Power Company, Orvis Company, and many others.

Similar small-scale but biologically significant on-farm efficiency projects exist around the west, partnering farmers and nonprofits, including:

## Little Bear Creek, Cache Valley, Utah

A farmer switched from flood irrigation to a combination of center pivot and pit irrigation, and moved the diversion from this cutthroat trout-bearing creek downstream to the South Fork of Bear Creek. This doubled the flow (from 3–6 cfs) in a 7.2 mile section of Little Bear Creek. The water pressure for the center pivots provides micro-hydro, and the whole project only cost about $250,000. It was coordinated by the Utah Water Project of TU. A neighbor of the farmer is now interested in doing a similar project on his land, which will further benefit the flows in the creek.[35]

## Nine Mile Creek, Tributary to Little Clark Fork, Montana

Nine Mile Creek flows into the Little Clark Fork and has a significant bull trout and westslope cutthroat population. Improved on-farm efficiency (wheel line instead of flood), decommissioned ditches, downstream movement of a diversion pump, discontinued irrigation on part of a ranch, and restoration of an area around an old pump composed the project, which was coordinated by the Clark Fork Coalition. The project received $75,000 for the wheel line from the Bonneville Power Administration's Columbia Basin Water Transactions Program.

[33] Personal communication with Stan Bradshaw, TU, Feb. 2011.

[34] **http://www.tu.org/waterpartners**.

[35] Personal communication with Tim Hawkes, TU, Nov. 2010.

## Badger Creek, Little Lost River Drainage, Idaho

TU worked with landowners on Badger Creek, a bull trout spawning tributary,[36] to reconnect the stream with the Little Lost River and to restore a half-mile section of Badger Creek. One farming and ranching family owns all of the private land surrounding the confluence of Badger Creek with the Little Lost River, and they historically diverted all its water for agricultural operations. TU worked with the family to change their point of diversion from Badger Creek to the Little Lost River, using FWS funding to install a new diversion with fish passage on the Little Lost River and NRCS funding to install a gravity-fed pipeline and center pivot irrigation system. This has resulted in less water diverted for irrigation while increasing agricultural productivity. Because of the conversion to center pivot sprinklers, a smaller amount of water will be diverted from the Badger Creek/Little Lost River system.

The difference will remain instream, although it will be available for diversion by the water right holders if they revert to flood irrigation. In addition, irrigation water is now taken from the Little Lost River, which is water quality impaired, and leaves cold, clean water from Badger Creek instream, reconnecting 6.4 miles of spawning habitat. The new point of diversion allowed TU to negotiate a 30-year non-diversion agreement with the irrigators on Badger Creek using the Columbia Basin Water Transactions Program. The non-diversion agreement ensures full natural flows; the diversion was removed as part of the restoration effort, and there are no other downstream diverters. Using a mix of funds from private, state, and federal sources, TU also restored and fenced Badger Creek to improve habitat. Recent fish population research shows that the reconnection and restoration project has benefited bull trout spawning in Badger Creek.

## Rock Creek, North Fork Blackfoot Drainage, Montana

A rancher with 80 acres of pasture converted from flood irrigation to center pivot on 55 acres with the assistance of TU. The conservation on the ranch, which had formerly dried up the creek during irrigation season, blocking migration of both fluvial westlope cutthroat and bull trout to upstream spawning grounds, now allowed at least 1.5 cfs to remain in the stream under a lease. In combination with floodplain and riparian restoration activities, the on-farm efficiency has kept the middle reaches of the creek flowing during critical westslope cutthroat and bull trout migration periods since 2005.[37] Funding partners in the Rock creek project included the Big Blackfoot Chapter of TU, NRCS, and the Columbia Basin Water Transactions program.

[36] **http://www.tu.org/waterpartners**, personal communication with Scott Yates, TU, Nov. 2010.

[37] Personal communication with Stan Bradshaw, Feb. 2011.

# Russian River, California: More Natural Flows

In the Russian River, municipal water efficiency programs contribute to a more natural flow regime, which is necessary to create more natural habitat for endangered coho salmon and threatened steelhead trout. Achieving more natural flows requires reducing water releases from an upstream dam in the summer, which must be accompanied by reduced downstream diversions in the summer. Together these actions can provide higher flows in the fall when another species of salmon, chinook, is returning. Taken together, these actions to restore a more natural hydrograph require significant on-the-ground water efficiency efforts downstream by water users including the Sonoma County Water Agency.

Historically, the Russian River has been managed with unnaturally high flows in the summer in order to allow for water diversions for municipal and agricultural uses, as well as to provide recreational opportunities. But when the central California coast populations of coho salmon, steelhead, and chinook salmon were listed under the ESA (in 1996, 1997, and 1999, respectively), it became clear that action to create a more natural flow regime would be necessary to protect these imperiled fisheries. Ramping up more efficient use of municipal and agricultural water in and around Russian River basin communities such as Santa Rosa (in Sonoma County) and Ukiah (in Mendocino County), along with reducing minimum summer instream flow requirements, will help contribute to creating a more natural flow regime.

NOAA Fisheries determined in a 2008 Biological Opinion on Russian River coho and steelhead that summertime flows should be reduced from as high as 185 cfs to 125 cfs in the upper river, and from as high as 125 cfs in the lower river, down to 70 cfs.[38] These summertime flow reductions create better habitat conditions for coho and steelhead, and also allow more cool water to be stored behind an upstream dam for release in the late summer and early fall for the benefit of adult salmon returning to spawn.

Implementing these flow reductions necessitates changing a 1986 decision by California's State Water Resources Control Board (State Water Board) that mandated the historically higher flows. To accomplish this, the Sonoma County Water Agency (SCWA), which is also the County Board of Supervisors, is initially seeking permission on a year-to-year basis to manage the river at flows below those called for by the 1986 State Water Board decision. After an environmental review is completed in 2013, SCWA will be in a position to ask the State Water Board for a permanent change to the 1986 decision.[39]

[38] **http://www.scwa.ca.gov/files/docs/projects/rrifr/rrifr%20flier%20flow%20changes%202010%20final.pdf.**

[39] *Id.* and personal communication with Pam Jeane, SWCA, Jan. 2011. Also **http://library.municode.com/index.aspx?clientID=16484&stateID=5&statename=California**.

The State Water Board has been supportive of this temporary reduction in instream flow requirements through its 2009 temporary order.

While obtaining permission from the State Water Board to implement the lower flows gets Sonoma County Water Agency and other Russian River water managers over a key administrative hurdle, on-the-ground action by SCWA is also underway, in the form of implementing significant water conservation and efficiency programs. A primary measure to achieve this goal is utilizing water budgets for commercial irrigation within the Sonoma County Water Agency's service area. This primarily affects summer diversions.

Other conservation tactics currently employed by SCWA and other local water managers include public education campaigns, cash for grass replacement, incentives to use graywater and harvest rainwater, and implementation of California Urban Water Conservation Council Best Management Practices.[40] The state's permanent change to the 1986 State Water Board decision is expected to include water conservation and efficiency requirements, which would institutionalize some of these efforts.

To date, flows in the river have more closely reflected natural levels, but they have not always met the levels outlined in the biological opinion. In 2009, the combination of water conservation and a drought allowed the Russian River to meet target flows. A wetter year in 2010 resulted in higher flows than were sought under this opinion, but flows were nevertheless lower than they had been previously.

In a separate effort, local grape growers, in response to winter low flows, are instituting frost control methods on local vineyards that are less water-intensive. While this does not contribute to summer instream flow reductions for endangered species, it has some impact on nighttime spring flows and through sudden changes in river and tributary flows may affect salmon and steelhead.[41] It also illustrates what may be possible in agricultural water efficiency. NRCS-suggested water efficient practices that protect crops from frost without impacting salmon habitat include various types of wind machines, retrofitting of sprinkler heads, and incorporation of on-site weather stations to improve timing and application of water.

[40] **http://www.scwa.ca.gov/files/docs/projects/water-supply/Water_Supply_Strategy_Action_Plan_BOARD_PRESENTATION_SEPTEMBER_2010.pdf.**

[41] Sonoma County Winegrape Commission, Water Conservation, Frost & Irrigation at **http://www.sonomawinegrape.org/frost.**

## Mono Lake, California

In the late 1990's a municipal water conservation program helped save water for environmental restoration—in this case streams flowing into Mono Lake and the Lake itself. In response to a 1994 State Water Board order to halt water withdrawals and raise lake levels, the Los Angeles Department of Water and Power, while initially reluctant, implemented a major efficient showerhead and toilet retrofit program. Los Angeles had already demonstrated the feasibility of reduced short term water use (20 percent in 1991-92), in response to drought conditions. Los Angeles water conservation programs have reduced long-term water use compared to early water use projections. Documented water savings are available for this effort, which is somewhat unique in that it is based on a decision relying on the public trust doctrine.

## Sacramento Water Forum Agreement, American River, California

The American River is prized for recreation as well as its fisheries and water supply. This negotiated agreement among 40 diverse interests in 2000 seeks a way to maintain more reliable water supplies and sufficient instream flows to protect the lower American River and support native salmon and steelhead. Municipal water conservation best management practices and conjunctive management of surface and groundwater are but two of seven elements of the multifaceted agreement, which also describes diversions and supply projects.

While agricultural districts are part of the agreement, specific agricultural efficiency measures were not included; for districts using federally supplied water from the Central Valley Project, different agricultural efficiency requirements apply, and those using groundwater are subject to groundwater provisions of the agreement.

In the ten years since the agreement was signed, some municipalities have put in place conservation plans and measures. Streamflow levels have been incorporated as part of protections for fisheries flows. But formal federal USBR and State Water Board approvals have not yet taken place. And savings from these efforts are not well documented. Permanent approval would require re-operating the federal Folsom Dam on a permanent basis for fisheries flows as well as hydropower and water supply. A "successor agreement" governs implementation of the original 30 year pact and refinement of agreements.

# The Legal Setting in the Colorado River Basin

The law—in the form of numerous statutes, regulations, ordinances, programs, compacts, contracts, and other governmental and non-governmental instruments—significantly influences what can be done with water, when, and where in the Colorado River basin. Almost any action will have a unique set of legal considerations, so a case-by-case analysis is nearly inevitable for any project that seeks to use water conservation[1] efforts to benefit instream flows.

Due in large part to the federal role in dam operations and the provision of water, U.S. Bureau of Reclamation and Army Corps of Engineers regulations and contracts shape water management in many parts of the basin. Also looking basin-wide, what has come to be known in short-hand as the Law of the River identifies water allocation to each state, priority of water usage among certain states, and even water quality requirements and more. While the Law of the River primarily addresses interstate water affairs, it influences what is done in each state and can affect conservation efforts and instream flow protections.

State law in the seven basin states also plays a significant role as it sets the base parameters for what can and cannot be done with water and what procedures are required.[2] For all seven basin states, the doctrine of prior appropriation is the dominant, if not exclusive, means of water allocation.[3] In short, prior appropriation is the first-come, first-served approach.

Traditionally, the oldest right is completely fulfilled, then the next oldest, and so forth down the line until there is no water left to allocate. In addition, prior appropriation has two key tenets: the no-injury rule, which protects water rights from impairment by others, and the doctrine of forfeiture, commonly known as "use it or lose it." Each state has its own interpretations of, exemptions to, and modifications of this basic system of allocation, which can and has resulted in widely varying opportunities between states for water conservation, instream flow protection, and combinations of the two. Therefore, each state is addressed independently below rather than as a collective.

Importantly, all discussion of using conserved water for instream flow purposes involves a change of use of an existing water right, not a new appropriation of water. Conserved water comes from an existing use, and hence an existing water right, that is requiring less water. So when conserved water is sought to be used for instream flow purposes, it is a change in the purpose and place of use of the existing water right rather than a new appropriation. This is a significant distinction because laws often treat new appropriations differently from changes in existing water rights, particularly when it comes to instream flow.

## Federal Influence

Many federal statutes and regulations affect or have the potential to affect water management in the Colorado River basin. They can create obstacles to or provide opportunities for water conservation and instream flow protection. The Clean Water Act establishes the primary framework for federal, state, and tribal regulation of water quality and has the potential to affect flows through discharge permits and water quality standards such as aquatic life use. The Endangered Species Act can affect water uses and management actions that may harm a threatened or endangered species, and its application to federal water projects has generated serious controversy in the West. In addition, the National Environmental Policy Act, Rivers and Harbors Act, Water Resources Development Act, Safe Drinking Water Act, and other federal laws can have varying degrees of influence on water management decisions.

[1] The meaning of the terms "water conservation" and "water use efficiency" varies across states and contexts, both legally and in practice, so they are intentionally not defined here. Identifying what does and does not qualify as a water conservation or use efficiency project or program under specific laws is outside the scope of this legal summary.

[2] *See, e.g.*, Charlton H. Bonham, *Perspectives from the Field: A Review of Western Instream Flow Issues and Recommendations for a New Water Future,* 36 Envtl. L. 1205, 1208 (2006); Ruth Mathews, *Instream Flow Protection and Restoration: Setting a New Compass Point,* 36 Envtl. L. 1311, 1324-5 (2006).

The U.S. Bureau of Reclamation (USBR) and, to a lesser extent, the Army Corps of Engineers (Corps) play a more direct role in the management of water in the Colorado River basin.[4] Their water control projects result in a significant quantity of stored water, water that can be delivered under contract to certain water users under defined circumstances. USBR is the largest wholesale water supplier in the country, providing one out of five western farmers with irrigation water and part of the water supply for over 30 million people.[5] USBR's Lower Colorado Region acts as the water master for the Colorado River from Lee Ferry to the Mexican border; to use any Colorado River water within that reach requires a water delivery contract with the Bureau.[6] As a result, USBR's participation in any water management decisions is often valuable if not necessary throughout the basin and particularly the lower basin. Important to note in this context, USBR has signaled its interest in water transfers through a policy explicitly seeking to facilitate temporary and permanent voluntary transfers of project water from existing to new users and uses, pursuant to state and federal law.[7]

The Corps, by contrast, is more limited in its role as water provider. It can enter into agreements to provide water for municipal and industrial uses when it would not adversely affect the existing uses of that water.[8] Water in reservoirs operated by the Corps may be used for irrigation purposes if the Secretary of the Interior recommends and the Secretary of the Army determines that such is warranted.[9] The Corps may be a relevant party depending on where in the basin the proposed activity is located.

In addition, the federal government owns a significant portion of land in the Colorado River basin. Where the federal government has designated certain lands for a specific purpose, those lands may have a right under federal law to receive the minimum quantity of water needed to fulfill that purpose.[10] Such "reserved rights" are usually determined in state courts, however, and are generally not recognized or protected until they have been judicially confirmed.

Also of note, the United States Supreme Court has original jurisdiction over controversies involving two or more states,[11] meaning that it plays an important role in this arena by being the final arbiter of interstate water allocation and compact disputes. Its recent decision in Montana v. Wyoming, 131 S.Ct. 1765 (2011) may influence water conservation as the Court held that the doctrine of prior appropriation in Montana and Wyoming allows water right holders to make their irrigation systems more efficient (through installation of sprinklers), even to the detriment of downstream water users. The analysis of this decision and influence of the Supreme Court suggests that a similar result could occur in other states.

3 David H. Getches, Water Law in a Nutshell, 7-8 (2009).

4 *See, e.g.,* A. Dan Tarlock, The Future of Prior Appropriation in the New West, 41 Nat. Resources J. 769 (2001).

5 **http://www.usbr.gov/main/about/fact.html**.

6 *See* Boulder Canyon Project Act, 43 U.S.C. § 617.

7 *See* 2001 Bureau of Reclamation Policy on Voluntary Transfers of Project Water, **http://www.usbr.gov/recman/wtr/wtr-p02.pdf**.

8 33 U.S.C. § 708.

9 *Id.* § 390.

10 *See, e.g.,* United States v. New Mexico, 438 U.S. 696 (1978).

11 U.S. Const. art. III, § 2.

# Law of the River

A series of laws, agreements, and court decisions over the course of many decades comprise the Law of the River. The Colorado River Compact divided water between the upper and lower basins of the river.[12] The Boulder Canyon Project Act apportioned 7.5 million acre feet (MAF) per year among the three lower basin states,[13] and the Upper Colorado River Basin Compact did the same for the upper basin states.[14] The Mexican Water Treaty of 1944 guaranteed 1.5 MAF per year to Mexico,[15] and Minute 242 of the U.S.-Mexico International Boundary and Water Commission of 1973 set salinity requirements for those deliveries to Mexico.[16] The Colorado River Basin Project Act authorized the construction of the Central Arizona Project and prioritized California's rights to Colorado River water over those used by the Central Arizona Project.[17] More recently, the Department of the Interior authorized interim operational guidelines for Lake Powell and Lake Mead during drought and low reservoir conditions, including agreed-upon delivery reductions for Nevada and Arizona in years that Lake Mead is projected to be at or below certain water levels.[18]

These and other aspects of the Law of the River create much of the overarching structure for water-based relations in the Colorado River basin, but their impact on water conservation efforts is not necessarily direct or always evident. The threat of a compact call, effectively a demand by the lower basin states of the water due to them under the Colorado River Compact, has the potential to encourage water conservation efforts in the upper basin because it could help with weathering a call. Also, with the increasing potential for a call, new appropriations of Colorado River water are not as secure as once thought; conservation can be a more reliable approach to meeting new demands. Furthermore, as rights in stored water in basin reservoirs become more quantifiable and transferable, year to year and party to party, water banking and transactions may add more incentive to conserve. The opportunities for and obstacles to water conservation from the Law of the River extend beyond these few examples and are likely to change in the coming decades.

The effect of the Law of the River on instream flow protection, however, is more evident and generally grimmer. Quantifying the water rights of each state in the basin has led to a mentality of keeping that full allocation in-state unless forced to give it up, for example through a compact call. The fact that the largest demand for Colorado River water is in the lower basin has only added to this protectionism; some believe instream flow rights are a potential tool for lower basin states to draw more water from upper basin states.

In this vein, several states have enacted geographic limits to instream flow rights, and two states explicitly reference compact rights. In Colorado, instream flow rights and recreational in-channel diversions are prohibited from preventing the full development and consumptive beneficial use of waters available by law and interstate compact.[19] In Wyoming, instream flow rights are prohibited from causing more water to leave the state than is allocated by interstate compact for downstream uses, and anyone may divert and appropriate instream flow waters for another purpose within one mile upstream from the Wyoming state line.[20] This mentality and the limitations on instream flow rights add even more obstacles to mainstem, basin-wide instream flow protection and restoration efforts and suggest that flow projects may have a greater likelihood of success when confined within a state.

The Law of the River has so many pieces that its present and potential influence on water conservation for instream flow purposes is hard to determine in all instances and in all areas of the basin. But at the most basic level, the allocation of water among states and setting of priorities for delivery appears to challenge more than assist multi-state and basin-wide instream flow efforts regardless of whether the source is water conservation.

---

[12] Colorado River Compact, Nov. 24, 1922, art. 3.

[13] 43 U.S.C. § 617c(a).

[14] Upper Colorado River Basin Compact, Oct. 11, 1948, art. 3. Arizona is both an upper and lower basin state.

[15] Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande: Treaty between the United States of America and Mexico, Feb. 3, 1944, art. 10.

[16] Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River, International Boundary and Water Commission, United States and Mexico, Minute No. 242, Aug. 30, 1973.

[17] 43 U.S.C. § 1521.

[18] Record of Decision: Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead, Dec. 13, 2007, **http://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf**.

[19] Colo. Rev. Stat. §§ 37-92-102(3), 37-92-305(13)(c).

[20] Wyo. Stat. Ann. §§ 41-3-1002(d), 41-3-1006(h).

# State Law

### Summary of Colorado Basin State Law Relevant to Water Conservation and Instream Flow

| | Can the purpose and place of use of conserved water be changed? | |
|---|---|---|
| | From agricultural rights? | From other rights? |
| **California** | Yes | Yes |
| **Nevada** | No | [No express prohibition/permission] |
| **Colorado** | [No express prohibition/permission] | [No express prohibition/permission] |
| **Utah** | No | [No express prohibition/permission] |
| **Arizona** | [No express prohibition/permission] | [No express prohibition/permission] |
| **New Mexico** | Yes | [No express prohibition/permission] |
| **Wyoming** | No | No |

| | Can an existing water right be changed to an instream flow (ISF) right? | Can conserved water be protected from forfeiture/abandonment? |
|---|---|---|
| **California** | Yes | Yes, it is equivalent to a beneficial use |
| **Nevada** | Yes | N/A—no forfeiture for surface water rights |
| **Colorado** | Yes, by or transferred to the state | Yes, participate in conservation program |
| **Utah** | Yes, by or to state or fish organization | Yes, nonuse exemption for up to 7 years |
| **Arizona** | Yes | Potentially, but forfeiture is not enforced |
| **New Mexico** | Yes, at least by or to the Interstate Stream Commission | Yes, participate in conservation program; ag conservation equals beneficial use |
| **Wyoming** | Yes, by or transferred to the state | No |

| | Who holds rights changed to instream flow? | For how long? | For what reasons? |
|---|---|---|---|
| **California** | Anyone | Temporary or indefinite | Wetlands habitat, fish and wildlife, or recreation |
| **Nevada** | Anyone | Temporary or indefinite | Any recreational purpose, including wildlife |
| **Colorado** | Colorado Water Conservation Board (CWCB)— a local government entity may hold recreational in-channel diversions (RICDs) | Temporary or indefinite | Preserve or improve the natural environment to a reasonable degree |
| **Utah** | Divisions of Wildlife Resources and Parks and Recreation and 501(c)(3) fishing organizations | State agencies: indefinitely or for 1 year or less; fishing org: longer than 1 year but not more than 10 | State agencies: many reasons; fish org: protection or restorwation of habitat for 3 species of trout |
| **Arizona** | Only the state may hold instream flow (ISF) rights retaining the priority date | Indefinitely if transferred to the state | Recreation, wildlife, or fish purpose |
| **New Mexico** | Anyone | Undefined | Fish and wildlife, recreation |
| **Wyoming** | The state | Indefinitely | Fisheries |

# California

California water law generally is favorable for using water conservation to benefit instream flows. A water right holder can protect conserved water from forfeiture and use that water for a new purpose and in a new place, including instream. A water right holder can transfer the right to conserved water but is not required to in order to create an instream flow right. Unlike many states in the basin, anyone can hold an instream flow right in California. The change of a right to instream flow may be temporary or indefinite, and there are expedited review procedures for shorter-term changes, making response to environmental needs easier.

A conventional obstacle to water conservation in prior appropriation states, the doctrine of forfeiture allows the state to take back a water right or portion thereof if it is unused for a set number of years, which in California is five.[21] As in most basin states, California has made a statutory exception for water unused due to conservation; specifically, the reduced water usage from conservation measures is deemed equivalent to beneficial use.[22] To secure this exception, the right holder need only note the amount of water conserved on periodic reporting forms. Separately, anyone entitled to water from the Colorado River under contracts with the United States and undertakes a water conservation effort that results in reduced use of Colorado River water within the Imperial Irrigation District is protected from forfeiture for the amount conserved. The forfeiture exceptions would allow the amount of water conserved simply to remain instream without repercussions to the water right. Also, conservation downstream to allow for lower, more natural flows during the late summer, as seen in the Russian River example, can avoid permanent impact on water rights through the exceptions.

But California water law goes further in paving the way for using water conservation to benefit instream flows. A water right holder may change the purpose of use, place of use, and point of diversion and even transfer the conserved portion of a water right.[23] A water right can be changed "for purposes of preserving or enhancing wetlands habitat, fish and wildlife resources, or recreation in, or on, the water."[24] In California, anyone may petition for and hold such instream flow rights.[25] Thus, a water right holder could change the purpose of conserved water to instream flow and hold the right herself, transfer the conserved water to an environmental organization which would then change the purpose of use to instream flow, or any number of other permutations.

Changing the purpose of use of a water right to instream flow can be temporary or indefinite but requires the permission of the State Water Resources Control Board in any event.[26] There are informational hurdles in this process. The standard petition for a change requires all information that is reasonably available to the petitioner or from the Department of Fish and Game regarding the potential effect of the change on fish and wildlife.[27] Specifically for change petitions to instream flow, the petition must state the time, location, and scope of the change.[28] The state also has expedited reviews for temporary urgency changes, which expire within 180 days and are subject at all times to revocation by the board,[29] and temporary changes associated with a transfer for a period of one year or less.[30] These options have the potential to allow faster response to environmental needs, conserving water and quickly putting it to an instream purpose when it is most needed.

California not only offers the opportunity to protect conserved water from forfeiture, but to change the purpose of its use to benefit instream flow, establishing a temporary or indefinite dedication of water to the stream that can be protected under state law from downstream users. In addition, the State Water Resources Control Board has a liberal view of water conservation, determined by reductions in withdrawals, generally resulting in more water being deemed conserved than under a consumptive use analysis. Water conservation efforts in the state have prevented the need to appropriate new water in many instances, despite growing demand. But relatively few water conservation projects have made water available for another purpose, and in only roughly twenty instances has the other purpose included instream flows. Water right transfers for instream flow purposes have tended to be from stored water or foregone use rather than water conservation. Thus, while the groundwork appears to be laid, the intersection of water conservation and instream flows is largely uncharted territory.

[21] Cal. Water Code § 1241.

[22] *Id.* § 1011(a).

[23] *Id.* § 1011(b).

[24] *Id.* § 1707(a)(1).

[25] *Id.*

[26] *See, e.g., id.* §§ 1701, 1707. Exception: A pre-1914 water right can be changed to instream flow without the necessity of State Water Board approval if there is a diversion of water involved.

[27] *Id.* § 1701.2(c).

[28] *Id.* § 1707(a)(2).

[29] *Id.* § 1440.

[30] *Id.* § 1728.

# Nevada

Nevada water law has several key attributes favorable to using water conservation to benefit instream flows, but a few substantial hurdles exist in practice. On the plus side, forfeiture is not an issue for surface water rights, the manner of use of a water right can be changed to instream flow, changes may be temporary or indefinite, anyone can hold an instream flow right, and credits are given for non-agricultural water conservation. However, conserved agricultural water cannot presently be put to a new use or marketed; no one has ever requested that credits be used to benefit instream flow; and given the significant demand for water in the state, there is little practical opportunity for water conservation to benefit instream flows in the Colorado River or its tributaries in Nevada.

In 1999, Nevada explicitly rejected the forfeiture doctrine for surface water.[31] Therefore, nonuse of a surface water right for any reason, including water conservation, is allowed without risk of forfeiture to the right. Nevada does still have an abandonment statute, but intent to abandon is very hard to prove.[32] At least theoretically, the amount of water conserved simply could remain instream, or conservation downstream could allow for more natural flows, all without long-term legal implications.

Water left instream, however, is not protected from use by others without changing the manner of use to instream flow or establishing private agreements with those downstream. The use of water for any recreational purpose, which includes wildlife watering, is a beneficial use and such a water right can be held by anyone.[33] In practice, those who do hold such rights vary tremendously, including water purveyors, tribes, government entities, and others. In addition, these water rights for "recreation" are not distinguished much from other rights in Nevada water law, so the rules have been applied equally to them. A water right holder can change the manner of use of an existing water right to "recreation," but the State Engineer must first approve it.[34] Such changes can be temporary or indefinite. The State Engineer may expeditiously approve a temporary change, which does not exceed one year, if the change is in the public interest and does not conflict with existing water rights of others.[35] The State Engineer has processed many of these temporary changes for instream flow. Thus, the manner of use of a water right may be changed to benefit instream flow, the process can be relatively quick to respond to short-term demands, and the original water right holder can retain those rights throughout the process.

With so many of the pieces in place to secure instream flow benefits from water conservation, Nevada's interpretation of water conservation and the practicalities of demand appear to be the limiting factors. The Office of the State Engineer has long held that changing the manner or place of use or transferring a portion of a water right that is no longer needed for the original purpose due to improved water use efficiency is an expansion of the right and thus prohibited. For example, a farmer is entitled only to the amount of water needed to grow the crop, even with a change of crop or improvement in irrigation. The state is considering modifications to this approach for purposes of promoting water conservation, but the focus to this point has been on allowing greater acreage to be irrigated, not flow or other benefits, when switching to a more efficient crop. The State Engineer does allow non-agricultural water purveyors to receive a credit for water conservation, and the credits have, for example, been used to develop additional lots. No one has ever requested that credits be used to benefit instream flow. For purposes of the Colorado River basin portion of the state, increasing municipal demand has been driving a variety of water conservation efforts and would compete with environmental demands for the quantity and timing of delivery of conserved water.

[31] Nev. Rev. Stat. § 533.060(2).

[32] *See id.* § 533.060(4).

[33] *Id.* § 533.030; Nevada v. Morros, 766 P.2d 263, 267 (Nev. 1988).

[34] Nev. Rev. Stat. § 533.325.

[35] *Id.* § 533.345.

# Colorado

Like Nevada, Colorado has a number of laws favorable to using water conservation to benefit instream flow but also significant hurdles to such an end, not the least of which is the state's view of conservation. Colorado has water conservation and instream flow protection exemptions to its abandonment statute. Only the state may hold instream flow rights, but leases to the state for that purpose are allowed, and many entities can hold recreational in-channel diversions, which are similar to instream flow rights. Also, expedited review procedures are available for certain temporary transfers. There are, however, numerous limitations on instream flow rights and recreational in-channel diversions as well as relatively rigorous procedural requirements for establishing such rights. Perhaps most importantly, Colorado arguably is more protective of existing water rights in the review of change applications than other Colorado River basin states. While healthy for the long-term sustainability of the water management system, this policy does create more of a burden before conserved water can be used for other purposes and in other places and ultimately a narrower view of what constitutes water conservation.

Colorado does not have a forfeiture statute. The state's abandonment statute, however, has a provision that serves effectively the same role. Failure to use all or a portion of a water right for a beneficial purpose for ten years or more creates a rebuttable presumption of abandonment of a water right for the amount of water unused.[36] As with forfeiture in other states, Colorado has exemptions to abandonment. Exemptions relevant to the topic at hand include nonuse of a water right that is a result of participation in a water conservation program either established by a municipality or municipal water supplier or approved by a state agency, a water conservation district, or a water conservancy district.[37] These provisions largely have been unused to date, so exactly what would and would not qualify as a "water conservation program" is unclear. But for anything that does qualify, the resulting amount of water could remain instream, or conservation downstream could allow for more natural flows, without risking loss of that portion of the right, at least theoretically. In addition, a loan of water to the Colorado Water Conservation Board (CWCB) for instream flow use exempts the water right from abandonment.[38]

The CWCB is the only entity in the state that is allowed to hold instream flow rights, but it can acquire these rights in many ways, including by purchase, donation, lease, exchange, or other contractual agreement, from or with any person.[39] Leases may be for long or short periods, and there are even special, expedited review procedures for leases to the CWCB that can be exercised for no more than 120 days and 3 times in a 10-year period to fulfill instream flow rights held by the CWCB.[40] The leasing laws are designed to prevent permanent dry-up scenarios, and they allow water right holders other than the CWCB to work to protect instream flows without permanent dedication of a water right. Flexibility and expediency in transfers are also supported by temporary review procedures for changes to water rights and interruptible water supply agreements, where the borrower can exercise the option to use the loaner's water right in accordance with the agreement.[41]

While not considered instream flow rights, and thus not violating the law allowing only the CWCB to hold such rights, recreational in-channel diversions (RICDs) have a similar end but can be held by other interests. The purpose of RICDs is to benefit non-motorized boating.[42] A county, municipality, water district, water and sanitation district, or water conservation or conservancy district may appropriate or change

[36] Colo. Rev. Stat. § 37-92-402(11).
[37] *Id.* § 37-92-103.
[38] *Id.*
[39] *Id.* § 37-92-102(3).
[40] *Id.* § 37-83-105(2)(a).
[41] *Id.* §§ 37-92-308, 37-92-309.
[42] *Id.* § 37-92-103(10.1).

the purpose and place of use of a right to RICD.[43] RICDs potentially offer another opportunity to use conserved water for instream flow purposes, although not directly for environmental benefit.

Changing a water right's decreed use to either instream flow or a RICD involves procedural hurdles and is limited in a number of ways. As noted above, instream flows may not deprive and RICDs may not impair the development and consumptive beneficial use of Colorado's compact entitlements.[44] Conditional water rights cannot be changed to instream flow or RICD rights.[45] Acquired rights changed to instream flow are restricted to the amount appropriate "to preserve or improve the natural environment to a reasonable degree," as determined by the CWCB.[46] A water right donation to the CWCB is prohibited if it would require the removal of infrastructure without consent of the owner.[47] The CWCB must request recommendations from the Division of Wildlife and the Division of Parks and Outdoor Recreation as well as from the U.S. Department of Agriculture and U.S. Department of the Interior before starting an instream flow acquisition.[48] RICDs are limited to specific points defined by control structures, the "reach of stream that is appropriate," and April 1 to Labor Day of each year.[49] For any RICD, the CWCB must make written findings as to whether the RICD would injure instream flow rights or impair development of compact entitlements and if it would promote maximum utilization of waters of the state.[50] And there is much more to the various procedures than can be noted here, resulting in complex water right change processes.

In addition to these obstacles, the major challenge to using water conservation to benefit instream flows is from Colorado's view of water conservation.[51] Colorado seeks to ensure that before any changes to water rights are made those changes will not injure the water rights of others. Such is the reason for extensive procedures for changes. It also results in a fear of being too liberal with regard to what one can do with conserved water, under the premise that "conservation" may not actually be a reduction in the consumptive use (effectively the amount of water removed from the river minus the amount returned). If a water right holder can otherwise use or sell conserved water, he or she may be able to expand the water right and as a result leave less water for others. Prohibiting, or at least being very careful with, such uses of conserved water gives greater assurance that others will not be harmed. That is why, to this point, Colorado rarely has allowed conserved water to be used elsewhere and otherwise. With developments in quantifying water usage and return flows, however, it may be easier in the future for the state to uphold its protections of other water rights while loosening its policies with regard to using conserved water for other purposes, including for instream flows. Indeed, the state presently is investigating means of accomplishing this end.

---

[43] *Id.* § 37-92-103(10.3).

[44] *Id.* § 37-92-305(13)(c).

[45] *Id.* §§ 37-92-102(3)(c.5), 37-92-305(14).

[46] *Id.* §§ 37-92-102(3), 37-92-103 (4).

[47] *Id.* § 37-92-102(3).

[48] *Id.*

[49] *Id.* §§ 37-92-103 (10.3), 37-92-305 (13)(a).

[50] *Id.* § 37-92-102(6).

[51] *See, e.g.*, Jesse A. Boyd, Hip Deep: A Survey of State Instream Flow Law from the Rocky Mountains to the Pacific Ocean, 43 Nat. Resources J. 1151, 1172 (2003).

# Utah

Utah has a few of the key pieces of law for using water conservation to benefit instream flows but also significant hurdles to connecting the two efforts and ensuring that the water remains instream. Nonuse of water may be approved for up to seven years at a time if occurring because of water conservation practices.[52] Fishing organizations as well as certain state agencies may change existing water rights to instream flow rights and hold those rights once changed, but only a state agency may permanently change a right for this purpose.[53] Furthermore, the state agencies have more options of instream flow uses, fewer administrative hurdles to changing a right to an instream flow use, and fewer restrictions on instream flow rights than do fishing organizations. Like Nevada and Colorado, perhaps the largest obstacle to using water conservation to benefit instream flows is restriction on changing the purpose of use of conserved water.

Utah has forfeiture exemptions like those found in other states, but none are particularly relevant to substantial water conservation efforts. For small improvements, the unused portion of the right is exempted if "substantially all" of the right is used within a seven-year period.[54] For larger water conservation efforts, an exemption does not naturally attach given the activity, but an alternative does exist in Utah law. The State Engineer can exempt for up to seven years at a time the nonuse of all or a portion of a water right for, among other reasons, water conservation or efficiency practices.[55] To secure this protection, a right holder must submit a nonuse application before a seven-year continuous period of nonuse is reached. While a more complex process, this protection of a water right still allows the possibility of more water remaining instream or creating more natural flows through downstream conservation, all without threat to the water right. But because a right holder has no authority to call water that will not be used, that water is available to the next appropriator in priority whether upstream or down; it may reach and flow past the current point of diversion, but there is no guarantee. In addition, water left unused in a stream, and not called for by other water right holders, is available for appropriation.[56]

Instream flows are only protected from use by others by changing the purpose of use to instream flow. Utah allows instream flow rights to be held by two state agencies as well as fishing organizations. While not affording quite the flexibility for connecting water conservation and instream flows that allowing anyone to hold instream flow rights does, it is an improvement over vesting such rights in a single state entity. The Division of Wildlife Resources and Division of Parks and Recreation may hold instream flow rights for the propagation of fish, public recreation, or preservation or enhancement of the stream environment.[57] A 501(c)(3) fishing organization may hold a limited instream flow right for the protection or restoration of habitat for the Bonneville, Colorado River, or Yellowstone cutthroat trout.[58]

As in Colorado, there are many procedures relevant to changing the purpose of a water right to instream flow. All change applications for instream flow rights must be submitted to the State Engineer and include studies, reports, or other information required for demonstrating the need for the instream flow and the projected benefits to the public.[59] Fishing organizations also must have the director of the Division of Wildlife Resources approve the change, which includes a number of additional requirements. These procedures mean fewer rivers and streams on which instream flow rights can be sought and more work to achieve what is possible.

Utah also explicitly limits certain aspects of instream flow rights. The two state agencies may only change a water right to instream flow permanently or for one year or less.[60] A fishing organization may only do so for a fixed time longer than one year but not more than 10 years.[61] Perhaps most important for purposes of using water conservation to support instream flows, instream flow rights that can be held by fishing organizations are geographically limited to the section of stream between the water right's original point of diversion and the next point of diversion made by another person.[62] Instream flows held by the state agencies are not so geographically restricted, but the water right would need to be donated to the state,[63] which likely reduces the incentive to pursue that option.

[52] Utah Code Ann. § 73-1-4.
[53] *Id.* § 73-3-30.
[54] *Id.* § 73-1-4(2)(e).
[55] *Id.* § 73-1-4(4).
[56] *See id.* § 73-3-8.
[57] *Id.* § 73-3-30(2)(a).
[58] *Id.* § 73-3-30(3)(a).
[59] *Id.* § 73-3-30(4)(b)
[60] *Id.* § 73-3-30(2)(a).
[61] *Id.* § 73-3-30(3)(a).
[62] *Id.* § 73-3-30(3)(c).
[63] *Id.* § 73-3-30(2)(c).

The most significant limitation to using water conservation to benefit instream flows in Utah is how the state interprets water rights. In Utah an agricultural water right is based solely on the amount of land. In the eyes of the state, if a farmer gets by with a lot less water due to improved irrigation, a change in crop, or some other means, he or she has not lessened actual usage and thus has no "extra" water to change to an instream flow use. While this hurdle appears to apply only to agricultural water rights, the vast majority of water from the Colorado River basin used in Utah is put toward agricultural production. Water conservation from municipal, industrial, and other water users may be of some support, but otherwise the connection of water conservation to Colorado River and tributary flows is left to state-approved forfeiture exemptions for water conservation and the hope that the water is not diverted and used by others.

## Arizona

Much of the law important to facilitate the connection between water conservation and instream flows and securing those instream flow rights is lacking or minimal in Arizona. Certain reasons for failing to use all or a portion of a water right are exempted from forfeiture, but none of the reasons expressly noted in law cover voluntary water conservation efforts generally. Only the state and its political subdivisions may change the purpose of use of a water right to instream flow and maintain the original priority date of the right.[64] This scenario is better than no one having that ability, but private participation is likely to be limited by the fact that a water right must be permanently transferred to the state or political subdivision thereof for this to happen.[65] In addition, there is little clarity in Arizona as to rights in conserved water and what can be done with them.

Forfeiture has not been enforced in Arizona in many years, if at all, which reduces the practical need for exemptions in order to encourage water conservation and promote leaving the conserved water instream. However, the forfeiture statute is still on the books.[66] Even though it is not a factor now, it may be in the future. Nonuse is allowed for several reasons, but only two of them are potentially relevant to water conservation and none are for voluntary conservation efforts.[67] The final nonuse allowance is "[a]ny other reason that a court of competent jurisdiction deems would warrant nonuse," which at least has the potential to include voluntary water conservation.[68]

Similarly, Arizona's instream flow rights laws are not particularly favorable for using water conservation to benefit instream flows. Any water right may be changed to an instream flow purpose, which in Arizona is a recreation, wildlife, or fish purpose. But if it is not to lose the priority of the original water right, it must be transferred indefinitely to the state or one of its political subdivisions.[69] Retaining the original priority date is critical, otherwise the outcome is little different than appropriating a new water right for instream flow, which anyone can do in Arizona, while losing the old, valuable water right. Thus, effectively, only the state and its political subdivisions can hold water rights that have been changed to an instream flow purpose. This is similar to the situation in Colorado, but in Arizona there is no clear avenue for leasing water to the state for this purpose, only permanent transfers. This reduces flexibility and likely participation in changing the purpose of a water right to instream flow.

Many of Arizona's irrigated acres are served by water under contract from the Central Arizona Project or through other contracts for Colorado River water. These contracts have their own parameters and even unique rules. Of note, county water authorities may subcontract for Colorado River water for recreational or fish and wildlife purposes when subcontracts have not been executed or when there is no current demand for the water by the subcontractors.[70] If the lack of municipal and industrial demand is caused by conservation, this explicit subcontracting opportunity may be a means of connecting water conservation and instream flows. These subcontracts are limited to five years, although they can be renewed.[71]

While nothing in Arizona law appears to substantially block a change of conserved water to an instream flow right, there is not much history of it in practice, which may itself present a big hurdle.

---

64 Ariz. Rev. Stat. § 45-172(A).

65 Jesse A. Boyd, Hip Deep: A Survey of State Instream Flow Law from the Rocky Mountains to the Pacific Ocean, 43 Nat. Resources J. 1151, 1154 (2003).

66 *See* Ariz. Rev. Stat. § 45-188.

67 *See id.* § 45-189(E).

68 *Id.* § 45-189(E)(13).

69 *Id.* § 45-172(A).

70 *Id.* § 45-2244(F).

71 *Id.*

# New Mexico

New Mexico has a few of the key legal pieces for facilitating the use of water conservation to benefit instream flows, but the dearth of instream flow laws and experience hinders such an effort. The state's forfeiture exemptions do include water conservation programs.[72] In addition, improved irrigation methods and changes in agriculture practices do not diminish beneficial use, which protects the conserved agricultural water from forfeiture.[73] The purpose and place of use of conserved water can be changed, but New Mexico law only explicitly allows it for agriculture.[74] Although state law allows the purpose of existing water rights to be changed to instream flow, statutes and regulations are silent as to the details. As a result, there is potential but little current opportunity to protect conserved water put to instream flow use from other users.

New Mexico has a number of forfeiture exemptions, one of which is water conservation. This exemption, however, is not as general as it is in some of the other basin states. To qualify, the water right must be placed in a water conservation program approved by the State Engineer.[75] A separate statute, applying only to agricultural water rights, provides greater flexibility regarding water conservation and forfeiture. The law states that changes in irrigation and other agriculture practices that result in water conservation are deemed not to diminish the beneficial use of the water right.[76] In effect, agricultural water conservation is a beneficial use of water. Since water being put to a beneficial use is inherently not in danger of forfeiture, this is another means of achieving a forfeiture exemption. Both of these laws have the potential to allow conserved water to remain instream without risk to the original water right. The latter law, however, appears to have fewer practical limitations, albeit applicable only to agriculture.

Like California, New Mexico takes the next step and allows the purpose and place of use of conserved water to be changed. Unlike California, the New Mexico law only applies to water conservation resulting from improved irrigation and changes in agricultural practices.[77] The water right holder still must apply to the State Engineer for the change, and the water conservation may not impair other water rights.[78] Depending on the State Engineer's response to such applications, the necessary foundation for using conserved water for instream flow purposes and protecting that water from use by others is present in New Mexico, at least for water conservation from agriculture. It is important to note, however, that even if law and the State Engineer make this feasible, the practical opportunities in New Mexico may be limited by the low value of many of the crops, such as alfalfa (little financial incentive and opportunity for improved irrigation), and the reactions of irrigation and conservancy districts.

The most significant legal hurdles to this endeavor in New Mexico actually may come from the laws pertaining to instream flow. In short, those laws are largely undeveloped and untested.[79] In 1998, then Attorney General of New Mexico Tom Udall issued an opinion stating that "there is nothing in the New Mexico Constitution, statutes, or case law that would preclude the State Engineer from approving an application to change the purpose of use of an existing water right to an instream purpose."[80] But other than a 2005 regulation that explicitly includes fish and wildlife as well as recreation in the definition of beneficial use,[81] state law has not developed much in terms of instream flow rights since the 1998 opinion. New Mexico law is silent as to who may hold instream rights, for how long, and for what span of the waterbody. The Interstate Stream Commission is explicitly authorized to purchase, lease, or receive through donation water rights to support the strategic water reserve, which has an instream flow component since it helps the state comply with interstate compacts and court decrees and benefits threatened and endangered species.[82] Aside from instream flow rights held by the commission for these purposes, it is unclear what instream flow rights could be in the state. Depending on how this uncertainty is resolved and the views of the State Engineer, New Mexico could have the basic components in place to protect conserved agricultural water used for instream flow from potential downstream users. For non-agricultural water conservation, however, the options appear far more limited.

[72] NM Stat. Ann. § 72-5-28(G).

[73] *Id.* § 72-5-18(B).

[74] *Id.* § 72-5-18(C).

[75] *Id.* § 72-5-28(G).

[76] *Id.* § 72-5-18(B).

[77] *Id.* § 72-5-18(C).

[78] *Id.*

[79] *See, e.g.,* Jesse A. Boyd, Hip Deep: A Survey of State Instream Flow Law from the Rocky Mountains to the Pacific Ocean, 43 Nat. Resources J. 1151, 1202 (2003).

[80] AG Opinion 98-01.

[81] NM Admin. Code tit. 19, § 26.2.7(D).

[82] NM Stat. Ann. § 72-14-3.3.

# Wyoming

Wyoming allows the change in purpose and place of use of a water right to instream flow, but this is the only aspect of state law that supports connecting water conservation with instream flow, and it is limited.

In Wyoming only the state may hold an instream flow right.[83] It may acquire any existing water rights by transfer or gift for this purpose.[84] Thus, a water right holder can change the purpose and place of use of a water right to instream flow, but only by indefinitely transferring it to the state. In addition, the Game and Fish Commission must petition and receive approval from the Board of Control to change the purpose of use of the right to instream flow.[85] Instream flow rights must be applied to a specific stream segment.[86] Also, within one mile of the Wyoming state line, the main stem of the North Platte River, Big Horn Lake, Flaming Gorge Reservoir, or Palisades Reservoir, waters of an instream flow right can be appropriated by another user for another beneficial use.[87] Instream flow rights cannot result in more water leaving the state than is allocated by interstate compact or Supreme Court decree.[88] Furthermore, the State Engineer is prohibited from enforcing instream flow rights "unless present or future injury to the fishery has been shown," and a city or town may condemn any portion of an instream flow right for municipal purposes.[89] These restrictions on instream flow rights reduce the incentive for private party participation and would challenge efforts to use water conservation to benefit instream flows, even if the other pieces were in place to allow it.

Wyoming has no salvage law, so water conservation does not create water that could be for a new use, a new place, or transfer for those with rights to flowing water. In addition, Wyoming has standardized water rights for agricultural uses, similar to those found in Utah, one cubic-foot per second of flow for 70 acres. If a farmer receives no credit for reductions in consumptive use through improved irrigation, a change in crop, or some other means, this policy presents a significant hurdle to using conserved water for an instream flow purpose in Wyoming. However, there have been instances in Wyoming where water conservation measures have benefitted those with rights to stored water. For example, the U.S. Bureau of Reclamation was able to use water conserved from lining a canal, and the City of Casper has gathered saved stored water.

Wyoming law does not have forfeiture exemptions relevant to water conservation. As a result, there is no legal protection of the portion of a water right not being used due to water conservation measures. This leaves a disincentive to benefitting instream flows by just leaving conserved water instream, and it distinguishes Wyoming from all other states in the basin. However, forfeiture is often hard to prove in Wyoming, so the exemption may not be as necessary in practice as it is in some of the other basin states. There may still be opportunity for water right holders to leave the amount of water conserved instream; there just is not legal protection of the original right or any assurance that the water will remain instream.[90]

---

[83] Wyo. Stat. Ann. § 41-3-1002(e).

[84] *Id.* § 41-3-1007(a).

[85] *Id.* § 41-3-104.

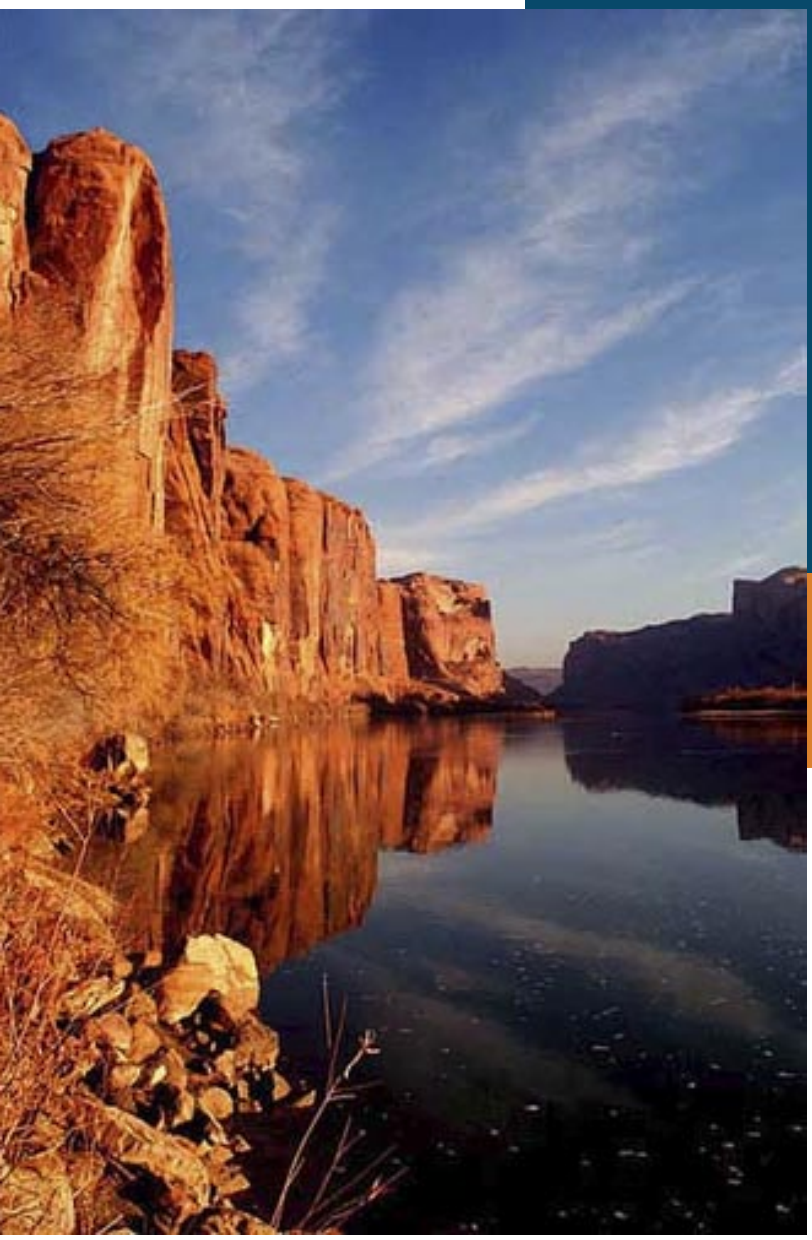
[86] *Id.* § 41-3-1007(b).

[87] *Id.* §§ 41-3-1002.

[88] *Id.* § 41-3-1006(h).

[89] *Id.* §§ 41-3-1008, 41-3-1013.

[90] *See* Jesse A. Boyd, Hip Deep: A Survey of State Instream Flow Law from the Rocky Mountains to the Pacific Ocean, 43 Nat. Resources J. 1151, 1198 (2003).



# Challenges, Incentives and Promising Opportunities:

## Linking Water Efficiency and Instream Flows

Practical possibilities for linking water efficiency efforts and instream flows do exist within the current context of the Colorado River basin. Lessons from experience west-wide can be applied to legal and other characteristics of the basin. Given a stream stretch with a clearly identified need for improved instream flows and a realistic opportunity for improving water efficiency in the surrounding area, willing partners generally can build the bridges needed to overcome other challenges.

While many challenges may hinder the link between water efficiency and improved instream flows in practice, many of those interviewed believe these obstacles can be channeled into incentives and strategies to strengthen this link in parts of the Colorado River basin. We describe in this chapter common characteristics of a successful situation and frame several possible practical approaches for willing partners to pursue promising opportunities within the basin's existing institutional context. Which approach will be most useful depends on the specific local situation and the partners.

This chapter is based on our analysis of the comments heard from over 40 in-basin interviews, advisory group members and the project team, as well as input from a one-day in-basin working session of experts.[1] Lessons from the west-wide case studies and 20 interviews from participants in those efforts were also considered.

[1] For more information on the working session, see **Appendix 2**.

# Challenges to Be Met

A wide range of challenges arise when people contemplate using water from water efficiency efforts to help improve instream flows in the Colorado River basin. One person summed up the obstacles as:

- We don't have the water or the right to it (a legal barrier);
- We don't have the money (a funding obstacle);
- We don't know what we want (an environmental issue); and
- Nobody cares (a willingness/awareness challenge).

## Legal

The traditional characteristics of prior appropriation can appear to be a formidable barrier. But it's important to distinguish between the actual law and the perception of what is and is not possible under it.

Improvement in water use efficiency may adversely affect other water rights in some situations.

The procedures for changing an existing water right to an instream flow right vary in complexity depending on the state; who may hold an instream flow right, for what duration, and for what distance in the stream varies as well by state.

In some states, conserved water cannot be used for another purpose or in another place.

Some states prohibit instream flow rights from limiting the state's ability to exercise compact rights, thus reducing the opportunity for multi-state instream flow protections.

Other laws at different levels of governance address a wide range of water issues, such as storage and groundwater, which can directly or indirectly influence the availability of water for instream flow.

More on these challenges is found in **Chapter 3**.

## Institutional and Motivational

Polarized water interests exist in many areas, based on previous events. Fear, uncertainty, and lack of trust can dominate conversations about the use of conserved water. Attitudes commonly expressed: leaving water instream is "waste;" temporary becomes permanent; instream flow is not perceived as a benefit until it's forced.

A wide array of federal and state programs affect individual water allocation and management decisions, and the larger scale water rights and supply systems of the Colorado River basin can overwhelm what's possible. Some areas may lack capacity and expertise for implementing water transfers and water conservation programs.

The jurisdictional boundaries of those entities undertaking water efficiency efforts may not match the location of streamflow needs, making it difficult to match water from efficiency efforts with instream flow needs.

State water conservation planning requirements may not encourage water efficiency for streamflow purposes. Government institutions may need an outside push to embrace water efficiency programs for this purpose.

The environment is perceived by some as an imposition or outside requirement, and there are those who believe that diverting water for the instream environment will not provide local benefits.

Some individual farmers are concerned that water transfers or conservation will result in unmet district water needs; some municipalities are concerned that allowing water for instream needs will result in unmet future human water demands.

Uncertainty as to future demand and insecurity about future water availability can lead a municipal water provider to err on the high side. Similarly, precise water use, and therefore savings, can be difficult to come by on the agricultural side, out of fear that water not "used" could be forfeited.

Regarding agricultural water use, one person put it, "We're stuck between two generalities: agriculture uses so much water; or, it's all return flows. We need to get to this case by case—can it work here?" Similar sentiments about polarized attitudes were voiced about municipal water use.

## Economics and Finances

For some, the first and biggest question is who will fund these efforts. A disconnect in costs, benefits, and impacts inhibits action. Money is often needed to make improvements upfront, before any economic benefit accrues.

Many municipal water providers perceive and in fact experience a decline in revenues from water efficiency efforts. There can be a financial consequence to overachieving in water efficiency, especially combined with other factors such as a weak local economy. Enormous investments are needed in many cases to improve agricultural water management inefficiencies; they may not be cost effective on their own.

A current lack of money in state water protection and other funds can curtail interest. And tension between local control and state or federal money can limit effectiveness where funds are available.

## Physical and Environmental

The timing and location of instream flow needs may not match the water that can be made available. Similarly, following a physical drop of water may show that water efficiency does not result in streamflow in a particular situation.

All individual efforts take place in a basin context; unintended consequences may result. Increased efficiency may alter the timing or volume of return flows, and thus affect flows in a downstream stretch or at a critical time for downstream fisheries. Water quality impacts from more efficient water use can vary depending on the stream and local conditions.

The groundwater and thus streamflow is site-specific: sometimes it helps ease pressure on a stream while other times it takes away a source of streamflow. And streamflow improvement may unintentionally create new habitat for endangered species.

Riparian areas in some states may be more important than physical water flows. And in some parts of the lower basin, streams are ephemeral or effluent dominated. In both cases, environmental improvement may depend on more than streamflow.

Scientific information regarding where and how much flow is needed must be available. Analysis detailed enough for decision making can be expensive.

## Water Use

The pressures of being continually water short can affect both attitudes and possibilities. Plans for future water needs—drought, development, demands of growth—often place the environment far down the list of priorities. Some see efficiency efforts as contributing to urban sprawl by providing more water supply for growth.

Communities may have a goal to conserve but no plan for use of the conserved water. Different estimates of water available from efficiency activities can complicate planning.

The perception of water utility managers that municipal water demand may harden, become less flexible, from more efficient water use makes some less willing to embrace new water efficiency strategies. Although there are no studies documenting this "demand hardening" effect, this perception that it exists is nonetheless a barrier.

Agricultural evapotranspiration (ET) losses and consumptive (vs. nonconsumptive) water use can impact how much water from efficiency measures can be made available instream, and where. The effect of efficiencies on the timing and volume of diversions as well as return flows can also complicate a project.

# Incentives and Strategies: How to Forge a Practical Link

While there are clearly many challenges, those interviewed commonly believe that often these apparently pervasive challenges can be addressed. Each situation must be evaluated separately, on a local or watershed basis. It's important to identify the challenges in a particular situation and consciously find ways to address them.

What makes sense in water conservation and management varies greatly. Successful efforts do not impose one approach, but allow autonomy to develop an approach for a specific situation—how can it work here? The model or arrangement can be different in each case, defining incentives state by state and even case by case.

Different incentives motivate different types of willing partners: communities, water suppliers, agricultural water districts, farmers and ranchers, nonprofit organizations, and government partners. Identifying incentives within the existing system that work for each participant is important.

## Legal

While it is more difficult in some basin states than in others, it is possible to link water efficiency and streamflows in each state. In several basin states, some creativity is required and legal protections of conserved water put instream may not be available. Slight changes in a state's water law can open more opportunities. Often ways can be found, despite apparent legal limitations.

Forfeiture and abandonment exemptions for water conservation have the potential to incentivize, or at least remove a disincentive to, conserving water and leaving it instream.

Some states allow a change in purpose and place of use of conserved water.

Some states allow temporary changes to an instream flow right or even allow individuals to hold water rights that have been changed to an instream flow purpose, which may encourage more water conservation for an instream flow purpose as compared to all instream rights being held by the government in perpetuity.

Court decisions and other precedent-setting interpretations of laws relevant to the different ways of using conserved water to improve instream flows may not yet exist. While this decreases certainty, it also provides opportunity since there are fewer formal hurdles and a chance to set precedent favorable to these efforts.

In some instances, out-of-basin diversions may result in more water from efficiency efforts and require less process because return flows (and downstream users) are not an issue as a result of "foreign water" laws. This allows the reduction in diversion to be fully used for instream flow protection.

Legal issues can be addressed in two ways: first, by defining what is possible within the existing framework, and how much legal certainty exists by state; and second, by clarifying upfront for a given situation how to reduce legal and regulatory uncertainty.

## Institutional and Motivational

Attitude, trust and willingness are the most important factors in success, according to those interviewed. These can counteract polarization, motivation and attitude concerns.

Partnerships for action are important—one water right holder can't do this alone. These efforts require willing partners and local support.

Personal leadership is key to building bridges among partners, especially water rights holders. A catalyst or champion to jump start the process can really help: a nonprofit organization or a water user with environmental values or need to make a change in existing water uses. In the Pacific Northwest almost every state has nonprofit groups serving as catalysts for action, getting folks on the ground working person to person, river by river.

Motivation often comes from outside events, termed "forced reasons" by one interviewee. Endangered Species Act species-specific requirements, or anticipation of them, can serve as a powerful driver for action. Other federal environmental laws and requirements, such as wastewater (NPDES), water quality, section 404 or TMDL requirements under the Clean Water Act, can serve the same role. Refocused state and federal water conservation plan requirements can motivate action, as can tribal water settlements.

Motivations to take action can be social—"green" values in a community, water-based recreation interests such as fishing and boating, or a simple love of the land. It's possible to build on motivations for environmental mitigation to improve streamflow.

Incentives-based and win-win solutions will engage water users. Each partner must "feel better off with than without" the arrangement, though in some situations better off can be simply avoiding a loss, even a future loss, or being assured of no future harm. Interest may be even higher when there's a direct benefit for property owners or water rights holders, such as improved operations.

Many of those interviewed note that piece-by-piece transactions can make more progress than tackling entrenched systems, and that making the link is less about the technological and physical base and more about the agreements.

Three way trades—e.g. agriculture, streamflow, fish and game; or agriculture, urban, environment—can produce benefits for all. Efforts can take advantage of a long history of folks working together to keep up the "call" on the Colorado River. And if the instream environment can be treated as another beneficiary or customer within the district, improved streamflow in that area may result.

Institutionally, many state and federal programs with similar goals already exist, such as Wild and Scenic Rivers programs. It's important to identify targets of opportunity that are not already addressed by these, and let successes continue in other programs.

An effort focused within one state makes it easier to line up diverse institutions and jurisdictions and utilize existing programs.

## Economics and Finances

Money can really motivate, though it is not the only factor. Put another way, the glue holding together a partnership can be funding—adequate funding to take care of all interests. Interviews suggested that lack of obvious funding sources does not by itself preclude action.

Existing funding programs with other stated purposes can often be applied to the water efficiency-streamflow link. Federal and in some cases state funding may be available from habitat programs, mitigation and habitat conservation funds, and other programs that do not target streamflow. Funding may be cobbled together from several sources on a case-by-case basis. Federal funding for water efficiency efforts is available from several programs at the U.S. Departments of Agriculture and the Interior; environmental benefits may be part of the criteria for selection. Federally sponsored programs, such as the Salinity Control Program and the program implementing the Central Utah Project, may allow and even actively welcome water efficiency efforts that improve streamflows.

While temporary funding has supported some efforts, in the long run permanent sources of funding may be required. On the regional level, the Bonneville Power Administration's Columbia River Basin Fish and Wildlife Program and Columbia Basin Water Transactions Fund may serve as models to structure

continuing source of revenues in the Colorado River basin. On the state level, the dedicated state funding for in- and out-of-stream water supply improvements of Washington's Office of the Columbia River could prove to be an option.

The economics of incentives must be worked out case by case. Many creative economic solutions are possible. Water available from efficiencies could be purchased for instream use. Private investment in instream flow needs may allow greater investment certainty. Allowing water customers to participate in funding can also build support as well as funding.

Positive financial incentives may be less important than simply not losing money. Mechanisms to address financial concerns of municipalities, such as decoupling water rates from volume used, similar to the energy sector, may help to make a water utility financially whole from any decreased revenue as a result of the effort.

Instream flow must compare favorably in economic terms, in the competition for the water available from greater efficiencies, with water demands for greater supply and growth.

## Physical and Environmental

A water district or municipality can achieve environmental benefit with a change in timing and/or location of diversions, as well as by adding to stream stretches between or with no headgates. A strategically relocated point of diversion, as part of a water management effort, can boost streamflow in a particular stream stretch, without necessarily affecting water rights or consumptive use.

Several states already have ways to assess streamflow needs and ranking systems to assist in identifying stream stretches with clear benefit, such as Arizona's state water atlas, Colorado's regional roundtables, the Wyoming Game and Fish five year plan, and Oregon's instream flow targets.

In California, the quantifiable objective concept is not, but could be, seen as a three-way benefit including the environment. Habitat conservation plans, while complex, can offer useful information.

Since simply avoiding harm can be an incentive, anticipating as much as possible unintended physical consequences and adjusting or planning for them can lead to success. Unaddressed return flow issues can complicate a water efficiency project, especially one with intended streamflow benefits. Quantifying the consumptive part of an agricultural water right and of actual return flow, as well as consumption by non-crop water users such as phreatophytes and evaporative losses, can improve certainty of benefits.

Accounting and quantification issues, such as how to track flows and benefits, can be more easily addressed upfront. One approach to a better connection between accounting for in- and out-of-stream needs, funding and legal structure is employed by Washington State's Office of the Columbia River, which estimates in- and out-of-stream demand for water, funds projects to incrementally meet that demand, and protects water saved instream through the state's trust water rights program.

## Water Use

Several recent reports identify opportunities for municipal water conservation in the Colorado River basin.[2] One user-friendly model for analyzing community water efficiency programs is readily available to assist in selecting cost-effective programs.[3] Agricultural water efficiency information for farmers and water districts is readily available as well. And several states have policies and programs that support local water efficiency efforts.

Water efficiency for streamflow can be linked to current structural proposals or other water management efforts. Claiming environmental benefits from more efficient water use, as one component of a project, can improve a project's economics.

As growth in water demand and development has slowed with a depressed economy, short term opportunities for instream flow improvement may emerge. Water efficiency programs that delay actual withdrawal of water may allow water to remain in a stream stretch in the short term.

[2] See for example Municipal Deliveries of Colorado River Basin Water, Michael J. Cohen, Pacific Institute 2011.

[3] More information on AWE's tracking tool is at **http://www.allianceforwaterefficiency.org/Tracking-Tool.aspx**.

# State or Federal Legal and Policy Options

Identifying active roles for state and federal government in linking water efficiency efforts and instream flows is not the focus of this project. Most individuals interviewed felt it important to work within existing institutional and legal structures. State or federal policy changes—some simple tweaks, some more significant—are beyond the scope of this study (below we briefly address ways to encourage local action within existing structures).

Still, many of those consulted for this report pointed to possible incentive, law and policy changes that states or federal agencies could undertake to facilitate the link between water efficiency efforts and improved streamflows in the Colorado River basin. The most commonly offered of these are reported here.

Several powerful state actions were frequently proposed:

- Establish new state-based funding mechanisms for projects that improve flows along with increasing water supply certainty (see, e.g. Washington State's Office of the Columbia River).
- Retool the rules for existing funding programs established for other purposes to allow or give extra credit for efforts that link water efficiency and streamflows.
- Adopt a percentage set-aside from any water right transfer for instream flows as a transaction cost of any transfer or any change to a water right. In Arizona, a percentage of water stored through artificial recharge must be left in the aquifer as a "cut to the aquifer" and the rest may be recovered for beneficial use. In Oregon, a percentage (usually 25 percent) of any conserved water from water efficiency measures is automatically allocated to instream flows in exchange for a change in the water right allowing use, sale or transfer of the conserved water.
- Utilize permit conditions for state water quality and water management programs to encourage water efficiency measures that meet program objectives.

Federal and multi-state adjustments to the larger water management system to allow or encourage efficiency efforts, primarily the province of the U.S. Department of the Interior (Reclamation) and the Basin Compact signatories, were also suggested:

- Amend the rules by which federal funds for water efficiency are spent, such as NRCS EQIP and USBR WaterSMART grants, to give extra credit for instream flow benefits.
- Allow policies and agreements flexible enough to allow streams and rivers to serve as conveyance systems between sources and points of use, particularly where enhanced flows may benefit the river ecosystem, including across watersheds. Consider other ways to allow a portion of conserved water to be made available for instream flows basinwide.
- Encourage measures that modify and apply the concepts of the Intentionally Created Surplus (ICS) program for the lower Colorado River basin[4] to allow linking water efficiency programs with instream flows in the upper basin and basinwide.
- Use the Colorado River Water Supply and Demand Study (Basin Study) process as an opportunity to discuss both institutional arrangements and environmental needs, as the study enters phase two. This might explore the changes needed to allow water banking for environmental needs across state lines and between lower and upper basin partners.[5]
- Adapt federal project purposes to meet environmental needs, such as needs of ephemeral streams in the lower basin affected by the Central Arizona Project.
- Employ mitigation obligations for hydropower dam owner/operators or others to help restore flows and habitat, as does Bonneville Power Administration's Columbia Basin Water Transactions Program.

[4] One overview of ICS and its effect on water suppliers can be found at **http://www.snwa.com/ws/river_surplus_ics.html**.

[5] Information on the Basin Study can be found at **http://www.usbr.gov/lc/region/programs/crbstudy.html**.

# Characteristics of Success

The many challenges of linking water efficiency efforts to improved instream flow can be met by a range of incentives and strategies. Successful efforts have several common characteristics that have emerged from our work. Many sections of the Colorado River have a wide array of water users and water interests, municipal, industrial, agricultural, environmental, recreational, spiritual, etc., and different incentives are necessary for different sets of partners in different scenarios to capitalize on the promising opportunities

## Clearly Identified Streamflow Need

A clearly and scientifically defined instream flow need for a specific stream stretch can be necessary to target efficiency efforts, promote buy-in through clear goals, and improve implementation, and in some cases meet state or federal legal requirements for an instream flow right. As scientific studies can be time-consuming and complex, in some cases restoring any flow to a specific stretch in need of flow improvement can be a worthwhile first step.

## Water Available Through Efficiency Measures in the Right Time and Place

Water must be physically available, or at least potentially available, from water efficiency efforts. The water available must also match or assist in improving instream flows in terms of timing, location and/or volume of flows. Building water efficiency measures into broader water management and/or habitat restoration efforts may hold the most promise for success. Even communities and agricultural districts that have implemented water efficiency measures may find room for more savings, with targeted programs and a clear environmental objective.

## Relevant Quantity

A small amount of water can fill a significant need in a small stream although it does very little in a large river. Tributaries and headwaters, rather than the mainstem of the Colorado River, may generally provide more opportunities because these areas often involve fewer water users and potentially less legal, procedural, and managerial complexity. Smaller scale projects can make a bigger difference in the flow of headwaters streams than in lower parts of the Colorado River basin.

## A Champion, Willing Partners and Willingness to Cooperate

Most efforts require a champion to get the effort started as well as bring and hold groups together. Multiple willing partners help spread the costs. Communities and districts that can see the benefits are more likely to engage in a sometimes lengthy collaborative process to shape the effort. Motivations can be varied: besides financial considerations, water users may have legal, ecological, recreational, or other concerns that spark action. Greater certainty in water supplies can play a role. While an outside driver, such as a potential Endangered Species Act action, can help motivate a desire for action, it can also create fear (sometimes motivating, sometimes paralyzing) of outside regulation and its impacts. Geographically, areas of high growth in water demand may still find benefit in water efficiency programs for streamflow improvement.

## Approach Adapted to the Specific Situation and the Partners

The strategy and scale of the effort will differ in each situation, matching with the interests and abilities of the partners. A single approach, without tailored variations, will not work in every instance. Experience from around the West shows there are several useful options for approach (see following).

## Funding for Water Efficiency Measures

While money is not always essential, when combined with bridge building it can create additional opportunities and even a more cooperative mentality. A creative funding package may be necessary even for short-term actions. Funding that increases certainty of in- and out-of-stream benefits may be most likely to result in durable success.

## Defined Legal Path within Existing State Law

Despite perceptions to the contrary, state water law is not always the main obstacle to linking water efficiency and instream flows. There are opportunities despite the law and because of it. Efforts with the greatest chance of success are designed around what is and is not possible under the law of the specific state, taking advantage of legal protections such as instream flow rights, where available. Creative interpretation may raise issues related to precedent that must be dealt with.

## Short Term and Pilot Efforts Can Lead the Way

Greater opportunities may arise through temporary, not permanent, approaches. A pilot project or short term effort can demonstrate that it is possible to work through the many challenges, how it can be done, and what the results are (and are not). Water users can be more open to these efforts after having seen them in practice.

Two recent efforts suggest factors similar to these that may help identify opportunities, at least for municipalities. A recent presentation on the Conserve to Enhance model cited three key factors: support from local stakeholders, a community approved river or enhancement project, and a way to account for participants' water use and savings.[6] A recent survey of Colorado West Slope communities identified several criteria that may have broader applicability: a community connection to the river; opportunity for saved water to stay instream for some distance; a physical relationships between the diversion and the river; and water efficiency savings that yield stream flow enhancement, community support and utility benefit.[7]

[6] Inspiring Water Conservation for Environmental Enhancement, Sharon B. Megdal, Joanna Nadeau. AWWWA annual conference, Washington DC, June 2011.

[7] Rushing Rivers Program: Feasibility Analysis of Application Within the Colorado River Basin of Western Colorado, Western Resource Advocates, July 2011 (p 3-1).

# Approaches to Partnership

Several promising approaches have emerged for working at the local level. Which approach works best for a given set of partners depends on the types of partners and the state and watershed context.

## Two-Party Model of On-Farm Water Right Owner and Nonprofit

A conservation minded landowner may want water to remain instream and be willing to work with a nonprofit to do so. Trout Unlimited and the Clark Fork Coalition have had success with this approach in rural upstream rivers and streams in Montana. Legal protections for conserved water are helpful here but not always essential for success.

## Community with a Connection to the River

This approach builds on communities and residents with a public connection to their stream, to channel that concern into water efficiency efforts that yield either water or money for local environmental improvement. The community could be small or large. A connection could be literal (the river runs through town), expressed in environmental values, or economic (water dependent tourism, fishing). An approach that links water users directly with instream flow protection could work in almost any community with a close connection to their river. [8]

## Agricultural District with a Desire to Modernize and One That Sees Value in Instream Benefits

From the large scale of Grand Valley, Colorado to more localized efforts, agricultural districts can meet their water management needs and see instream improvements, often utilizing federal funding for water management improvements or habitat restoration. In a June working session of experts gathered on this topic, one group described what might work for a willing agricultural district: motivated by the threat of unmanaged "buy and dry;" ability to collect assessments; enough remaining water volume for farming; a point of diversion that allows enhanced streamflows; and exit fees, money, or cooperation with buyers, to let go of water.

## Nonprofit as a Willing District Partner

The instream environment can be treated as another beneficiary, not a competitor, for water. An approach used by the Elephant Butte Irrigation District was not developed for water efficiency but still can apply—the nonprofit is a willing partner, treated as another water user by the agricultural water district. The water is used for instream flows, in effect growing fish not crops.[9]

## Three-Way Trades

Applying the experience in three-way arrangements for water transfers—among agriculture, streamflow, and a government environmental authority (such as a state fish and game agency); or agriculture, urban, and environmental water uses—can provide more options to link water efficiency efforts with streamflow improvements, and produce benefits for all. The water needs of the sectors may be at different times, have varying degrees of flexibility, or other characteristics that can optimize efficiencies.

## Multiparty Approach

Multiple partners collaborating in a watershed may be able to anticipate an upcoming environmental imperative, whether physical or regulatory. Borrowing from the Deschutes River basin experience, a multiparty nonprofit can act as a catalyst, look ahead for significant instream flow issues, identify when and where water will be needed, and work with agricultural districts and municipalities to identify incentives to improve water efficiency.

---

[8] Conserve to Enhance: Voluntary Municipal Conservation to Support Environmental Restoration, Schwarz, Megdal, Jan. 2008, Journal of the American Water Works Association 100 (pp. 43-53). **http://ag.arizona.edu/azwater/files/Journal_01-08_Schwarz-Megdal.pdf**.

See also Conserve to Enhance description in Case Studies section.

[9] Agricultural/Urban/Environmental Water Sharing: Innovative Strategies for the Colorado River Basin and the West, Colorado Water Institute, Colorado State University, 2010. **http://www.cwi.colostate.edu/publications/sr/22.pdf**.

# Setting the Stage for Local Action

Nonprofits and government agencies can choose to begin short-term efforts that set the stage for local action and strengthen the link between instream flow needs and water efficiency efforts. Most of those interviewed feel that working squarely within existing institutional structures is important to success and that existing state water efficiency and streamflow programs are an important starting point.

## Pilot Projects

Pilot projects tailored to a specific state or watershed can show it's possible to work through the many challenges, ease concerns, emphasize cooperation, and demonstrate both results and a positive and scaleable approach. They also can emphasize patience, for multiparty projects often take time and can't be done quickly. Short of this, efforts to develop comfort with the concept and create awareness of the possible link between water efficiency and streamflow can help.

## Educational Efforts

Education by state and by watershed, in partnership with the state engineer's office, can clarify what law can and cannot do. State programs that promote water efficiency can also make the connection for the public about the concept of improved streamflow as a benefit of efficiency. Targeting youth can build this understanding in future generations. A tool box of options for local action may take education and pilot projects one step further.

## Identifying and Anticipating Needs

Identifying and publicizing areas where state or federal endangered or threatened species may be a factor in the future, as well as areas with upcoming instream flow needs and biological demand for water that may avoid future ESA and state regulation, may help motivate willing partners. Highlighting key drivers, "forced reasons," or powerful community connections to the river can also help.

Distinguishing among funding sources available for other purposes that can be used for this purpose will allow for creative funds packaging at the watershed level, without need for additional state funds.

## Dialogue

Dialogue with water conservation practitioners can show whether instream flows could be part of their goals, and whether they think they're already achieving environmental benefits. Encouraging dialogue in any watershed with instream flow needs can avoid conflict and encourage cooperative solutions.

# Promising Opportunities for Forging the Link: Conclusion

Practical possibilities for linking water efficiency efforts and instream flows, within the existing basin context, exist in the Colorado River basin. Given a stream stretch with clearly identified environmental benefit from improved instream flows, and a realistic opportunity for improving water efficiency, willing partnership is the first and most critical characteristic of success; willing partners generally can build the bridges needed to overcome other challenges. Creative funding, a defined legal path, and short-term or pilot efforts are other common elements of success.

Opportunities can take the form of:

- An upstream farmer or rancher working with a nonprofit working to improve streamflows;
- A community with a direct connection to a stream stretch;
- An agricultural district seeking to modernize its water management systems in a way that can also reduce or relocate diversions from a river;
- Three-way arrangements for water use, such as trades among agriculture, streamflow, and a government environmental agency;
- A nonprofit with strong local relationships willing to take the lead; and
- Multiple partners collaborating in a watershed that perceive an upcoming environmental imperative, whether physical or regulatory.

Different incentives tailored to motivate the various types of willing partners are needed to take advantage of promising opportunities. Communities, water suppliers, agricultural water districts, farmers and ranchers, nonprofit organizations, and government partners may all respond to different approaches.

With a champion or catalyst, willing partners, and a locally tailored approach, more efficient water use can be linked to improved instream flows in areas of the Colorado River basin.

**Photo Credits**

Page 4 Colorado River basin—John Jengo, Dowingtown, PA, American Rivers

Page 7 Colorado River basin map—U.S. Bureau of Reclamation

Page 28 Grand Valley, CO—Colorado River Recovery Program

Page 32 Badger Creek, ID—Trout Unlimited

Page 33 Russian River, CA—Sonoma County Water Agency

Page 47 Colorado River basin—Eric Hinson, American Rivers

Page 58 Fossil Creek, AZ—American Rivers

# Appendix 1

# Western Water Efficiency-Instream Flow Experience: Cases Considered

A wide ranging search for practical experience in the western U.S. linking water efficiency and instream flow protection yielded over 40 candidate case studies, from individual on-farm water efficiency measures to major city-wide conservation programs and large-scale agricultural district efficiencies. While there are many successful water efficiency programs west-wide, if a program had no link to instream flow, however indirect, we did not include it. Likewise, we opted for cases with demonstrable results, rather than models and policies that are as yet untested.

We considered several other factors as well in our selections:

- Does the project appear likely to achieve its intended purpose?
- Does it seem transferable to the Colorado basin in terms of climate, geography, culture or other important factors?
- Will the project provide a significant amount of water for instream use and/or provide an important environmental benefit?
- Are the instream flow improvements protected legally or only in practice?
- Does the project have landowner and/or local support? Is implementation accepted by the broader community? Has significant opposition been overcome?
- Is the project perceived to be innovative?
- Does the list as a whole include a diverse range of project types?

## Cases Similar to Case Studies Included in Chapter 2

- Sunnyside Irrigation District, Yakima River, WA
- Lower Yellowstone Irrigation District, Yellowstone River, MT
- Los Molinos Mutual Water Company, Mill Creek, CA
- Barker Ranch, Yakima River, WA
- Columbia Basin Project Irrigation Districts (East, South, and Quincy), Columbia River, WA/OR
- Little Bear Creek, Cache Valley, UT
- Nine Mile Creek, Tributary to Little Clark Fork, MT
- Badger Creek, Little Lost River drainage, ID
- Rock Creek, North Fork Blackfoot drainage, MT
- Tucson, AZ, Conserve to Enhance program
- Mono Lake, CA
- American River, Sacramento Water Forum Agreement, CA

## Cases Described in Municipal Efficiency Resource Section

- Albuquerque, NM
- Santa Fe, NM
- Seattle, WA

## Other Cases Considered

- Walla Walla River, WA
- Lehman Farm, Methow River, WA—only water leasing
- Ipswich River Basin, MA—return flow issues, east coast example
- Agnew Irrigation District, Dungeness River, WA—project perceived as too different from Colorado basin
- Middle Fork John Day River, OR—only a lease
- Naches-Selah Irrigation District, Yakima River Basin, WA—not yet implemented
- Fresno Irrigation District Canal Improvement Project, CA—no instream flow benefits identified
- Eastern Municipal Water District reuse/recharge, CA—not yet implemented, limited or no instream flow benefit
- Ute Mountain Ute Tribe Farm & Ranch Enterprises, SCADA Project—no identified instream flow benefit
- Southern Nevada Water Authority, Virgin River, NV—main purpose to expand supply, not improve instream flows
- Backwash Recycling Project, Bella Vista Water District, CA—doesn't meet definition of "efficiency"
- Santa Fe "Living River" Fund, Santa Fe River, NM—no direct instream flow improvements, no connection to water efficiency
- Fort Collins/Cache La Poudre, CO—not yet implemented, possible instream flow benefit hasn't been defined yet
- Hidalgo County Irrigation District #6 Canal Lining, TX—not implemented yet, smaller scale than similar Government Canal, Sunnyside projects
- Ashland, OR—not linked to instream flow
- San Gregorio Watershed, Central Coast, CA—uses winter storage, not conservation, to improve summer flows
- Boise-United Water, ID—no identified instream flow improvements
- Santa Ana River, CA—conservation efforts do not benefit flows

# Appendix 2

# Interactive Workshop on Water Efficiency for Instream Flow: Making the Link In Practice

To provide input into this project, in June 2011 the project team gathered over 30 experts in various aspects of Colorado River basin water management for a one-day hands-on working session in Denver. The two goals of the workshop were to help the project team assess the practical opportunities for voluntary, incentive-based projects that link water efficiency and improved streamflows in Colorado River tributaries, and to identify strategies to address social, political, economic, and legal hurdles in specific areas of the basin.

The workshop was not intended as a stakeholder meeting; as a result, not every interest group in the basin was included. Attendees came from throughout the river basin, and from state agencies, nonprofit organizations, municipal water utilities, water districts, and universities. A Deschutes River Conservancy representative gave a lunchtime presentation on how water efficiency contributed to improved streamflows in the Deshutes River basin in Oregon. A separate workshop report was not prepared; workshop input is reflected in this report.

The workshop was positive and thoughtful; very few major disagreements surfaced. A positive skepticism prevailed, with the predominant attitude that this linkage could work, the issues being where and how. Participants identified many challenges, especially legal and physical, yet often expressed them as incentives. Willingness to take action emerged as the number one characteristic of success, ahead even of funding. Several types of approaches for cooperative partners were discussed.

Interactive sessions and breakout discussion groups focused on the challenges in linking water efficiency and improved streamflows in the Colorado River basin, the types of incentives that might motivate different types of willing partners, types and characteristics of a situation that provide the best chance for a successful project, practical opportunities in the basin, and strategies to pursue these possible opportunities.

## Agenda

| | |
|---|---|
| 9:30 a.m. | Group introductions, project summary, and legal context |
| 10:00 a.m. | Breakout on challenges in the Colorado River basin |
| 11:00 a.m. | Groups report back; full group discussion on challenges and incentives |
| 12:00 p.m. | Working lunch, presentation on Deschutes River Basin |
| 1:15 p.m. | Breakout on possible practical opportunities |
| 2:00 p.m. | Groups report back briefly; full group discussion on practical opportunities |
| 3:00 p.m. | Full group discussion on possible strategies |
| 4:15 p.m. | What did we hear today? |
| 4:30 p.m. | Closing |

## Selected Breakout Group Discussion Questions

1. What are the top 2–3 challenges you see in linking water efficiency and improved streamflows in the Colorado River basin and its tributaries? What can be done about these challenges, and who would do it, in the short term?
2. What 2–3 incentives seem most important to you in employing water efficiency efforts to improve streamflows in the Colorado River basin? What types of incentives might motivate different types of willing partners: communities, water suppliers, agricultural water districts, farmers and ranchers, nonprofit organizations, government partners?
3. What 2–3 characteristics of a situation do you think would make for the greatest likelihood of success in employing water efficiency efforts to improve streamflows in the Colorado River basin? What types of situations, geographic and other, might provide the most opportunity?
4. What 2–3 practical possibilities do you see, within the existing basin context?
5. What 2–3 strategies would you use to pursue these possible opportunities?
6. How would you approach working within each state's water rights framework?