Analysis of Water Banks In the Western States

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Department of Ecology
Water Resources Program
P.O. Box 47600
Olympia, WA 98504-7600
Phone (360) 407-6872

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Analysis of Water Banks In the Western States

Prepared by
Washington Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

and

WestWater Research
121 Grand Avenue, Suite 222
Laramie, WY 82070

Authors: Peggy Clifford, Clay Landry, and Andrea Larsen-Hayden

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Executive Summary

"Water banking in its most generalized sense is an institutionalized process specifically designed to facilitate the transfer of developed water to new uses. Broadly speaking, a water bank is an intermediary. Like a broker, it seeks to bring together buyers and sellers. Unlike a broker, however, it is an institutionalized process with known procedures and with some kind of public sanction for its activities."

Lawrence J. MacDonnell,
"Water Banks: Untangling the Gordian Knot of Western Water," 1995.

The report "Analysis of Water Banking in the Western States" provides an analysis of water banking legislation, policies, and programs in 12 Western states. A primary purpose of the review is to identify banking programs and structures that promote and enhance environmental trades. The analysis examines each state individually beginning with the legislative history of the development of the banking programs. In addition, the review provides a detailed description of banking rules and level of activity.

The review of water banking programs includes the characteristics that influence program participation and an assessment of program pricing structures and transaction contracts. The analysis generated a set of questions that should be addressed, and guidelines to consider, when establishing a water bank. The states reviewed are Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Utah, Washington, and Wyoming.

Definition and functions of a water bank

Water banks exist in almost all western states. There are significant differences in the way banks operate, particularly the degree of involvement surrounding sales, pricing, and price controls. Although the approaches may differ, the common goal is moving water to where it is needed most.

Water banks can be involved to differing degrees in water exchange. Banks have assumed the role of broker, clearinghouse, and market-maker. Brokers connect or solicit buyers and sellers to create sales. A clearinghouse serves mainly as a repository for bid and offer information. A market-maker attempts to ensure there are equal buyers to sellers in a market. Many banks pool water supplies from willing sellers and make them available to willing buyers. Banks can also provide a host of administrative and technical functions, for example:

- Determining what rights can be banked.

- Establishing quantity of bankable water.
- Limiting who can purchase or rent from the bank if necessary.
- Setting contract terms and/or prices.
- Facilitating regulatory requirements

In this report, water banking is broadly defined as "an institutional mechanism that facilitates the legal transfer and market exchange of various types of surface, groundwater, and storage entitlements."

Current status of water banking

Water banking is emerging as an important management tool to meet growing and changing water demands throughout the United States. While banking has been used historically in the western United States, this approach for managing water has had a renewed interest among policy makers and water suppliers within the last decade. Water banks are growing in popularity and have been either proposed or in operation in almost every western state.

While the number of water banks in the last 10 years has increased, trading activity measured both in the number of transactions and amount of water has not increased significantly. This is in large part because many water banks in the West are relatively new. As a consequence, potential participants have limited experience with banking and often do not fully understand how the bank functions. They will often hold back during the initial trading periods to observe and gain market information and then enter once the market is more established.

Purpose of water banking

In addition to the overarching goal of facilitating transfers, individual water banks have strived to achieve one or more of the following objectives:

- Create a reliable water supply during dry years.
- Ensure a future water supply for people, farms, and fish.
- Promote water conservation by encouraging right holders to conserve and deposit rights into the bank.
- Act as a market mechanism.
- Resolve issues of inequity between groundwater and surface-water users.
- Ensure compliance with intrastate agreements of instream flow.

Review of water banking programs

Most of the 23 water banking programs reviewed in this report were established after 1990. Only Idaho had earlier programs dating from 1979. Banking programs use short term leases or permanent acquisitions of surface water, groundwater, or stored water from underground aquifers or above ground reservoirs.

Three states, California, Arizona and Idaho, are identified as having programs with a high level of activity. They include surface and stored water leasing, and underground storage. Fifteen water banking programs had varying degrees of environmental objectives. All the programs have some form of regulatory oversight. The pricing structure was generally either fixed or market based.

Overview of Water Banking

Introduction

The purpose of this report is to provide a review and analysis of water banking, and related policies, legislation, and operational programs in twelve western states.

Part one provides an overview of water banking and includes descriptions of bank formats, administrative services, market structures, contract types, and market activities and participation.

Part two contains questions that should be addressed, and guidelines to consider, when establishing a water bank. It identifies factors that influence banking participation, trading activity, and public support with the goal of creating a banking structure that satisfies local characteristics.

Part three is a detailed analysis of each state's water banking programs, policies, and legislation. For operational water banks, key characteristics that influence program participation and an assessment of program pricing structures and transaction contracts are identified.

Part four includes acknowledgements, bibliography, and glossary.

Appendices and **maps** are available on CD by request (see inside cover).

This review examined water banking activity in these twelve western states:

- Arizona
- California
- Colorado
- Idaho
- Montana
- Nevada
- New Mexico
- Oregon
- Texas
- Utah
- Washington
- Wyoming

Other states: Water banking programs are being developed in states such as Nebraska, Kansas, and Florida. Programs and proposals within these states are in the initial states of development and tend to be modeled after existing programs located in western states. Consequently, these banking programs are not included in this review.

Background: Setting the Context

Water banking is emerging as an important management tool to meet growing and changing water demands throughout the United States. While water banking has a long history in the Western United States, this management approach has had a renewed interest among policy makers and water suppliers within the last ten years. With growing popularity, water banks have been proposed or are operational in almost every western state. Yet significant differences exist in the way that each bank operates with respect to market structure, degree of participation, pricing and price controls, regulatory oversight, and environmental objectives as well as many other factors. Regardless of these differences, every water bank is transferring water to demand centers in an environment of fluctuating and unpredictable water supply and demand.

In recent years, the number of states and the number of banks has increased. However, trading activity measured both in terms of number of transactions and volume of water has not dramatically increased even with the increase in the number of banks. In fact, many of the banks created within the last ten years are lightly traded. A key reason is because they *are* new.

Water banking activity was identified in nine of the twelve western states included in this review. Table 1 provides a summary of banking activity within the states.

Table 1
Water Banking Activity in the Western United States

State	Primary Banks	Initial Bank Activity
Arizona	Central Arizona Project Water Banking Program	1996
California	Drought Water Bank	1991
	Dry-Year Purchasing Program	2001
	Multiple Groundwater Banks	
Colorado	Arkansas River Basin Bank	2002
Idaho	State Water Supply Bank	1979
	6 Rental Pools	1932
Montana	No Banks	-
Nevada	Interstate Water Bank with Arizona	2002
	Truckee Meadows Groundwater Bank	2000
New Mexico	Pecos River Basin Water Bank	2002
	Pecos River Acquisition Program	1991
	ESA Mitigation on Pecos river	Proposed
Oregon	Deschutes Water Exchange –	2003
	Groundwater Mitigation Bank	
Texas	Texas Water Bank	1993
	Edwards Aquifer Authority Groundwater Trust	2001
Utah	No Banks	-
Washington	Yakima Basin Emergency Water Bank	2001
Wyoming	No Banks	-

Purpose of Water Banking

The overall goal of a water bank is to facilitate the transfer of water from low-valued to higher-valued uses by bringing buyers and sellers together. The transfer of banked water performs a multitude of objectives. In addition to the overarching goal of facilitating transfers, individual banks will strive to achieve one or more of the following objectives:

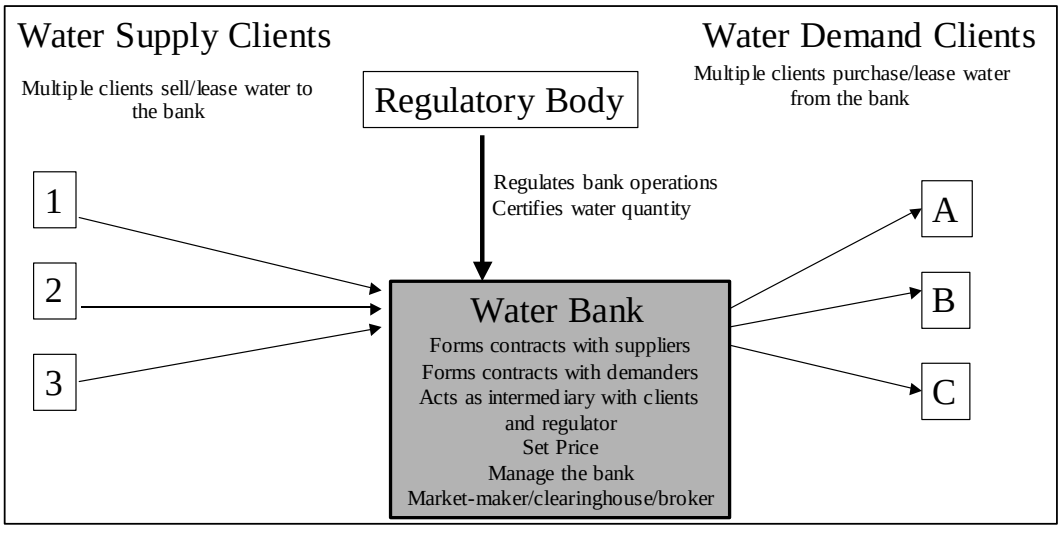
- Creating reliability in water supply during dry years.
- Creating seasonal water reliability.
- Ensuring a future water supply for people, farms, and fish.
- Promoting water conservation by encouraging water-right holders to conserve and deposit water rights into the bank.
- Acting as market mechanism.
- Resolving issues of inequity between groundwater and surface-water users.
- Ensuring compliance with intrastate agreements of instream flow.

Definition of Water Banking

The term "water banking" is widely used to refer to a variety of water management practices. In general, no single or common definition exists for water banking. As shown in this review, water bank covers a wide range of approaches. The term "water banking" is increasingly being used within the water sector to describe other types of water management strategies that extend beyond the traditional definition of "water banking."

For this analysis, water banking is broadly defined as an institutional mechanism that facilitates the legal transfer and market exchange of various types of surface, groundwater, and storage entitlements. In effect, the bank acts as an intermediary—or broker—bringing together buyers and sellers. In addition, the banking administrator can provide a host of administrative and technical functions. Figure 1 below illustrates the general concept of water banking.

Figure 1: Water Bank Conceptual Model *(source WestWater Research)*



Water banks have developed variations on the basic concept shown in Figure 1 to best suit their budgets, regulatory requirements, and individual bank goals. In general, banks with larger budgets and outside funding (e.g. mill levy as is the case for the California Drought Bank) have the financial backing to take a position in the market by buying and selling water. In contrast, banks that rely on administrative fees to cover their operating expenses tend to act as brokers and try to clear the market by matching offers from buyers and sellers (e.g., California Dry-Year Purchasing Program). The level of bank involvement in market trades can differ greatly depending on the type of market, pricing rules and contract structures put in place.

Water Banks and Lease Banks

As previously discussed, the term "water banking" has been widely adopted for various water management strategies. Increasingly, the term is being adopted by water leasing programs. A leasing program is usually designed for a single buyer to solicit and temporarily obtain water from multiple sellers for a specific use. In contrast, water banking is differentiated from leasing programs because it involves the exchange of water entitlements through the interaction of multiple buyers and multiple sellers. Lease banks are widely used to obtain water for environmental purposes. Lease banks tend to be more restrictive in terms of openness and participation and generally do not provide a mechanism for water to be acquired by third parties. Several lease banks are reviewed in this analysis to provide a comparison to more conventional water banking programs.

Water Banking Formats

Water banks are often designed around a specific source or type of water entitlement. This report identifies three major categories that describe sources that drive the design and structure of banks. Due to the wide range of existing legal and institutional structures, some banks could be classified in multiple categories.

Institutional Banking

An institutional bank provides a legal mechanism for exchanging water rights and other various forms of entitlements. These banks are often called "paper exchanges" in reference to the transfer of legal documents that represent a specific water quantity. Institutional banks are developed for areas where physical water storage is limited or for large geographic areas. In addition, these banks are commonly used for natural flow water rights (or a combination of storage and natural flow rights) where the supply and delivery of water is subject to hydrologic and regulatory variations.

Most institutional banks require multi-year deposits. For example, the Idaho Water Supply Bank requires a minimum term of five years for all water rights deposited in the bank. Longer term deposits allow for long-term contracting and exchanges through the bank. The Texas Water Bank is another good example of an institutional bank.

Surface Storage Banking

Surface storage banks are typically formed around a reservoir or series of storage facilities where storage allotments can be banked and exchanged. By definition, the exchange of water is backed by physically stored water. Unlike institutional banks, surface storage banks typically provided greater reliability in supply. Surface storage entitlements are usually based on specific volume or percentage of annual available storage.

Generally, surface storage banks operate on an annualized basis where deposits and exchanges are limited to a single year. Some surface storage banks allow limited carry over of deposits to subsequent years. The California Drought Water Bank and Dry-Year Purchasing Programs provide examples of surface storage banking.

Groundwater Banking

Groundwater banking is a relatively new form of water banking. Groundwater banking programs provide a mechanism for exchanging credits or entitlements for water withdrawals within an underlying aquifer. However, the extent of functional groundwater banking programs within the United States is limited.

Several programs have been developed to address conjunctive use and extensive groundwater withdrawals which have depleted aquifers across the United States. Under conjunctive use programs, excess surface water is injected or infiltrated into the groundwater aquifer. This groundwater is later extracted during times of limited surface water supply. The California groundwater banks are good examples of conjunctive use water banking.[1]

In addition, groundwater banking programs are also being developed to provide mitigation in areas with excessive surface water withdrawals. The groundwater mitigation bank in the Deschutes Basin, Oregon provides an example of how groundwater banking can be used to address over appropriation of surface water sources. The bank is relatively new and no permanent transaction has occurred at this time. In addition, the State of Oregon is reviewing the Mitigation Banking Administrative Rules.

While surface water allocation procedures are well established in state water codes, ground water allocation has recently emerged as an issue. In the past, many states—like Texas—did not view groundwater as a state resource and allowed usage under the "rule-of-capture." However, an effective groundwater banking program requires a defined allocation system to specify the quantity available for transfer to buyers. A variety of allocation procedures have been proposed for groundwater banks. These proposals give special consideration to the unique hydrological and legal aspects of groundwater aquifers. The leading allocation proposals for groundwater banking are yield-stock rights, unitization, and proportional rights.

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[1] The Natural Heritage Institute. 2001. Designing Successful Groundwater Programs in the Central Valley: Lessons from Experience. Berkeley, CA. www.N-W-I.org .

Yield-Stock Rights: Individual water users in the aquifer are given property rights for a share of the groundwater. Each right has two components: 1) claim to a percentage of the annual recharge into the aquifer, and 2) claim to a percentage of the aquifer's storage or stock. The initial allocation of the water right is based on an individual's historic water use during a specific time period. This type of accounting system has been in place since 1978 in the Genevois Basin, which underlies the border between France and Switzerland.

Unitization: This approach is used to allocate oil and natural gas deposits that lie in subterranean reservoirs similar to groundwater. Unitization means an aquifer is operated or managed by a single entity. Individual landowners within the aquifer elect a manager. The primary objective of the manager is to ensure efficient Yield Production from the aquifer by regulating the spacing of wells and applying an extraction rate that maximizes long term benefits.

Proportional Rights: This approach develops a market for groundwater rights that is based on a proportion of the aquifer's annual safe yield. The principal objective of this proposal is to ensure that the aquifer maintains a minimum level.

Aquifer Storage and Recovery

In addition, the term "water banking" has been adopted to include various forms of groundwater storage or aquifer storage and recovery (ASR) programs. Generally defined, these programs store water into confined or semi-confined aquifers during wet years and recover the water during dry years. The majority of ASR projects are developed by a single user and do not perform the same type of marketing and exchange functions as conventional water banks. However, at least one groundwater storage project is developing commercial water banking services.[2] These private and quasi-public projects are providing short and long term storage and water supply services for a fee.

Water Bank Administrative Services

Each bank is operated by an administrative body that is responsible for overseeing the transactions and establishing banking rules and services. The administrative services provided by water banks vary significantly. At a minimum, most banks aggregate water supplies from willing sellers and facilitate their sale to willing buyers.

However, some banks have taken a more active position by assuming the role of broker, clearinghouse, or market-maker. As a broker, the bank connects or solicits buyers and sellers to create sales. As a clearinghouse, the bank serves mainly as a repository for bid and offer information and facilitates the regulatory requirements for trades. And as a market-maker, the bank creates liquidity in the market by standing ready to purchase surplus water or sell reserve water within predetermined price ranges. The purpose of the market maker is to ensure that trades occur even when counter parties (e.g., buyers and sellers) are not present. Market maker's can provide a valuable service in creating and maintaining liquidity in newly formed markets that are thinly traded. Not all banks take

[2] Market Demand and Feasibility Analysis for Semitropic Groundwater Banking Programs. 2003. WestWater Research L.L.C.

an active role in exchanges and have opted to provide administrative services that facilitate sales and transfers. These services may include:

- Registry of water rights or entitlements
- Regulating or setting market prices
- Setting and implementing long-term strategic policies and daily operations
- Establishing whether the bank operates on a year-by-year or continual basis
- Determining which rights can be banked
- Quantifying the bankable water
- Specifying who can purchase or rent from the bank
- Setting transfer or contract terms
- Dealing with any regulatory agencies
- Resolving disputes

The fees and charges for administrative services also vary across water banking programs. The fees are used for a variety of purposes such as offsetting operational expenses such as salary costs for staff and committee members, facility improvements, legal and consulting fees, financing conservation projects, and funding of environmental acquisitions. The majority of banks require that proceeds raised through banking activity be used for public purposes that directly or indirectly benefit bank participants.

The two most common fee structures are to charge for specific services or charge a transaction fee that is incorporated into the unit price established by the bank. Under the fee for services format, banks essentially act as consultant by providing professional services such as preparing regulatory filings, completing contract agreements, brokering services. These services are charged based on an hourly rate or commission fee.

Under the transaction fee structure, an administrative fee is charged on water that is deposited and withdrawn from the bank. The majority of banks that levy a flat fee have elected to add the fee to bank rental rate. Therefore, the total fee is shared proportionally based on the volume of water exchanged through the bank and is effectively split between the buyer and seller. Several banks use a flat fee for exchanges involving small volumes of water. A flat fee is charged for exchanges up to a specified volume of water. This approach recognizes that there are fixed costs associated with transfers regardless of size.

Market Structure of Water Banking

Market structure determines how market participants interact and engage in transactions. The market structure is also critical in price determination and the dissemination of market information. Price and market information are widely recognized as essential to the development of water banks, particularly during the early stages of market development. Without adequate price and market information, buyers and sellers have a difficult time locating trading partners and price signals on the relative value of water across different market participants.

The majority of water market transactions that occur outside of a water bank are bilateral trades between a single seller and single buyer. Buyers and sellers can incur significant expenses in identifying trading partners. Once a trading partner is identified, limited information is typically available to assist in negotiating a transaction price. Market participants that have invested resources in obtaining marketing information often have a strategic advantage in price negotiations. As a result, large price dispersions within a market are often attributable to differing levels of price information between trading partners. While not necessary, markets tend to function more efficiently when a uniform price is developed.[3]

Water banks play a key role in facilitating trades through the exchange of market information. Consequently, the design and structure in which banking participants interact can have a significant influence on trading activity and the overall success of a bank. The following section describes various types of market structures commonly identified or used.

Clearing House

The simplest type of bank organization is a clearinghouse where buyers and sellers post their intent to buy and sell. The majority of water banks within the western United States utilize a clearing house structure.

Under a clearing house, the bids for buying or selling are posted on bulletin boards which are often literal bulletin boards maintained by an irrigation or water management district. However, many banks are increasingly developing electronic online notice boards where banking participants can advertise their intent to buy or sell. For example, the Arkansas Basin River Bank (www.coloradowaterbank.org) and the Texas Water Bank (www.twdb.state.tx.us) maintain websites with online listings of bank deposits.

Most transactions, which are conducted through a clearing house structure, involve individual exchanges with bilateral negotiations between a single buyer and a single seller. Prices are determined by the market through repeat interaction between buyers and sellers. Market price is the most common pricing method used by water banks. The bank facilitates the transaction by connecting the trading partners. One of the primary limitations of a clearing house approach is that price dispersion could continue to exist in thinly traded markets. An additional limitation of the clearing house approach is that trading outcomes are not always economically efficient and transactions costs may exceed other means of market regulation.

Fixed Price

Under this structure, the bank posts a fixed price which is intended to act as the market clearing price. This approach requires the bank administrator to have sufficient information to accurately estimate the market clearing price. A fixed price approach also requires that water rights and entitlements are fairly uniform in quality and reliability

[3] One of the primary challenges in developing a uniform price within many water markets and water banks is the heterogeneity of water entitlements that often exists. Factors such as priority date, location, and water quality can affect price.

within the market region. Otherwise, price variation will be necessary to reflect difference in water right and entitlements.

Fixed pricing is the second most commonly used market structure by water banks. (Clearing house is the most common.) This price approach is often preferred in markets in small communities because it creates a sense of fairness. Each individual water user is offered the same price, reducing the concern of price gouging or market speculation.

However, significant tradeoffs are associated with the fixed price structure. For example, prices are unresponsive to changing market and climatic conditions. A fixed price structure is used in the Idaho rental pools which are often used as models for other banks. However, the limitations of their pricing policies have become acute during the recent drought in the region. Without a market based pricing structure, no incentive exists for suppliers to deposit water in the banking during dry years when supplies are scarce. Therefore, participation in the rental pools has been limited during the drought. As a result, the fixed price structure has limited the effectiveness of the Idaho banking system during dry years.

Water Supply Options

Water supply options provide banking participants greater flexibility through the bank for managing financial and water supply risks. Instead of purchasing water outright, the participants buy and sell options to supply or purchase water. The terms and conditions of the contracts dictated the maximum price and quantity of water (or options on water) as well as the timing and location of delivery. Currently, water supply options are in a conceptual stage and are not utilized by the established water banks. Water supply options are more likely to become feasible as a bank matures and trading activity increases.

Auctions for Water Banks

Simply stated, an auction is a method of allocating scarce goods, a method that is based upon competition. It is the purest of markets: a seller wishes to obtain as much money as possible, and a buyer wants to pay as little as necessary. An auction offers the advantage of simplicity in determining market-based prices. It is efficient in the sense that an auction usually ensures that resources accrue to those who value them most highly and ensures also that sellers receive the collective assessment of the value.

Auctions provide an important market structure for price discovery. However, few existing water banks utilize auctions to facilitate exchanges. As previously discussed, most water markets suffer from limited price information. One of the primary advantages of auctions is that they can create rich and extensive price information even in thinly traded markets. The auction format requires participants to reveal price information through bids and offers. This allows the bank to record price information even if a transaction is not completed. For example, a seller may offer water at a price that is a level above a buyer's bid price. Similarly a buyer may submit a price that is below the offer price that seller is willing to accept. While no transaction occurs, information has been obtained about the relative value and price assigned to the water by the respective buyer and seller.

Auctions are classified in many different ways. The most familiar are open-outcry auctions where bids and offers are "yelled out." There are also sealed-bid auctions where bids and offers are submitted in writing and not disclosed to other market participants. In addition, there are auctions where the price ascends and auctions where the price drops at regular intervals.

While there are a wide range of auction formats, there are two formats that should be considered when evaluating auction for water banks. These include one-sided and double-sided auctions, where bids and offers can be submitted through an open-outcry or seal-bid process. One-sided auctions are where only bids or offers are permitted, but not both. In the case of water banks, the U.S. Bureau of Reclamation utilized a one-sided sealed bid auction format during the 2001 Klamath Basin Pilot Water Bank.

In contrast, a double-sided auction is where bids and offers are submitted simultaneously. The New York Stock Exchange is a classic example of a double sided auction. The double auction format has been used in other natural resource commodity markets. For example, the Chicago Board of Trade used this approach for SO_2 emission credits. While no water bank in the U.S. currently utilizes double auctions, this format has been implemented with varying success in Australian water markets.[4]

Double auctions are well suited for markets where:

- Trading is relatively thin and price discovery is required
- Participants have limited market information
- [1]Speculation is a concerning factor

Applying a Sealed Bid Double Auction

Several water banking studies have examined the potential of sealed bid double auction formats. At the beginning of a transaction period, potential buyers and sellers submit sealed bids/offers. The bank orders the offers to sell and offers to buy by price. Bids and offers are matched to establish the clearing price which is set at a level where the maximum volume of water is sold. This information enables the bank to develop market demand and supply curves for water and to identify a market clearing price and quantity. Table 2 provides an example for determining the clearing price.

[1] Howe, Charles W. 1994. "Issues in the Design and Operation of a Water Bank: Using Water Banks to Promote More Flexible Water Use" Final Report submitted to the US Geological Survey, MacDonnell et al.

Table 2
Determining Clearing Price for Sealed Double Auction

Buyer Bid Summary			Seller Offer Summary		
Bid Price ($/AF)	Bid Volume (AF)	Cumulative Bid Volume (AF)	Offer Price ($/AF)	Offer Volume (AF)	Cumulative Offer Volume (AF)
$10	50	290	$10	0	0
$15	50	240	$15	0	0
$20	45	195	$20	10	10
$25	45	150	$25	20	30
$30	40	110	$30	25	55
$35	**35**	**75**	**$35**	**35**	**90**
$40	30	45	$40	40	130
$45	20	25	$45	60	190
$50	15	10	$50	70	260

Bids and offers are aligned, and the clearing price is set at the level where the cumulative offer volume meets or exceeds the cumulative bid volume. In the example presented in Table 2, the clearing price is established at $35 per acre-foot. At that price level, the total volume of water on offer by sellers exceeds the total volume demanded by buyers.

Managed auctions do not completely mimic the open market, and buyers and sellers may try to engage in strategic behavior to manipulate trading to their advantage. A variation of this theme is repeated sealed-bid auctions where several auctions are organized through the growing season (e.g., pre-season, mid-season, post-season). This repeated auction process incorporates new information about crop growth and water availability into pricing decisions.

Contingent Contracts

Under a contingent market, buyers and sellers enter into contracts that are executed contingent upon certain conditions (e.g., the amount of rainfall by a certain date).[5] One benefit of this arrangement is that contracts are only executed if the contingency is met and unnecessary trades do not occur. Contingent contracts function much like option supply agreements. One primary difference however, is that the contingent contract is executed based on predetermined conditions. Option contracts can be designed with similar conditions. However, generally the holders of options typically prefer to maintain flexibility in determining if the option is exercised. From a seller's position, the contingent contract may be more beneficial because the contract clearly identifies the

[5] Howe, Charles W. 1994. "Issues in the Design and Operation of a Water Bank: Using Water Banks to Promote More Flexible Water Use" Final Report submitted to the US Geological Survey. MacDonnell et al.

terms and conditions under which water will be delivered. Unfortunately, the transactions costs associated with these types of contracts can be higher than non-contingent contracts. Despite this cost, contingent contracts are popular and often used for protecting urban areas from water shortages during drought.

Contract Types for Water Banking

Water banks use a range of contracts to facilitate transactions. However, most water banks require separate contracts for each buyer and seller. For example, a seller contracts with the bank to deposit water, and a buyer contracts with the bank to lease water. These separate contracts can increase the transaction costs associated with trades. Some attempts have been made to standardize contracts in an effort to reduce transaction costs and streamline the contracting process. The following section reviews supplier and buyer contracts commonly used by water banks.

Supplier Contracts

The goal of supplier contracts is to allocate specific water entitlements for deposit in a water bank. The duration of supplier contracts may vary from a single season to long-term contracts. The water may be secured through many arrangements including three main types of contracts: 1) fallowing agricultural land contract for selling surface water instead of irrigating land, 2) groundwater contract for selling surface water and using groundwater, and 3) stored water contract for releasing water from reservoirs. The California Emergency Drought Banks of 1991, 1992, and 1994 provide strong examples of these three types of contracts used to secure water from sellers.

Fallow Contracts

Fallow contracts require growers to fallow their land or withhold application of irrigation water to crops that are normally irrigated but could be produced without irrigation. Payments for fallowing can be based on the estimated water use of the crop planned for annual production. Since crops have different water use requirements, the amount of water allocated as a bank deposit varies per acre as a function of regional conditions and crop type. Supplier contracts recognized these differences and set a purchase price per acre-foot that varies payments for each acre enrolled in the program depending on the crop planned for production. For example, payments may be calculated by the following equation: Payment/acre = price/acre-foot ($) * water conserved (acre-feet).

Groundwater Substitution Contracts

Under groundwater substitution contracts, farmers sell surface water to the bank that would normally have been applied to crops and then irrigate crops with ground water. Pumping can be metered to ensure supply obligations are met. Therefore, payments can be based on actual quantities pumped up to a maximum specified in each contract.

Stored Water Contracts

Under stored water contract, the sellers deposit storage credits or entitlements into the water bank. Water allocations are backed by physical surface storage which provides greater reliability in supply. Surface storage entitlements are usually based on volume or percentage of annual available storage.

Option Contracts

Other supplier contracts may include an option arrangement. The seller would agree to sell its water entitlement under specific circumstances such as drier hydrologic or higher demand conditions. The payment structure may include an upfront option payment at the time of contract signing and then a purchase payment at the time of transfer. The payment structure could also specify a reverse option contract whereby the seller receives an option payment at the end of the contract if the water bank did not exercise the option to purchase water supplies. Again, the California surface water banking programs provide detailed examples of these contract structures.

Buyer Contracts

Buyer agreements can be permanent purchase contracts, short or long term lease contracts, or option contracts. The contract specifies the amount of water to be purchased or leased as well as the specific timing and location of delivery. The type of water offered by sellers will determine how the buyer can use the water. A change in use will most likely require a change in the original permit.

A permanent transfer contract will usually require the buyer to pay the bank a one-time fixed fee. In contrast, a lease or option contract may have two cost components: 1) a fixed payment at the time of signing the contract, and 2) a transfer payment depending on actual amount transferred to buyer.

Again, the California surface water banks provide examples of buyer contracts. Similar contracts were used by the Idaho water bank to lease water to buyers.

Risk Management

The overall goal of the seller and buyer contracts is to appropriately spread the risks associated with the water transfer among the bank, buyers and sellers. The risk profile should encourage bank participation by both sellers and buyers. An unbalanced risk profile will likely result in limited transactions through the bank. Risks that must be addressed include operational ability of the bank, regulatory constraints on transfers, financial stability of parties, and climatic conditions.

An example of risk distribution is the 1991 California drought water bank. During this water banking activity, the bank purchased or leased water upfront from sellers based on a survey of buyers needs. Therefore, the bank assumed all the financial risk in the event that demand did not meet or exceed their supply. In fact, demand did not reach their predicted levels, and the bank was required to spend $45 million to purchase the oversupply of water which was delivered to State Water Project contractors in 1992.

Although the bank could draw on State funding to mitigate these losses, the banking program changed its contractual arrangements with sellers to prevent another year of oversupply and cost to the program. Future contract arrangements spread risks more evenly among the bank, sellers and buyers.

Market Activity and Participation in Water Banking

Market activity varies widely across the banking programs reviewed in this analysis. In general, market activity among the various banking programs is limited. The limited market activity is partly explained by the following:

- Water banking programs are relatively new and potential participants have limited experience with water banking.
- Restrictions are placed on the number and type of participants.
- Few water banks have developed education and outreach programs during the initial stages of development.

Emerging Water Banking Programs

Many water banking programs around the United States are relatively new. As a consequence, potential participants have limited experience with banking and often do not fully understand how the bank functions. This is a common occurrence for newly created environmental markets. Potential participants will often hold back during the initial trading periods to observe and gain market information and then enter once the market is more established.

Restricting Market Participation

One factor limiting water banking activity is that several banks have placed restrictions on the type of entities and uses that can participate in trading. For example, the California drought water banks limited participation to existing water right holders and users. Restrictions like those in California drought water banks can limit both the demand and supply within the bank and as a result can greatly influence both the function of the market as well as market price. Other water banks have limited participation to entities that can take actual delivery of the water. This restriction is primarily intended to discourage speculators within the market. One result from this type of restriction is that entities are prevented from purchasing water for environmental purposes including instream flow augmentation. Careful consideration should be given before restrictions are placed on market participation.

Education and Outreach

Water banking activity would benefit from conducting outreach, training, or mock trading programs to facility market development. Mock trading programs are a useful approach to help potential banking participants learn and understand the functions of the market. This training technique has been used for other newly created environmental

markets. In fact, the World Resources Institute utilized a mock trading session to introduce its online water quality trading platform entitled nutrientnet.org. Mock trading has also been used by the newly formed Chicago Climate Exchange to provide market participants with trading experience. The Chicago Climate Exchange was formed in 2003 to provide a market for carbon credits.

Measuring Market Activity

This review provides a qualitative assessment of market activity which can be measured in both the number of transactions and the volume of water traded in any given year. Assessing market activity requires a qualitative analysis due to the large disparity in size and market scope across various water banking programs. Four categories based on the number of annual trades are utilized in the report to classify market activity. These categories include:

- None: No trades
- Limited: Less than 5 trades annually
- Moderate: Between 5 and 10 trades annually
- High: More than 10 trades annually

Water Bank Summary

Table 3 provides a summary of the water banking programs reviewed in this analysis. The table provides a highlight of key characteristics discussed above.

Table 3
Summary of Water Banking Programs in the Western United States

Project Name	ST	River Basin	Est.	Active	Bank Format	Market Structure	Participation	Activity	Pricing	Price Range ($/AF/year)	Regulatory Oversight	Administrator	Environmental Objective
Arizona Water Bank	AZ	Colorado and Central Arizona Project	1996	1997	Long-term underground storage	Non-market	Supply – CAP Water Demand – CAP Users	High	Fixed Price	$21-$53	Imported water – permit system	Arizona Water Banking Authority	None
California Drought Water Bank	CA	Statewide, SWP and CVP	1991	1991, 1992, 1994	One-year surface leasing program	Clearinghouse--Pooling of supplies for transfer	Supply – Water users north of Delta Demand – SWP and CVP contractors	High	Fixed Price	$68-$175	Streamlined process through the State Water Resources Control Board	California Department of Water Resources	Yes: Minimum streamflow though the Delta
California Dry Year Purchasing Program	CA	Statewide, SWP and CVP	2001	2001, 2002, 2003	One-year surface leasing program	Clearinghouse--Pooling of supplies for transfer	Supply – Water users north of Delta Demand – SWP and CVP	High	Fixed Price	$75-$100	Streamlined process through the State Water Resources Control Board	California Department of Water Resources	None
Semitropic Groundwater Banking Program	CA	Kern	1991	1990	Long-term groundwater storage	Contractual	Supply – SWP contractors Demand – SWP contractors and Central Valley uses	Moderate	Market based	Range of fees based on annual operations	Environmental review of bank and banking partners' operations	Semitropic Improvement District	None
Arkansas River Water Bank	CO	Arkansas	2001	2003	One-year leasing of stored water rights	Clearing House – bilateral trades	Supply – Agricultural community Demand – Urban uses	None	Market Based	$500-$1000	Pre-review by State Engineers	Southeastern Colorado Water Conservancy District	None
Idaho State Water Supply Bank	ID	Statewide	1979	1995	Institutional	Clearing House – bilateral trades	Supply – Open Demand – Open	Moderate	Market Based	$11	Pre-reviewed by State	Idaho Department of Water Resources	None
Snake River Rental Pool	ID	Snake	1979	1979	Leasing of stored water	Clearing House – bilateral trades	Supply – Stored Water Demand – Open	High	Fixed Price	$3.00 – in basin $10.50 – out of basin	Stored Water	Water District #1	No: Instream transactions encumbered by "last fill" policy.
Boise River Rental Pool	ID	Boise	1988	1988	Leasing of stored water	Clearing House – bilateral trades	Supply – Stored Water Demand – Open	Moderate	Fixed Price	$6.50 – in basin $6.93 – out of basin	Stored Water	Water District #63	No: Instream transactions encumbered by "last fill" policy.

Project Name	ST	River Basin	Est.	Active	Bank Format	Market Structure	Participation	Activity	Pricing	Price Range ($/AF/year)	Regulatory Oversight	Administrator	Environmental Objective
Payette River Rental Pool	ID	Payette	1990	1990	Leasing of stored water	Clearing House – bilateral trades	Supply – Stored Water Demand – Open	High	Fixed Price	$3.20 – in basin $5.65 – out of basin	Stored Water	Water District #65	No: Instream transactions encumbered by "last fill" policy.
Lake Fork Creek Rental Pool	ID	Payette	1999	1999	Leasing of stored water	Clearing House – bilateral trades	Supply – Stored Water Demand – Open	High	Fixed Price		Stored Water	Water District #65k	No: Instream transactions encumbered by "last fill" policy.
Lemhi River Rental Pool	ID	Lemhi	2001	2001	Institutional	Clearing House – bilateral trades	Supply – Irrigation Demand – USBR	Limited	Fixed Price	$146	Reviewed by State	Water District #74	Yes: Lease-bank program by USBR to meet minimum flows.
Shoshone-Bannock Tribal Water Bank	ID	Snake	1994	1994	Institutional /Storage	Clearing House – bilateral trades	Supply – Tribal Federal Reserve Rights Demand – Open	Limited	Fixed Price	$9	Reviewed by State	Shoshone-Bannock Tribe	Yes: Instream use identified as a beneficial use within the bank.
Interstate Water Bank	NV	Colorado	2002	2002	Storage	Non-market	Supply – Excess Colorado River Apportionments Demand – Nevada Colorado River Entitlement holders	Limited	Fixed Price	$78-	Permit system/ interstate agreements	Southern Nevada Water Authority, Arizona Water Banking Authority, Central Arizona Water Conservation District	None
Truckee Meadows Groundwater Bank	NV	Truckee	2000	2000	Long-Term Groundwater Storage	Non-market Accounting System	Supply and Demand – Truckee Meadows Water Authority	Limited	-	-	Reviewed by State	Truckee Meadows Water Authority	None
Pecos River Basin Water Bank	NM	Pecos	2002	Not-to-date	Institutional	Clearing House – bilateral trades	Supply – Open Demand – Interstate Stream Commission	None	Market Based	-	Reviewed by State	Interstate Stream Commission	Yes: augment flows for federally protected species
Pecos River Acquisition Program	NM	Pecos	1991	1992	Institutional	Clearing House – bilateral trades	Supply – Open Demand – Interstate Stream Commission	Moderate	Market Based	$50 - $100	Reviewed by State	Interstate Stream Commission	Yes: secondary objective to meeting flow compact with Texas.

Project Name	ST	River Basin	Est.	Active	Bank Format	Market Structure	Participation	Activity	Pricing	Price Range ($/AF/year)	Regulatory Oversight	Administrator	Environmental Objective
ESA Mitigation on Pecos River	NM	Pecos	Proposed	2003	Institutional	Clearing House – bilateral trades	Supply – Carlsbad Irrigation District Demand – USBR	Limited	Market Based	Water exchange	Reviewed by State	USBR	Yes: augment flows for federally protected species.
Deschutes Water Exchange Groundwater Mitigation Bank	OR	Deschutes	2003	2003	Groundwater mitigation/ Institutional	Standing price Auction	Supply – DWE Lease Bank (surface water) Demand – mitigation applicants (groundwater)	Limited	Fixed price	$65	Reviewed by State	Deschutes Resources Conservancy/ Deschutes Water Exchange	Yes: encourage conservation and reduce groundwater depletion.
Texas Water Bank	TX	Statewide	1993	1994	Institutional	Clearing House – bilateral trades	Supply – Open Demand – Open	Limited	Market Based		Reviewed by State	Texas Water Development Board	Yes: encourages conservation.
Texas Water Trust	TX	Statewide	1997	1998	Institutional	Clearing House – bilateral trades	Supply – Open Demand – Texas Water Trust	Limited	Market Based	Donations	Reviewed by State	Texas Water Development Board	Yes: Water rights specifically for instream use.
Edwards Aquifer Authority Groundwater Trust	TX	Edwards Aquifer	2001	2002	Groundwater /Institutional	Clearing House – bilateral trades	Supply – Aquifer Withdrawal Permits Demand – Aquifer Withdrawal Permits	None	Market Based	-	Reviewed by State	Edwards Aquifer Authority	Yes: encourage conservation and reduce groundwater depletion.
Yakima Basin Pilot Water Bank	WA	Yakima	2001	2001	Institutional	Clearing House – bilateral trades	Limited to water right holders	Moderate	Market Based		Reviewed by State	Special Committee	None
Salmon Creek Water Lease Bank	WA	Okanogan	2000	2000-2002	Institutional	Clearing House – bilateral trades	Supply – Okanogan Irrigation District Demand – Washington Water Trust	Moderate	Fixed Price		Reviewed by State	Washington Water Trust, Colville Fed. Tribes, Okanogan Irrigation District	Yes: Provide flows in Salmon Creek.

Water Banking: Questions to Consider

Water banking can be an effective water management tool for meeting growing and changing water demands throughout the United States. Each bank has significant differences in the way that it operates with respect to market structure, degree of participation, pricing and price controls, regulatory oversight, and environmental objectives as well as many other factors. Regardless of these differences, banks strive toward a common goal of transferring water to demand centers in an environment of fluctuating and often unpredictable water supply and demand. This section provides a list of questions that should be addressed when establishing a water bank.

What principles should be considered in determining the most appropriate structure for the water bank?

The state should enact general authorizing legislation to create the water bank. This legislation will strengthen the bank's authority and legitimacy. In addition, this policy will establish an operational framework to facilitate a flexible trading mechanism. Overall, the water bank administrator must have legal authority to execute the water banking mandate.

The transfer process should encourage flexibility and provide for many water trading methods to accommodate the changing hydrological and demand conditions both in the short-term and/or long-term.

If the banking system has physical storage, a sequence of closed bid double auctions may be appropriate to facilitate transfers between buyers and sellers at specific trading dates, e.g., pre-season, mid-season and late season.

Auctions may better facilitate the transfer of direct flow water rights which have greater risk due to future hydrological conditions and state regulations for the protection of minimum instream flow. Auctions may be the most appropriate mechanism to capture the changing hydrological conditions and regulations.

Combining or pooling of water rights may facilitate transfers when sellers have limited supplies and/or the demands are concentrated The action of pooling water rights increases the quantity available and reduces the transaction costs incurred by the buyer since the transaction requires only one contract.

A continuous bank registry—either physical or online—may be an effective tool to persistently reinforce the water banking concept and facilitate immediate bilateral trades.

The operation and decision process should be transparent and relatively predictable for all participants. Consistency of process should expedite transfers.

Public values must be considered to engage public support for the transfer process. These public values may include instream flow protection, enhancing water quantity and providing water-related recreation.

The bank should limit transaction costs to allow smaller or marginal transfers to be cost-competitive.

What issues should be addressed in the operating framework of the water bank?

The operational framework should outline the process for setting and implementing long-term strategic policies and daily operations. The management of the water bank should represent all water-related interests within the geographic area to encourage participation and support for water banking activities.

The operational procedures must specify whether the bank operates on a year-by-year or continual basis. For example, the California Drought Water Bank only operates in years classified as drought conditions, while the Texas Water Bank operates continually.

The framework should specify the transfer terms. The transfers may be executed under short-term leases or permanent purchases. Also, the term of storage must be delineated as either annual or long-term.

The water bank must decide whether it has the ability to buy and sell water on its own account which would result in taking a position in the water market and acting as a market-maker (e.g., the California Drought Water Bank of 1991).

A consistent and fair dispute mechanism must be incorporated into the operating framework.

How does the water bank encourage participation?

Education and training are important tools as few people will have experience with water banks and how they operate. Education and training should include:

- Creating realistic price expectations: Price information from other markets can provide useful examples, but be sure to highlight differences that can affect price.
- Providing water trading experiences: Provide mock trading opportunities prior to the bank's first transaction. This allows potential market participants to gain experience before official trading occurs. Several new environmental markets utilized demonstration markets as way to familiarize participants

with rules and procedures. In fact, the World Resources Institute utilized a mock trading session to introduce its online water quality trading platform entitled nutrientnet.org. Mock trading has also been used by the newly formed Chicago Climate Exchange to provide market participants with trading experience. The Chicago Climate Exchange was formed in 2003 to provide a market for carbon credits.

Local water or irrigation districts should be encouraged to participate.

The bank should advertise its existence and purpose throughout the banks operational area including an explanation of how water banking is a safe and beneficial tool for water management.

How does the bank identify its market area/geographical area?

In general, water banks can exist for an entire state basin or within a small irrigation district. However, water banks must be large enough to incorporate and include numerous buyers and sellers to ensure liquidity in the bank and defray administrative costs.

The size of the geographic area for the operation of the bank will depend on population density and water use.

Bank boundaries are often defined by numbers of potential participants and conveyance abilities (natural and man-made). The reliance on political boundaries most likely will hinder the ability to effectively function within a water basin.

The bank must decide whether to allow for inter-basin trades depending on conveyance abilities, costs, political hurdles, and environmental concerns.

Generally, activity tends to be higher for banks that operate at a regional or local level than at a statewide level. Within regional and local markets, the buyers and sellers are more transparent increasing the marketability of the bank. Also, the infrastructure to transfer water is more likely to exist in smaller market areas, and the transfer is less likely to spark political and regulatory controversy.

Who or what type of water can participate in the bank?

Water supplies should be open to include surface water, groundwater, stored water, and reclaimed water if appropriate within the water banking structure. These entitlements may be represented by water rights, irrigation allocations, or storage credits. Limiting supply source minimizes the overall effectiveness of the water bank.

The bank should be open to all potential demands rather than limiting purchases to water right holders. One of the benefits of a water bank is that it can allow a flexible approach to water management, and limitations on buyers would impede the development of a market driven reallocation process. By limiting water purchases to those individuals who have water rights, interest groups wishing to obtain instream water for fisheries may be

precluded. Therefore, potential buyers may include public agencies, individuals, and/or private companies.

The exception for allowing open access is if the bank was solely established for drought emergency. Then, current water right holders should have priority.

Critical needs or preferential treatment for specific uses may be considered in the allocation process. Limitations may be placed on quantity, timing, and location of transfers.

How does the bank limit the administrative red tape?

One of the big roadblocks to a bank's success is the administrative approval process for short-term transfers. Some of the problems include:

- Long delay for regulatory approval
- Slow information request process
- Significant legal, technical, and consulting costs associated with moving water into and out of the bank.

The overall goal of the water bank should be to simplify the method of facilitating market-based transfers. This goal could be achieved though implementing the following procedures:

- An established method of verifying bankable quantity, type of entitlement, and transfer capability of water entitlements which includes requiring evidence that shows the water right ownership is valid and in good-standing.
- Streamlined process for short-term enrollment. Potential for injury may exist, but is confined to short term. A mitigation fee may be collected prior to transfer for use to prevent and mitigate impacts resulting from transfer.
- Pre-approved enrollment for those who have previously participated, so long as the water entitlements are the same.
- Pre-approve water rights before listing permanent transactions.

In general, longer-term deals should go through a more extensive approval process. First, the potential injury would last longer. Second, the importance of immediate approval is diminished under a longer-term arrangement.

What administrative costs will be incurred by the bank?

Administrative costs will be incurred by the water banking program. These costs are associated with developing the appropriate structure and operating framework; promoting the public awareness campaign to encourage participation; maintaining records of deposits, potential buyers and completed transactions; and reporting to stakeholders. The structure and operating framework should strive to minimize administration costs.

Administrative costs can be minimized by limiting administrative red tape procedures.

Administrative costs will be defrayed if the water bank is large enough to incorporate and include numerous buyers and sellers. The administrative costs will be distributed over more transactions which will lower the transactional costs associated with each deal.

The pricing structure should consider and incorporate the administrative costs associated with the banks' operation.

Lower administrative costs will encourage more participation in the bank.

What principles should be considered when determining price?

The pricing structure must strive for economic efficiency to maximize net benefits while ensuring equity or fairness among all affected parties.

The willingness-to-sell is the opportunity cost of the water to the owners based upon their perceived future income and water-related amenities, while the willingness-to-buy is the perceived income that the buyers will derive from utilizing the water in their business ventures (e.g., maintaining municipal supply, developing an industrial site, maintaining a planted crop).

The pricing structure may reflect a changing willingness-to-sell. For example, the value of water increases after crops are planted and under increased hydrological uncertainty.

In general, more trades will lower transaction costs. The transaction costs include the physical transfer cost; market, legal, and engineering analysis; administration cost; and public support campaign. The water bank administrative cost should be split between buyers and sellers.

The price structure should encourage market or competitive bidding and discourage misrepresentation of values and/or available quantities.

The market risks should be explicitly considered, and the associated costs spread among the bank, buyer and seller to encourage participation.

What are the major pricing structures?

Fixed Price Approach:

- With fixed pricing, all enrolled water rights are presumed equal in value. However, pricing should reflect that older more senior rights are more valuable by establishing pricing tiers to distinguish between junior and senior water rights.
- Fixed pricing is often perceived as being equitable and providing equal access. However, equal access is only relative to the price. If the price is fixed at a high point, then access may not be equal.

- Under fixed pricing, the bank must determine how water supplies will be handled when demand exceeds supply (e.g., first come, first serve).

Market Based Price Approach:

- A market price approach ensures highest and best economic use.
- Under market pricing, incentives are created for supply.
- Under market pricing, incentives are created for conservation if conserved water can be sold through the bank.
- Market prices are continually updated through exchanges within the bank.
- Costs of transferring water rights external to the bank may increase if transaction requirements such as customized legal documents and appraisals are required.

How should market information be provided to interested parties?

One of the problems associated with providing the names of sellers and buyers is that it encourages parties to negotiate privately outside the bank. A possible solution is to post the available water along with its bid, but keep the buyer and seller information confidential. This confidentiality can be achieved by assigning a numerical identification to each party.

Price and trading information should be provided and include:

- Most recent trading prices and quantities
- End-of-year report

How does the bank encourage the agriculture community to participate?

The water bank must strive to get the support of the agricultural community as this water use category will most likely be the largest water supplier. The agricultural or irrigation districts can promote water banking activities to their members. The district itself may be a potential buyer or seller within the water bank. For example, an irrigation district can more efficiently manage the district water resources for its members through the regional water banking system whereby increasing the benefits for the agricultural members.

If the bank provides temporary transfers:

- Water banks provide a mechanism for meeting new water demands without water permanently leaving the agricultural sector. This alternative may be better perceived than agricultural water being permanently purchased away from agricultural use.
- Water right ownership is retained by the landowner.

If the bank provides for permanent transfers:

- Market trades confirm the value of water rights.
- The water bank provides source of water for growers seeking water to expand operations.

How does the bank protect water entitlements from non-use forfeiture or abandonment?

Under legislation, water rights are often forfeited or abandoned after a period of non-use due to the principal of "use-it-or-lose-it". Water right holders will be less likely to work with a water bank if they fear a loss of their entitlements. The bank must consider current legislation and its impact on the water rights held within the bank. The goal of the bank should be to secure the holding claims of the water rights while the entitlements are deposited in the bank, as is the case in the State of Washington under the Trust water statutes.

Under a temporary lease facilitated by the bank, the water rights may not be used by the lessee. The bank must consider the forfeiture impact which faces the water right owner. However in Washington and some other states, water leased to increase instream flow will not face forfeiture since instream use is considered a beneficial use.

How does the bank encourage community acceptance?

Water banks may appear as a threat to losing a "community" resource. Education is an essential tool to gain community support.

All local and state water agencies should promote the water bank.

Key community members and representatives of stakeholders groups should be included on the board or advisory committee to foster acceptance of the bank.

The water bank should have an effective method of mitigating potential adverse impacts resulting from water transfers. This method may include establishing a mitigation fund which collects fees for every transfer and applies the monies towards the protection and mitigation of adverse impacts.

How do legislative sunset dates impact the effectiveness of the bank?

The time required to establish an effective water bank may exceed the life of the enacting legislation. Pilot projects must be encouraged to further acceptance of water banking.

Water banking proponents must work with the legislators to develop a realistic time-frame for pilot projects.

Sunset dates can discourage participation if people are unable to depend on the bank as medium to long term source of water.

Sunset dates are likely to have limited impact on emergency banks.

How can banks provide water for environmental objectives?

Increasingly, water banks have developed with an objective of addressing environmental purposes such as stream flow augmentation, water conservation, or habitat enhancement. The challenge of these banks is to balance environmental objectives with the bank's overarching object of reallocating water to competing needs. The primary environmental strategy employed by most banks is to recognize deposit into the bank as a beneficial use protected from abandonment or forfeiture. Other policies are being evaluated by water banks which would enhance an environmental objective. For example, one policy under review by several banks is to recognize deposited unallocated water entitlements as temporary instream water rights.

However, some banks have policies which discourage transactions that provide environmental benefits. For example, the Idaho rental pools give preference to rentals for irrigation use and effectively penalize water that is rented for flow augmentation. The pools have adopted a "last to fill" provision for water rented for uses such as flow augmentation that occur outside the water district. Under this rule, reservoir space representing water rented for flow augmentation is the last to be refilled in subsequent years. Despite these provisions, the majority of the water banks reviewed in this analysis had environmental objectives and goals.

Water banks should consider the following when establishing environmental objectives:

- Ensure that bank exchanges do not negatively impact existing stream flow levels.
- Allow instream uses to be classified as a beneficial use.
- Provide incentives for deposits through nonuse and forfeiture protection
- Allow open participation in the bank by third parties that would acquire water for instream use.
- Grant priority for transfers that benefit instream flow.
- Establish standing offers to buy leases for instream flow in pre-recognized critical flow areas.

Who should administer and operate the bank?

The administration and operation of the bank has significant impact over the effectiveness of the program. The bank administration will have a direct impact on the level of trust, acceptance, and participation by water users.

There are three basic administrative structures to consider when forming a bank. These include:

- Public – Governmental administration by a federal, state, or local agency.
  - The majority of water banks are operated by a federal, state, or local governmental agency or an administrative board specifically developed to provide administrative oversight.
  - Example: Arizona Water Bank
- Private – Nonprofit Organization
  - Create a newly formed nonprofit that consists of a governing board comprised of representatives from stakeholder groups.
  - Contract with an existing nonprofit to operate the bank.
  - Example: Truckee Meadows Groundwater Bank
- Private – For Profit Corporation
  - Sporadic attempts have been made by private entities to develop water supply banks. The return on investment has proven to be limited and most privately operated banks have faced skepticism by potential bank participants.
  - Example: Semitropic Groundwater Banking Program
- Public-Private Partnership
  - One approach to consider is a private – public partnership, where a private corporation and a public entity jointly invest capital and operate the water bank.
  - Example: Shoshone-Bannock Tribal Water Bank

State Review of Water Banking Programs

Arizona

The Arizona Water Banking Authority oversees the Arizona Water Bank. However, this bank does not act as a market mechanism or facilitate transfers from willing buyers and sellers. Rather, the bank operates as a system of storage facilities in Arizona.

Water Allocation

Within Arizona, surface water and groundwater are regulated under separate and distinct legal doctrines. Surface water is considered public property or state water, and the right to use state water is obtained through appropriation by the state.[4] The allocation process is based upon the doctrines of prior appropriation, beneficial purpose and historical use. The Director of the Arizona Department of Water Resources allocates water use through a permit system. Any change in place or rate of diversion and place or type of use requires obtaining a permit amendment. In addition, water rights are allocated through court decrees and contracts with the federal government.

In contrast, groundwater is not included in Arizona's definition of public water. However, a groundwater code has been enacted to regulate the withdrawal of groundwater resources in specified areas. Groundwater basins are delineated and limitations are placed on the withdrawal rates, use and storage.

[4] Arizona Revised Statutes, §45-141.

State Water Banking Policy Review

Coordinated water banking has been initiated in Arizona within storage facilities along the Central Arizona Project (CAP). The Arizona Water Banking Authority (AWBA) was created in 1996 by the enactment of House Bill 2494[5] and amended in 1999 by House Bill 2463.[6] No administrative rules have been adopted for the AWBA.[7] Through these acts, the legislature recognized the importance of using water storage facilities to efficiently manage, distribute and use water in the state.

The passage of this legislation faced little opposition for two specific reasons. First, the AWBA was created to utilize existing laws and infrastructure. Second, the revenue sources were already in place, and the funds were redirected (see the Arizona Water Bank section for more information on funding sources).

The Arizona Water Bank (AWB), as administered by the AWBA, was implemented for the overall purpose to ensure that Arizona uses all of its 2.8 million acre-feet of its entitlement to Colorado River water. After all on-river entitlements are fulfilled, the remaining excess water is delivered to the CAP. The AWBA may purchase CAP water that is not used by subcontractors to the CAP water. Prior to 1996, any unused CAP water flowed to southern California. The AWBA now has the ability to purchase and store the water in wet-years for future use in dry-years. During dry-years, stored water is recovered from storage facilities and provided to users facing a shortage thus enhancing Arizona's ability to:

- Assure adequate supply to municipal and industrial users in times of shortages or disruptions of the CAP system;
- Meet management plan objectives of the Arizona Groundwater Code;
- Assist in the settlement of Indian water rights claims; and
- Exchange water to assist Colorado River communities.

The 1999 amendments added two significant changes to AWBA operational capabilities. First, the AWBA is now allowed to store effluent water after storing all available excess CAP water. Second, the AWBA can engage in water banking service agreements with entities in Arizona that may not have the opportunities or resources needed to store water.[8] Specific tasks which can be undertaken by water banking service agreements include storing water; obtaining storage permits; accruing, exchanging, and assigning long-term storage credits; and lending and obtaining repayment of long-term storage credits. Water can be stored over multiple years using the accounting system.

In addition, the water banking legislation recognizes that the welfare of Arizona is influenced by the Nevada and California economies. Therefore, this legislation provides

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[5] House Bill 2494 was enacted by the 42nd Legislature and codified as Arizona Revised Statutes, §45-2401 through §45-2472.

[6] House Bill 2463 was enacted by the 44nd Legislature.

[7] Gerry Wildeman, Technical Administrator, Arizona Water Banking Authority. Personnel Correspondence, April 4, 2002.

[8] Entities could develop their own facilities, but using the AWBA may expedite their permit process since the AWB already has storage permits at all state facilities and may reduce administrative requirements.

the outline for interstate water banking agreements with these neighboring states. In 1999, the prospect for interstate water banking was significantly enhanced by a federal regulation.[9] The Secretary of the Interior authorized an interstate banking program between Nevada, California and Arizona. Nevada and Arizona have further negotiated terms for the interstate banking project and completed the final agreements in December 2002 (see the Chapter on Nevada: Legislative Update Section).

Other regulatory statutes enhance the state's ability to implement water banking. Specifically, the prospect of large-scale water banking is enhanced by three important aspects of the Arizona water code.

First, the definition of beneficial use and terms of forfeiture are conducive to water banking.[10] Appropriated water rights in Arizona, initiated after June 12, 1919, may be forfeited after 5 years of non-beneficial use. However, forfeiture does not result if the water rights are stored in a groundwater bank for future beneficial use or if surface and groundwater are exchanged.

Second, Arizona policy allows water rights to be severed from the appurtenant place of use and transferred to another place of use without losing priority of right.[11] A change in place of diversion or use, as well as type of use, is allowed through the permit process overseen by the Arizona Department of Water Resources.

Third, water can be transported out of state for beneficial use if approved by the Arizona Department of Water Resources unless restricted by an interstate compact, federal law, or international treaty.[12] Hence, interstate water banking has become a water management tool.

Highlights of Legislative Updates

Resolution 2002-1 was approved in March 2002 by the AWBA. This resolution establishes a priority of use for long-term storage credits which were accrued with general fund appropriations. The list of priorities follows:

1. Supplying municipal and industrial users of Colorado River water in Arizona, but outside Central Arizona Water Conservation District (CAWCD) service area (on-river M&I users);

2. Aiding in the settlement of water right claims by Indian Communities in Arizona;

3. Firming CAP municipal and industrial users serviced by CAWCD; and

[9] Department of the Interior, Bureau of Reclamation. 43 CFR Part 414: Offstream Storage of Colorado River Water; and Development and Release of Intentionally Created Unused Apportionment in the Lower Division States. November 1, 1999.

[10] Arizona Revises Statutes. §45-141.

[11] Arizona Revises Statutes. §45-172.

[12] Arizona Revises Statutes. §45-292.

4. Water management objectives of the Arizona Groundwater Code.

In December 2002, the final agreements were signed to authorize an interstate water banking program between Nevada and Arizona.[13] This program required several agreements among numerous parties including the AWBA, the CAWCD, the US Bureau of Reclamation, Colorado River Commission of Nevada (CRCN), and the Southern Nevada Water Authority (SNWA). The agreements include:

- Agreement for Interstate Water Banking. AWBA, SNWA, and CRCN. July 3, 2001;
- Agreement for the Development of Intentionally Created Unused Apportionment. AWBA and CAWCD. December 18, 2002; and
- Storage and Interstate Release Agreement. USBR, AWBA, SNWA, and CRCN. December 18, 2002.

While Arizona has meet with California on the subject of interstate water banking, no specific agreements or contract terms have been established.

Water Banking Programs

Arizona Water Bank (AWB)

Location:	Western, central, and southern Arizona
River Basin:	Colorado and the Central Arizona Project (CAP)
Year Established:	1996
Year Active:	1997
Bank Format:	Long-term underground storage of excess surface water
Market Structure:	Non-Market, but provides storage credits for CAP
Participation:	Excess CAP water is stored and returned to CAP users during drier conditions
Activity:	High; over 200,000 acre-feet stored each year beginning in 1997
Pricing:	No market pricing as the AWB purchases the CAP water at the administrative price set annually by the CAP.
Price Range ($/AF/YR):	$21-53.
Regulatory Oversight:	Underground storage contracts overseen by a state permit process
Administrator:	Arizona Water Banking Authority (AWBA) and Central Arizona Water Conservation District (CAWCD)

[13] Specific terms of the agreement and historical interstate trading activity is included in the Nevada section of this report.

Environmental Objective: None. The primary objective is to store Colorado River water that is allocated to Arizona but not used in one year for use in a drier year.

Program Description

The AWB is not a clearinghouse of water right transactions between willing buyers and sellers. Rather, the bank facilitates a water storage system to meet future state needs. The AWBA was created to utilize existing laws and infrastructure whereby overseeing banking activities (e.g., coordinating purchase, storage, distribution, and recovery of long-term storage credits). [14] The accrual of long-term storage credits is affected by four significant factors: 1) the quantity of unused water available to AWBA, 2) delivery capacity of the CAP, 3) availability of funds to purchase water, and 4) recharge capacity available at storage facilities.

The AWBA purchases excess CAP water or effluent. The water purchase price is set annually by the CAP. The AWBA acquires water through three primary sources of funding: 1) allocation from the state general fund[15]; 2) groundwater withdrawal fees collected within the Phoenix, Pinal and Tucson Active Management Areas[16], and 3) 4 cent *ad valorem* property tax charged by the CAWCD in the three counties of service.[17] These funding sources also support storage and administrative costs associated with the AWBA.

The purchased water is delivered through the CAP system operated by CAWCD. The AWBA can not own, develop, operate or construct storage facilities but has obtained permits to reserve storage capacity in all state facilities. An accounting system records the long-term storage credits earned within the system storage facilities which consist of eight underground storage facilities and fourteen groundwater savings facilities. Underground storage facilities provide direct recharge of surface water via spreading basins, while groundwater saving programs creates storage credits through the use of surface water in lieu of pumping groundwater.

Under the AWB, stored water refers to the amount of accrued long-term storage credits. These credits will equal the purchased quantity minus delivery conveyance losses and the statuary five percent contribution to the aquifer for maintaining long-term health of the groundwater system. Any Colorado River water diverted for storage by the AWBA is considered a consumptive use and protected from non-use forfeiture.

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[14] Gerry Wildeman, Technical Administrator, Arizona Water Banking Authority. Personnel Correspondence, December 9, 2003

[15] Due to budgetary constraints, this funding has not been available since 2001.

[16] Under the 1980 Groundwater Management Act, active management areas (AMAs) were designated for areas with groundwater overdraft. The AMAs are fairly consistent with county boundaries and consist of the Phoenix AMA, Pinal AMA, and the Tucson AMA. The AMAs have two specific functions related to the AWBA: 1) provide groundwater withdrawal fees to AWBA as funding; and 2) provide guidance as to where the AMAs would like the AWBA to accrue storage credits.

[17] Through 2016, the CAWDC is statutorily authorized to levy an *ad valorem* property tax in the three counties of the CAP service areas. The tax may be up to four cents per $100 of assess valuation. The CAWCD board may elect to transfer these funds to the AWBA.

The AWBA can not be the entity which recovers the water. Instead, the storage credits are transferred to either the Arizona Department of Water Resources or the CAWCD. The Arizona Department of Water Resources would acquire these storage rights and extinguish them whereby leaving the water permanently in the aquifer as a water management tool. The CAWCD would acquire the storage credits during dry years to meet the water demands of the CAP subcontractors.

The CAWCD determines the quantity of storage credits it needs on an annual basis. In a year where the CAP allocation is limited, subcontracts for agricultural use are forgone. If the remaining CAP water is still less than the total municipal and industrial subcontract demand, the CAWCD will request the transfer of storage credits to meet municipal and industrial needs thereby firming supply. Since the water was purchased with public funds, the only cost incurred by the CAWCD is cost of recovery.[18]

The AWBA can engage in water banking service agreements with entities in Arizona that may not have the opportunities or resources needed to store water. Specific tasks which can be undertaken by water banking service agreements include storing water; obtaining storage permits; accruing, exchanging, and assigning long-term storage credits; and lending and obtaining repayment of long-term storage credits.

Trading Activity

Currently, the AWBA is accruing water storage credits, has provided storage for Nevada through an interstate banking program, but has not engaged in any water banking service agreements with other Arizona entities.[19] Long-term storage accounts have been created for each of the three Active Management Areas. Within each Active Management Area, the bank ledger records which funding sources were used to purchase the water. Table 4 shows the bank ledgers through 2002.

[18] Gerry Wildeman, Technical Administrator, Arizona Water Banking Authority. Personnel Correspondence, December 9, 2003.

[19] Gerry Wildeman, Technical Administrator, Arizona Water Banking Authority. Personnel Correspondence, December 9, 2003.

Table 4
Amount and Location of Long-term Storage Credits Accrued through 2002

Location and Funding Source		Long-term Storage Credits Accrued (AF)
Phoenix AMA		
	4¢ *Ad valorem* Tax	699,183
	Groundwater Withdrawal Fee	45,000
	General Fund	61,612
	AMA Total	805,795
Pinal AMA		
	4¢ *Ad valorem* Tax	73,884
	Groundwater Withdrawal Fee	186,969
	General Fund	294,318
	Interstate Water Banking-Nevada	111,000
	AMA Total	666,171
Tucson AMA		
	4¢ *Ad valorem* Tax	127,765
	Groundwater Withdrawal Fee	0
	General Fund	39,748
	AMA Total	167,513
Total by Source of Funds		
	4¢ *Ad valorem* Tax	900,832
	Groundwater Withdrawal Fee	231,969
	General Fund	395,678
	Interstate Water Banking-Nevada	111,000
	TOTAL	1,700,479

Source: Arizona Water Banking Authority. 2003. Arizona Water Banking Authority Annual Report 2002.

The unit cost per long-term storage credit has increased each year except for 2001 (see Table 5). These increases are the result of cost increases associated with water acquisition and storage. For example, the cost of water increased in 2002 by $10 per acre-foot. Also, a shift to underground storage facilities increases costs as these facilities have higher costs than groundwater savings programs. The 2003 Annual Plan of Operation estimated that $14 million would be expended to accrue 253,000 acre-feet of credits, with a CAP's

delivery rate of $54 per acre-foot and a storage cost between $4 and $25 per acre-foot.[20] The proposed 2004 plan will estimate that $19 million will be expended to accrue 275,000 acre-feet of credits with a CAP's delivery rate of $70 per acre-foot and a storage cost between $11 and $18 per acre-foot.[21]

Table 5
Average Annual Cost for the AWBA to Obtain a Long-term Storage Credit

Year	Credits (AF)	Funds Expended ($)	Average Cost ($/AF)	percent Stored in GSF: percent Stored in USF
1996	0	0	$0	0 % : 0 %
1997	296,987	$6,387,000	$21.51	85 %: 15 %
1998	202,542	$7,143,000	$35.27	68 % : 32 %
1999	232,142	$8,733,000	$37.61	68 % : 32 %
2000	272,122	$11,163,000	$41.02	60 % : 40 %
2001	269,687	$10,893,590	$40.39	62 % : 38 %
2002	255,000	$13,700,300	$53.73	64 % : 36 %

Source: Arizona Water Banking Authority. 2003. Arizona Water Banking Authority Annual Report 2002.

[20] Arizona Water Banking Authority. 2002. Annual Plan of Operation 2003. The estimated values for 2003 will be confirmed in the Annual Report 2003 to be published in July 2004.

[21] Gerry Wildeman, Technical Administrator, Arizona Water Banking Authority. Personnel Correspondence, December 9, 2003. The estimated values for 2004 will be reported in the Annual Plan of Operation 2004 to be published in December 2003.

California

While the legislation related to water banking is limited, the operational experience in California provides constructive examples of market mechanisms which facilitate trades between willing buyers and sellers. The term "water banking" applies to many structures in California including drought water banks, dry-year purchase programs, and conjunctive-use groundwater banks.

In addition, several acquisition programs have been established to acquire water for environmental restoration purposes. For example, CALFED has created the Environmental Water Account (EWA). The overall goal of the EWA is to addresses fish protection and recovery in the San Francisco Bay/Sacramento-San Joaquin Delta, while at the same time improving water supply reliability for Central Valley Project (CVP) and State Water Project (SWP) customers. To improve the reliability of supply systems, the program acquires, stores, and delivers water through the SWP and CVP infrastructure. Although the program is actively attempting to acquire water rights through one-year and multi-year leases, the program does not intend to re-lease or sell these rights on an open market. Thus, the program does not operate as a water bank.

Water Allocation

Within California, surface water and groundwater resources are regulated differently. Surface water is considered public property or state water and is regulated under appropriative and riparian rights. Appropriative rights are claims to divert water from the source, while riparian rights are held by landowners whose property borders a water course. The California State Water Resources Control Board (SWRCB) issues water use permits for appropriative rights, while the SWRCB does not have jurisdiction over riparian rights. The appropriation process is based upon the doctrines of prior appropriation, beneficial purpose and historical use. Any changes in place or rate of diversion and place or type of use require obtaining a permit amendment. [22]

Groundwater is not considered state water and is regulated under the doctrines of rule-of-capture and reasonable use. However, the State of California has formally recognized groundwater as a valuable natural resource and encourages local agencies to manage

[22] California Statues, Water Code, §1240.

groundwater resources within their districts.[23] As a result, groundwater districts have formed and adjudicated water rights within the basin.

State Water Banking Policy Review

While water banking has been active over the past fifteen years in California, the legislature has not enacted any new statues or rules to authorize the water banks.[24] However, several statutes and other governmental initiatives paved the way for water banking.

First, Executive Order No. W-3-91 was the mechanism to mitigate the results of a five-year drought in California. The key directives of this executive order included:

- Appointing the Director of the Department of Water Resources (DWR) as the administrator of the executive order;
- Creation of the Governor's Drought Action Team; and
- Instructing the DWR to create a clearinghouse of water transactions between voluntary buyers and sellers that would also protect fish and wildlife habitats.[25]

In 1991, the regulatory process for approving water right transfers was streamlined by enacting two emergency pieces of legislation. First, Assembly Bill 9X allowed water suppliers to transfer water outside the supplier's service area. Second, Assembly Bill 10X protected the supplier's water right during drought conditions.[26]

Since 1991, water right holders can submit a petition to the SWRCB to change the type of use to: 1) preserving or enhancing wetlands habitat; 2) fish and wildlife resources; or 3) recreation in or on the water.[27] This legislation is not related to water banking activities, but does provide a vehicle for instream flow augmentation.[28]

In 1999, the Legislature enacted Assembly Bill 1584, and chapter 725 declared that conjunctive use is an effective management tool which water suppliers should consider to improve system reliability.[29] Conjunctive use refers to "the temporary storage of water in a groundwater aquifer through intentional recharge and subsequent extraction for later use."[30]

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[23] California Statues, Water Code, §10750.

[24] Bob Alrdige. State Water Project Analysis Office, Department of Water Resources. Personnel correspondence, April 2002.

[25] Bob Alrdige. State Water Project Analysis Office, Department of Water Resources. Personnel correspondence, April 2002.

[26] Littleton et al., 1995 cited in Yolles, P. L. 2000. Update 2000: Progress and Limitation in Developing a Water Market in California. Water Resources Update.

[27] California Statues, Water Code, §1707.

[28] Bob Alrdige. State Water Project Analysis Office, Department of Water Resources. Personnel correspondence, April 2002.

[29] Assembly Bill 1584 Chapter 725 filed with Secretary of State on October 10, 1999. This legislation included §79170 through §79183 which discuss the importance of conjunctive use.

[30] California Statues, Water Code, §79171.

Storage can be achieved through direct recharge of surface water or in-lieu recharge. Under direct recharge, surface water is placed in the aquifer through infiltration ponds or injection wells. In-lieu recharge is achieved by using surface water instead of pumping groundwater water.

Overall, a water supplier may transfer or store water through any state drought water bank, or any water supplier or user, if excess water is available in its service area above water allocated to its water users. This transfer or storage of water may not unreasonably impact other users without consent.[31]

Highlights of Legislative Updates

California water policy will be significantly influenced by the Quantification Settlement Agreement for the Colorado River which was finalized in October 2003. The five parties to the agreement are the State of California, Metropolitan Water District of Southern California (MWD), San Diego County Water Authority (SDCWD), Coachella Valley Water District (CVWD), and Imperial Irrigation District (IID). While this agreement does not specifically address water banking activities, water transfers are outlined which will effect the placement of water and shift water storage needs.

[31] California Statues, Water Code, §1745.04

Water Banking Programs

California Drought Water Bank

Location:	Statewide
River Basin:	Statewide, Primarily SWP and CVP service areas
Year Established:	1991
Year Active:	1991, 1992, 1994
Bank Format:	One-year leasing program during drought conditions to reallocate water between users
Market Structure:	Clearinghouse which pools water and allocates supplies to critical demands in the state
Participation:	Supply – Northern California users; Demand – SWP and CVP contractors south of the Delta
Activity:	High
Pricing:	Fixed, Administrative
Price Range ($/AF/YR):	$68-$175
Regulatory Oversight:	Streamlined transfer process through the State Water Resources Control Board (SWRCB)
Administrator:	California Department of Water Resources (DWA)
Environmental Objective:	Ensure minimum stream flows through the Delta

Program Description

In response to a five-year drought, the State of California implemented an Emergency Drought Water Bank to meet the "critical needs" of the state. Three separate drought water banks were established to meet the state emergency needs. This section examines the differences in the water banks as well as describes the surface water infrastructure system which makes the situation in California extremely unique for implementing water transfers.

As is the case everywhere, surface water supply is largely driven by precipitation, and demand is driven by runoff and population. The majority of California's water supply originates in the northern part of the state, while California's population is heavily concentrated along the southern coastline. The reliability and flexibility of water supplies is optimized through large infrastructure projects.

Surface water supplies are utilized by both local purveyors as well as being distributed to other basins through large infrastructure projects. California's two primary water infrastructure projects that are responsible for moving water from north to south are the Central Valley Project (CVP) and the State Water Project (SWP). Both the CVP and SWP are reliant upon northern California runoff as their primary source of water. These two projects are capable of delivering well over 10 million acre-feet of water during average

climatic conditions. In addition, reservoirs within the system infrastructure are able to store water during wet periods and release water during drier conditions resulting in more consistent flow levels.

In 1991, California was facing its fifth year of drought and the state's water resources were greatly depleted.[32] For example, the SWP had limited deliveries to municipalities to ten percent of contract entitlements and deliveries to agricultural users had been suspended. The CVP system also was cutting back deliveries to 75 percent for Sacramento River water rights and San Joaquin exchange contractors, 50 percent for municipalities, and 25 percent for agricultural users.[33]

In February 1991, the SWRCB accepted Governor Wilson's Drought Action Task Force which created the 1991 Emergency Drought Water Bank. The goal of the bank was to obtain water from voluntary transfers to supply water to "critical needs" of the state. The DWR was selected to administer the bank, largely because it oversaw the SWP.

The DWR was charged with negotiating purchase contracts, monitoring compliance, securing SWCRB permits, and coordinating deliveries. Through optimization of the operations of the SWP, the DWR could facilitate transfers between willing buyers and sellers, optimize storage facilities, and provide the physical mechanism for water transport from the north to the users south of Delta.

The DWR negotiated contracts with individual sellers at varying prices. A seller could be an owner of appropriative water rights or individuals who held entitlements to delivery from irrigation districts. The goal was to create "new" surface water through the implementation of three types of contracts: 1) fallowing agricultural land contract for selling surface water instead of irrigating land, 2) groundwater contract for selling surface water and using groundwater, and 3) stored water contract for releasing water from reservoirs. The DWR evaluated the validity and reliability of the water sources prior to purchase.

In addition, the drought bank obtained riparian rights through a special provision. In the state, riparian rights can not be transferred, but can remain instream for a limited period before loss of rights. The DWR obtained riparian rights for the bank under the premise that the water was used for instream flow in the Delta allowing others appropriative rights to be transferred below the Delta.

The base sell price was $125 per acre-foot of water. However, a price escalation clause was added to limit price uncertainty for the seller. If new contracts were negotiated with other similar sellers from more than 10 percent, the initial sellers would receive the higher price. The DWR negotiated 351 contracts which provided over 820,000 acre-feet of water. All the contracts were pooled as one supply unit.

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[32] In Northern California, drought condition lasting longer than three years are relatively rare with the most notable being the droughts in years 1929-34, 1976-77 and 1987-92. California Department of Water Resources, "Background-Droughts in California" http://watersupplyconditions.water.ca.gov/background.cfm

[33] Howitt, R. N. Moore, and R. T. Smith. 1992. A Retrospective on California's 1991 Emergency Drought Water Bank. Reports prepared for the California Department of Water Resources.

All potential buyers were required to quantify their "critical needs" for the current year remaining after maximum utilization of normal sources including surface water allocations, groundwater, reclaimed water, and other water transfers. Extreme critical needs were given priority and included water for drinking, health, sanitation, fire protection, and agricultural critical needs.

A seller had representation on the "Water Purchase Committee" which set the purchase price. Water was sold at $175 reflecting all the acquiring costs including the purchase contracts, transport through the Delta, and administration of the bank. The water was delivered at the Harvey O. Banks Delta Pumping Plant, and a buyer was responsible for transportation costs beyond the pumping station. The DWR sold 396,000 acre-feet to 12 purchasers. The remaining 264,000 acre-feet was purchased by the state at $45 million to increase carryover storage which was delivered to SWP contractors in 1992.[34]

As was expected the sellers were located in the northern California, and recipients of the allocations were south of the Delta. The concentrations of transfers lead to arguments that the third party impacts were disproportionate in a few areas. In addition, the first year of the bank included some controversy over paper water associated with wheat crops, over-stated consumptive use, short lead-time resulting in unnecessary farming costs, and connections between groundwater wells and surface water.[35]

The drought condition continued in 1992. As a result, the state implemented another drought water bank. The bank was similar to the 1991 bank with the following changes. First, the DWR committed to purchasing water only after a contract was signed with a potential buyer. This provision was to eliminate the cost of carry-over supplies as incurred in 1991. Second, the water supplies were divided into six separate pools of water which could have different pricing mechanisms. However, all six pools established a purchase price of $50 per acre-foot and selling price at $72 per acre-foot. Third, fallowing contracts were eliminated as a source of water resulting in less concentrated impacts. Forth, buyers could store purchased water as long as use occurred prior to December 1995.

California had a wetter year in 1993, but dry conditions reoccurred in 1994. A third drought water bank was established under the same rules as the 1992 bank. The purchase price was set at $50 per acre-foot and selling price at $68 per acre-foot. The majority of the buyers were CVP contractors whose allocations were cut significantly, and the primary need for water was agricultural.

A precautionary bank was formed in 1995. This water bank switched to options contracts. The bank intended to purchase options to buy at $3.50 per acre-foot and could exercise the options at prices between 36.50 to $41.50 per acre-foot. The sellers would be able to keep the option payment regardless of whether the bank exercised its options. No options contracts were signed that year as water supplies increased and buyers did not contract with the bank for water. Therefore, the bank was never operational due to the significant precipitation later in the year.[36]

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[34] 1996. Layperson's Guide to Water Marketing & Transfer. Sacramento: Water Education Foundation.

[35] MacDonnell, L.J. 1994. Using Water Banks to Promote More Flexible Water Use: Final Project Report. Boulder: United Stated Geological Survey.

[36] 1996. Layperson's Guide to Water Marketing & Transfer. Sacramento: Water Education Foundation. For a detailed description of the development for the 1995 water bank see Jercich, S. A. California's 1995 Water

Trading Activity

Overall, the 1991 bank was the most active and traded at the highest prices. The subsequent years were slightly more restrictive and had lower prices.

Table 6
California Drought Water Banks

Supply/Use	1991		1992		1994	
	AF	$/AF	AF	$/AF	AF	$/AF
Water Source						
Fallowing	410,000		0		0	
Groundwater	246,000	125	152,000	50	187,000	50
Stored Water	164,000		38,000		33,000	
Total	820,000		190,000		220,000	
Delta Requirements	-160,000		-30,000		50,000	
Net Available	660,000		160,000		170,000	
Allocations						
Urban Uses	297,000		40,000		25,000	
Agricultural Uses	99,000	175	96,000	72	145,000	68
Environmental Uses	0		24,000		0	
Carryover Storage	264,000		0		0	
Total Allocated	660,000		160,000		170,000	

Source: Jercich, S. A. California's 1995 Water Bank Program: Purchasing Water Supply Options. Journal of Water Resources Planning and Management. January/February 1997. pp. 59-65.

Bank Program: Purchasing Water Supply Options. Journal of Water Resources Planning and Management. January/February 1997. pp. 59-65.

California Dry Year Purchasing Program

Location:	Statewide
River Basin:	Statewide; Primarily SWP and CVP service areas
Year Established:	2001
Year Active:	2001, 2002, 2003
Bank Format:	One-year leasing program
Market Structure:	Clearing house which pools and allocates water supplies to demand centers
Participation:	Supply – irrigation and water districts in the northern part of California; Demand – irrigation and water districts as well as a few individuals in the southern part of California
Activity:	High
Pricing:	Fixed, Administrative
Price Range ($/AF/YR):	$75 to $100
Regulatory Oversight:	Streamlined transfer process through the State Water Resources Control Board (SWRCB)
Administrator:	Department of Water Resources
Environmental Objective:	None

Program Description

The dry-year purchase program is similar to the drought banks, and the DWR continues to administer the program. However, the drought water banks of the 1990's were established to function only during times of drought as a clearinghouse of transactions. From 2001 through 2003, California has experienced dry conditions even though the Governor has not officially declared a drought. In 2001, the SWP allocations were less than 25 percent, while CVP allocations were as low as 15 percent for some users.[37] As a result, the SWP and CVP users requested that the DWR initiate a program to buy water from willing sellers.[38]

Under the dry year purchasing program, the DWR negotiates a Memorandum of Understanding (MOU) with potential buyers to estimate water demand, and then DWR enters into separate agreements with sellers to purchase water on behalf of the participants of the MOU. This program is available in years with less than normal hydrologic conditions.

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[37] Press Release March 13, 2001. DWR Program Encourages Voluntary Water Purchases. California Department of Water Resources.

[38] Dan Fua, Senior Engineer, State Water Project Analysis Office, Department of Water Resources. Personnel communication, May 2002.

The 2002 MOU sets forth the procedures for purchasing water. Water can be purchased through two different types of contract structures: 1) dry-year option contract, or 2) direct purchase contract.[39]

Under the dry-year option contract, the buyer submitted an option request to DWR by November 30th of previous year. This request specified the quantity, maximum price, and delivery terms. At the time of the option request submittal, the buyer paid a non-refundable agreement preparation payment of $2,500 in 2002 to offset the cost incurred by DWR in preparing the MOU for the current year. In addition, the buyer paid an option deposit fee of $10 per acre-foot requested. The DWR charged $5 for administrative fee, and the remaining $5 was applied to the option exercise payment.

The DWR then contracted with potential sellers to hold open an offer to sell water at a specified price. This price became the strike-price of the option agreement. Buyers with similar option terms (e.g., maximum price and delivery location) were combined into an option pool as designated by the DWR. The total water provided by an individual seller or group of sellers was allocated to an option pool. Each buyer was initially allocated a proportion of the total supply based on its requested quantity as percentage of total pool requested. Unmet requests were automatically available for another option pool. Prior to March 31st, the buyer had to either exercise or forfeit its option to purchase water. A buyer was not required to exercise all options which had been allocated to them. Upon exercise of option, the buyer paid the option to exercise payment which was determined by the seller's agreement with the DWR.

The second type of water contract was the direct purchase. A buyer submitted a purchase water request specifying the quantity, maximum price and delivery terms. All requests were submitted by March 31st. At the time of request, the potential buyer submitted the agreement preparation payment and a purchase deposit of $25 per acre-foot requested. This fee consisted of a $5 administrative fee retained by the DWR and a $20 applied to the purchase component.

The DWR then contracted with potential sellers to sell water at a specified price which became the total price of the purchase agreement. Buyers with similar purchases terms (e.g., maximum price and delivery location) were combined into a purchase pool as designated by the DWR. The total water provided by an individual seller or group of sellers was allocated to a purchase pool. Each buyer was initially allocated a proportion of the total supply based on its requested quantity as percentage of total pool requested. Unmet requests were automatically available for another purchase pool. If the final purchase cost was greater than $20 per acre-foot, the buyer was responsible for the difference.

Under both contract types, the buyer is responsible for conveyance cost beyond the point of delivery.

[39] State of California, The Resources Agency, Department of Water Resources. 2002. Memorandum of Understanding Regarding the Department of Water resources 2002 Dry Year Water Purchase Program.

Trading Activity

The Dry Year Purchasing Programs resulted in transactions in 2001, 2002, and 2003. The transferred quantity of water was greatest during the first year of the program, while the costs have increased from $75 per acre-foot to $100 per acre-foot over the three terms.

Table 7
California Dry Year Purchasing Program

Supply/Use	2001		2002		2003	
	AF	$/AF	AF	$/AF	AF	$/AF
Water Supply						
Browns Valley Irrigation District	8,000	75				
Butte Water District					11,355	100
Western Canal Water District	16,754	75				
Yuba County Water Agency	114,052	75	22,050	75		
Total Supply	**138,806**	**75**	**22,050**	**75**	**11,355**	**100**
Water Allocation						
Antelope Valley-East Kern Water Agency	18,014	75				
Dudley Ridge Water District	12,113	75	6,675	75	2,220	100
Kern County Water Agency	14,125	75	1,875	75	8,741	100
Lloyd Phelps and Gary Phelps (individuals)					300	100
Metropolitan Water District of Southern California	80,000	75				
Napa County Flood Control and Water Conservation District	3,200	75				
Oak Flat Water District	2,000	75	1,000	75		
Palmdale Water District			12,500	75		
Ronald Conn (an individual)					94	100
Santa Barbara Flood Control & Water Conservation District	4,754	75				
Tulare Lake Basin Water Storage District	4,600	75				
Total Water Allocation	**138,806**	**75**	**22,050**	**75**	**11,355**	**100**

Source: Teresa Geimer, Supervising Engineering, California Department of Water Resources. Personal Correspondence. January 12, 2004.

A $5 per acre-foot is also charged to cover the administrative expenses of the program. If the allocated water is derived through crop idling, the buyers are responsible for paying an additional five percent of the total value to cover potential third party impacts. For example, all water allocate in 2003 was derived through crop idling. In response, all buyers were charged five percent of the value (i.e., $5 per acre-foot) resulting in a total cost to buyers in 2003 at $105 per acre-foot. However, this mitigation cost may not be incurred

every year, and the cost may be diluted if the allocated water is created through multiple methods. Therefore, the mitigation cost is not included in the unit cost so that the unit cost represents a consent charge for multiple year comparison.

Conjunctive-Use Storage Programs

The first two water banking programs focused on the transfer of surface water supplies during dry years. However, the California legislature has recognized that conjunctive use programs are vital to meeting the water supply needs of the state. In general, conjunctive use refers to storing excess surface water during wet years beneath the ground for use during dry years. Similar to surface reservoirs, coordinated management of surface water and groundwater is an effective management tool to increase the reliability and flexibility of California's water supplies.

The most active groundwater banking programs import water supplies to recharge aquifers in wet years and later pump or exchange the stored water for delivery elsewhere. Such programs deliver stored water supplies to regions that are disconnected from the original source of water. Conveyance facilities and related capacity must be available to physically move the water.

A 2001 study conducted by the Association of Ground Water Agencies (AGWA) analyzed 18 major Southern California groundwater basin groupings.[40] The study showed that over 21.5 million acre-feet of additional groundwater storage is available in Southern California groundwater basins (see Table 8). A 2001 report from the Natural Heritage Institute identifies seven major groundwater banking programs in California's Central Valley that could store imported water supplies for purveyors not hydrologically connected to the program aquifer (see Table 9).[41] As an example of groundwater banking, this report describes and analyzes the Semitropic Bank.

[40] "Groundwater and Surface Water in Southern California," Association of Ground Water Agencies, 2001.

[41] An additional source of information on conjunctive-use water banking programs is the report by L.J. MacDonnell prepared for the U.S. Geological Survey entitled, "Using Water Banks to Promote More Flexible Water Use." This report describes three groundwater banking programs in California which include the Kern Water Bank, Arvin Edison/Metropolitan Water District arrangement, Orange County Water District.

Table 8
Long-term Storage Potential of Southern California Groundwater Basins

Basin Groupings	Potential Dry Year Storage (Acre-Feet)
Kern County Basin	8,000,000
Tehachapi/Cummings Basin	N/A
Ventura County Basins	500,000
San Fernando valley Basins	150,000
Raymond Basin	144,000
San Gabriel Basin	400,000
Los Angeles Coastal Plain Basins	1,089,000
Orange County Coastal Plain Basin	300,000
Six Basins	30,000
Upper Santa Ana River Basins	1,854,000
Bunker Hill Basin	0
San Jacinto Watershed Basins	1,284,000
Upper Santa Margarita River Basins	200,000
San Diego County Basins	270,700
Mojave River Basins	1,790,100
Hayfield Basin	500,000
Cadiz Valley Basin	1,000,000
Coachella Valley Basin	4,000,000
Total	**21,511,800**

Source: American Groundwater Association, data originally supplied by groundwater basin managers

Table 9
Groundwater Banking Programs

Name	Hydrologic Basin	Program Structure
Semitropic Groundwater Banking Program	Kern River	Recharge through spreading basins or in-lieu delivery; recovery through well field pumping or groundwater substitution
Butte County	Sacramento Valley	State Drought Bank
Sacramento North Area Conjunctive Use Program	American River	In-lieu, spreading and injection of surface water
EBMUD/San Joaquin County Conjunctive Use Project	San Joaquin River	In-lieu, spreading and injection of surface water
Madera Ranch Groundwater Bank	Madera Basin	Spreading via recharge ponds/wetland ponds
Arvin-Edison Water Management Program	Kern River	Recharge through spreading basins; recovery through well field pumping or in-lieu deliveries
Kern Water Bank	Tulare Lake	Spreading

Source: Thomas, G. A. 2001. Designing Successful Groundwater Banking Programs in the Central Valley: Lessons from Experience. Natural Heritage Institute.

Semitropic Groundwater Storage Program

Location:	Near Bakersfield
River Basin:	Kern River with access to SWP, CVP and California Aqueduct water
Year Established:	1991
Year Active:	1990
Bank Format:	Long-term underground storage facility
Market Structure:	Non-Market--contractual relationship with banking partners to store and extract water from facilities
Participation:	Supply and demand centers are the same and use the bank facility to increase the reliability of their supplies
Activity:	Moderate
Pricing:	Fixed, Administrative
Price Range ($/AF/YR):	Banking fees include put fees, take fees, annual operation and maintenance fees, and capital contributions based on initial contractual arrangements, but no cost is included for raw water transfers
Regulatory Oversight:	Approved Environmental Impact Report for groundwater storage program, but requires each banking partner to complete its own environmental review for their specific operations within the bank
Administrator:	Semitropic Improvement District
Environmental Objective:	None

Program Description

The Semitropic Water Storage District (District) was organized in 1958 to supply supplemental water within its boundaries. Semitropic is located in North Central Kern County in the San Joaquin Valley, about 20 miles northwest of the City of Bakersfield. The total land area within Semitropic is approximately 221,000 acres (345 square miles), with about 136,000 acres (213 square miles) irrigated.

Following a state pilot program in 1990, the District voters adopted a water banking program in 1991. Upon development of the Semitropic Water Banking Program, the District created the Semitropic Improvement District to facilitate the implementation of the banking program. In 1994, the environmental review process was completed and banking partners were contracted.

The Semitropic facility can access the Central Valley Project through the Friant-Kern Canal which conveys water South from Millerton Lake to the Kern River. Overall, the goals of the water banking program are the following:

- Optimize the use and distribution of water resources;

- Recharge groundwater and reduce overdraft; and
- Preserve operational reliability and flexibility of water delivery.

The Semitropic Groundwater Banking Program is a long-term storage project which consists of an in-lieu service area, conveyance facilities, groundwater wells, and pumps. The Semitropic Water Storage District owns all physical assets of the banking program including the land, well field, and delivery infrastructure connecting Semitropic to the California Aqueduct. The ability to use the storage facilities is managed through contracts with banking partners.

Originally, the Semitropic Groundwater Banking Program was comprised of five banking partners from the agricultural, urban, and private sectors. The original banking partners held varying stakes in the project as illustrated in Table 10.

Table 10
Original Banking Partners in the Semitropic Water Bank

Stakeholder	Option #	Percent Stake	Stake (aft)
Metropolitan WD	2	35.0 %	350,000
Santa Clara Valley WD	2	35.0 %	350,000
Alameda County WD	2	5.0 %	50,000
Zone 7 Water Agency	3	6.5 %	65,000
Vidler Water Company	3	18.5 %	185,000

Source: Semitropic Water Storage District

The Vidler Water Company originally held 18.5 percent of the shares. However, the company is actively exiting its positions in California to focus its efforts on water development projects in Arizona and Nevada. Therefore, in May 2001, Vidler sold 55,000 acre-feet of storage capacity, or 29.7 percent of its original stake to Newhall Land and Farming Company for $3.3 million, or approximately $60 per acre foot of storage capacity. Then in September 2001, Vidler sold 100,000 acre-feet of storage space, or 54.1 percent of its original stake to the Alameda County Water District for $6.9 million, or $69 per acre foot of storage capacity. These two sales suggest a small premium for large blocks of storage capacity, which may be relatively harder to come by than smaller blocks. Table 11 summarizes the stakes currently held by each banking partner.

Table 11
Current Banking Partners in the Semitropic Water Bank

Stakeholder	Option #	Percent Stake	Stake (aft)
Metropolitan WD	2	35.0 %	350,000
Santa Clara Valley WD	2	35.0 %	350,000
Alameda County WD	2	5.0 %	50,000
Alameda County WD	3	10.0 %	100,000
Zone 7 Water Agency	3	6.5 %	65,000
Newhall Land & Farming Company	3	5.5 %	55,000
Vidler Water Company	3	3.0 %	30,000

Source: Semitropic Water Storage District

Banking partners deliver a portion of their SWP entitlement water or other supplies to Semitropic during periods when such water is available through the California Aqueduct. This delivery to Semitropic is defined as a "Put" operation usually during periods of above normal precipitation or whenever the consumptive needs of the banking partners are lower than their SWP entitlements. Semitropic uses this water in-lieu of pumping groundwater for irrigation or recharges the aquifer using spreading basins. By not operating wells, the groundwater that would have been utilized for irrigation remains in storage and accumulates over time. During dry years and/or upon request, Semitropic returns the banking partner's previously stored water either by pumping the stored water from its groundwater basin through pumpback facilities into the California Aqueduct or by providing them with an equivalent portion of their SWP entitlement. This process of delivering stored water to the banking partners is defined as a "Take" operation.

The maximum defined storage capacity is one million acre-feet of water which is apportioned among banking partners. This defined capacity is not based upon a storage limitation, but is related to the specific allotments contracted for by the banking partners. Recovery rates corresponding with extraction of storage is achieved through a combination of direct pumpback (up to 90,000 acre-feet) and entitlement exchange (up to 133,000 acre-feet).

Direct pumpback requires returning water through existing District facilities and pumped back to the California Aqueduct. This pumpback capacity is 90,000 acre-feet and represents the minimum capacity of system. The entitlement exchange is based on Semitropic's SWP entitlement of 155,000 acre-feet minus 22,000 acre-feet reserved for the District's operation and allowance for losses, resulting in an available entitlement of 133,000 acre-feet. Since the SWP entitlement water deliveries have historically been reduced in dry years when take operations are requested, the firm capacity refers to only that capacity provided by existing pumpback facilities, or 90,000 acre-feet.

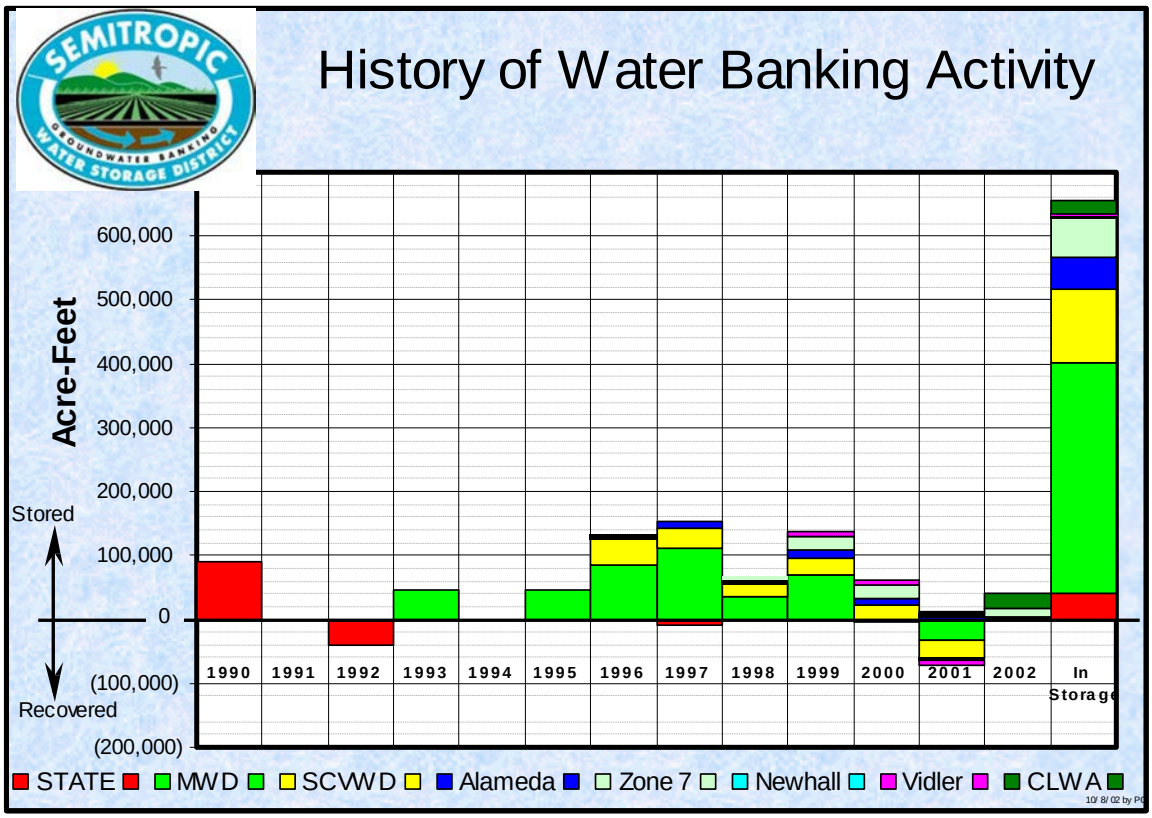
Banking partners contract with Semitropic for the right to both store and extract water in Semitropic's facilities. Each partner is entitled to draw a consistent, guaranteed amount of water each year, regardless of hydrologic conditions. The Bank operates on a "bucket-for-bucket" basis meaning only the amount of stored water can be returned.

The banking partners increase the reliability of their supplies that fluctuate annually and seasonally which adds value to end users that demand consistency. In evaluating their dry-year operations, the banking partners concluded that their operations would be significantly improved if the previously stored water could be recovered over an approximate three-year period instead of the current rate of eleven years (one million acre-feet extracted by 90,000 acre-feet annual increments). This desire for faster recovery rates and increased storage capacity led to the development of the Stored Water Recovery Unit of the Semitropic Groundwater Banking Program. The purpose of the Stored Water Recovery Unit is to provide additional facilities to store, recover, and convey each banking partner's (either current or future) banked water at a faster rate than the existing pumpback facilities permit and create additional storage capacity. In addition, the defined storage capacity would increase by 650,000 acre-feet for firm recovery. Therefore, the Bank would provide additional flexibility to existing banking partners and also open storage capacity for other potential banking partners.

Trading Activity

Over the past ten years, the Semitropic Bank has acquired a substantial pool of banked water. Semitropic's groundwater banking partners have consistently delivered water to Semitropic. Figure 2 shows net storage recharge and return from 1990 to 2002 by banking partners.

Figure 2
Semitropic Water Storage District Trading Activity



Source: Semitropic Water Storage District

The first year banking partners exercised their right to recover water from the Semitropic Bank was 2001 during the California drought conditions. Previously, stored reserves were drawn down to supplement banking partners' water supplies. The observable pattern of recharge in the six years prior to water recovery in 2001 is certainly sustainable. The far-right column, showing total water stored to date, illustrates the significant stockpile of water built-up in the Semitropic Bank. Based on a comparison of the magnitudes of the total storage column with the net withdrawal in 2001, the Semitropic Bank appears to provide a reliable source of water for several successive drought years.

The trading partners are charged several fees. These payments include put fees, take fees, annual operational and maintenance fees, and capital contributions. Each banking partner had the choice between four contract options with varying cost allocations. Options 1 and 2 have higher operational fees and no capital contribution, while options 3 and 4 have lower operational fees and significant capital contribution fees. These charges assume that the banking partners already have a source of water. In the future, new banking partners may be contracted that do not have a water source, and these partners would also be required to pay for the raw water source in addition to banking fees.

Water provided from Semitropic is classified as either first or second tier. First tier water is storage capacity used by banking partners as specified by their contract and is priced

differently for each of the four contract options. Second tier water is extra storage capacity used by banking partners above the amount specified by their contract and is charged at a flat rate to all partners regardless of their contract option. Table 12 summarizes costs for each option.

Table 12
Cost Summary by Contract Option (1994 Dollars per AF)

	Period of Charges	Option 1	Option 2	Option 3	Option 4
Payments for 1st Tier Water					
Put	Per AF in year stored	$ 110.00	$ 90.00		
Take	Per AF in year recovered	$ 20.00	$ 40.00	$ 10.00	$ 10.00
Annual O&M	Per AF of Storage Capacity	$ 3.98	$ 3.98	$ 3.98	$ 3.98
Cycling Incentive	Per AF/YR stored over 5 years		$ 20.00		
Capital Contribution	Per AF storage per year			$ 12.40	
Capital Contribution	Per AF storage capacity				$ 120.60
Payments for 2nd Tier Water					
Put	Per AF in year stored	$ 50.00	$ 50.00	$ 50.00	$ 50.00
Take	Per AF in year recovered	$ 50.00	$ 50.00	$ 50.00	$ 50.00
Annual O&M	Per AF storage capacity	$ 3.98	$ 3.98	$ 3.98	$ 3.98

Source: Semitropic Water Storage District

Colorado

Water banking in Colorado has faced significant opposition, and currently no long-term water banking programs exist in the state. However, the 2001 Colorado General Assembly approved the Arkansas Water Bank Pilot Program. The pilot program became operational in 2003, but no trades were facilitated through the online clearinghouse banking procedure.

Water Allocation

Within Colorado, surface water and groundwater resources are regulated under separate and distinct legal doctrines. The right to use "waters of natural surface streams" or surface water is allocated through appropriation by the state.[42] The allocation process is based upon the doctrines of prior appropriation and beneficial use. In contrast, groundwater is not included in Colorado's definition of waters of natural surface streams. However, groundwater usage is allocated based on the management procedures of many state entities including the Ground Water Commission, Water Conservation Board, and ground water management districts which regulate the withdrawal of groundwater resources.

State Water Banking Policy Review

Colorado has a long history of water marketing. Informal water transfers have been occurring in Colorado since the late 1880's. In fact, the state is home to one of the world's oldest and best functioning markets. However, Colorado has only recently embraced the concept of water banking. In 2001, the legislature approved a bill that proposed to test the concept of water banking for five years in the Arkansas River basin.[43]

The bill authorized the State Engineer to promulgate rules and regulations for the temporary and voluntary banking of storage water rights. Rules were promulgated in 2002, and the Arkansas River Pilot Water Bank became operation in 2003. A central and controversial tenant of the banking program was a provision that allowed out of basin transfers. The supporters of the provision felt this factor was essential to elevating the

[42] Colorado Revised Statutes, §37-82-101.

[43] House Bill 1354.

demand pressures of permanent water right sales to front-range cities such as Aurora and Denver. The original bill was scheduled to sunset in 2007, at which time the Colorado General Assembly was schedule to evaluate the success of the pilot program and look at extending banking opportunities to the rest of the state.

The Upper Arkansas Water Conservancy District, among others, formally opposed the establishment of a Pilot Water Banking Project on the Arkansas River. This opposition was based on the contention that the water bank was a quick and easy way to move water out of the basin. The District claimed that the bank transfer notice periods need to be extended to provide sufficient time for potential objectors to respond.

The 2003 Colorado General Assembly addressed some of these concerns through House Bill 1318, a water banking proposal that permanently expanded the pilot project from the Arkansas Valley to six other water districts.[44] A key change in the legislation was a restriction on out of basin transfers. Despite the changes, the interest in water banking in other regions of the state has been limited. The Arkansas River Basin Water Bank has not affected a single transaction and efforts to establish banks in other areas have been limited. Some contend that the prices for the water offered for lease are too high in Arkansas River Basin Water Bank. Others contend that multi-year leases are necessary to entice municipal entities. Regardless, the limitation on out-of-basin transfers is believed to have limited the interest in the Colorado water banking program.[45]

Water Banking Programs

Arkansas River Water Bank Pilot Program

Location:	Arkansas River Basin – Pueblo Area
River Basin:	Arkansas River Basin
Year Established:	2001
Year Active:	2003
Bank Format:	One-year leasing program for stored water rights
Market Structure:	Clearinghouse facilitating bilateral trades between willing buyers and sellers through an online bulletin board listing service
Participation:	Short-term water transfers from agricultural community to urban uses
Activity:	None
Pricing:	Market based, Negotiated between seller and buyer
Price Range ($/AF/YR):	No completed transactions as the current asking prices ($500 and $1000) appeared to be higher than market prices

[44] Colorado Revised Statute 37-80.5-104.5

[45] Joseph Grantham, Hearing Officer, Colorado Division of Water Resources, Personal Communication, December 12, 2003.

Regulatory Oversight: Colorado Division Engineer's Office

Administrator: Southeastern Colorado Water Conservancy District

Environmental Objective: None

Program Description

Legislative changes allowing the creation of the Arkansas River Basin Water Bank were implemented in 2001, and the bank became operation in 2003. [46] The program allows leasing of stored water within the Arkansas River basin and its tributaries. One goal is to increase the availability of water, while assisting farmers, ranchers, and cities by developing a mechanism to realize the value of their water without forcing permanent severance of those water rights from the land. The bank is administered by the Southeastern Colorado Water Conservation District with regulatory oversight provided by the State Division Engineer's office.

As the administrative body, Southeastern Colorado Water Conservancy District is responsible for the day to day operations of the bank and the water bank web site. The banking registry is a key feature since the water bank intends to be operational via the web site (www.coloradowaterbank.org). The administrative process of the bank is as follows:

- Water owners wishing to temporarily lease their water shall fill out an application, gather all pertinent information and submit the documents to the Southeastern Water Activity Enterprise office along with an application fee of $15.00.
- The completed application will be reviewed by the Division 2 Engineer's office to assure that the water is available to be leased.
- The staff will then post the offering on the water bank website.
- Qualified bidders may then post their bids on the water.
- Bids are a binding offer to pay such amount.
- On the 11th business day after posting the offering, staff will review the in-basin bids. The highest bid(s) meeting the minimum acceptable bid required by the lessor will then be submitted to the lessor for acceptance.
- The lessor may then accept any out-of-basin bid as they are posted.
- Upon acceptance, a lease is prepared and posted as under contract for the thirty-day public review. The proposed lease will also be mailed to those on the notification list.
- After the thirty-day review, the Division Engineer has 5 days to consider comments and will provide the terms and conditions for the transaction.
- Quantification of the available water is based on historical consumptive use.
- Once all parties involved in the transaction accept the Terms & Conditions, then an agreement is signed and a transaction fee is paid to the bank.
- The water bank will notify the Division Engineer's office, the reservoir operator where the water is stored, and those on the notification list.

[46] See Arkansas River Basin Water Bank Rules

- The lessee must notify the Division Engineer 24 hours in advance of when they need the water released.

The bank functions primarily through the online registry and webpage. Depositors and bidders are required to register through the website. The web page provides detailed information on depositors and bidders. The deposit information lists the name of the depositor, the quantity of water approved by the Division Engineer, the minimum asking price, the source of the water, as well other location information. The website also provides a listing of individuals seeking water. The listing includes the contact name, requested quantity and phone number. Transactions conducted through the bank are limited to one year. Prices are determined by the market and negotiated between the buyer and seller.

The bank has made considerable effort to develop a simple process and provide documents that help facilitate deposits and transactions. The bank provides a variety of sample contract agreements and forms through the website that bank participants can download and customize for their use. These forms include a standard lease agreement, option agreement, and storage agreement as well as others.

Despite the attempts to develop a simple process, the Arkansas River Basin Water Bank has yet to complete a transaction. During 2003, four individuals deposited water in the bank, and all but one were eventually withdrawn due to lack of interest by bidders. Table 13 provides a summary of the 2003 bank deposits.

Table 13
Arkansas River Basin Water Bank Deposits

Depositor	Quantity (AF)	Source	Price	Status
Farm	47.32	Lake Meredith	$800/AF/YR	Withdrawn
Farm	140	Lake Meredith	$800/AF/YR	Withdrawn
Farm	135.51	Lake Meredith	$500/AF/YR	Withdrawn
Farm	8.02	Twin Lakes	$1000/AF/YR	Listed

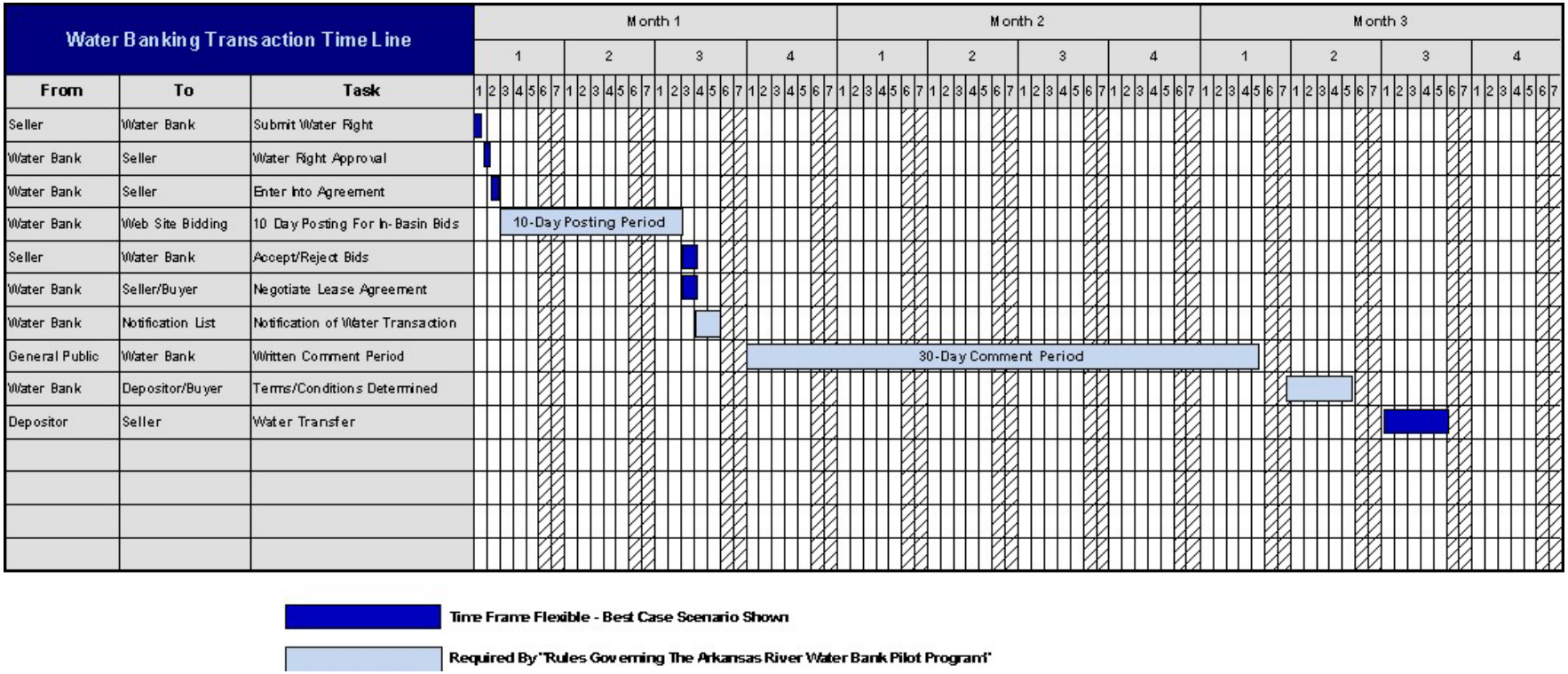
Source: Southeastern Colorado Water Conservation District

Bidders are required to register with the bank. In 2003, a total of nine cities, two landowners, and one irrigation company registered with the bank. Bidders expressed limited interest primarily because of the asking price. Bidders indicated that the asking prices were well above offer prices. Requested lease prices within the bank ranged from between $500 to $1000 per acre-foot per year. On average, these prices are well above observed lease prices in other western state markets and could explain why no transactions have occurred. Limited efforts were made by the district to provide assistance in establishing price expectations prior to the initiation of the bank.

In addition to price, banking participants have indicated that the timeline required to complete a transactions is too lengthy for annual agreements. Approval for a transaction is expected to take a minimum of two months and, on average, is expected to take three months. Figure 3 shows the steps and time requirements for deposits and transactions within the bank.

Figure 3

Arkansas River Basin Water Bank Transaction Timeline



Municipalities participating in the program have indicated that the review period constrains the usefulness of the bank for addressing short-term municipal needs. The cities have pointed out that the effective market timeframe is highly constrained by the requirements for farms to have determined their water needs for the year and the time frame required to obtain approval. In addition, the restriction on multi-year contracts prevents the cities from utilizing the bank as a long-term water source.

The bank may also be limiting its successfulness in an effort to provide transparency to the market. The names and contact information for depositors and bidders are provided on the banking website. As a result, it is relatively easy for buyers or sellers to directly contact trading partners without going through the bank. In fact, at least one deposit withdrawn from the bank was eventually sold in an external agreement.

Idaho

Water banking has been operational with Idaho since 1932, while legislation related to water banking was not enacted until 1979. Idaho has a State Bank, the Shoshone-Bannock Bank, and five local rental pools. Each water bank functions under unique operational procedures, and the level of activity varies among the banks. Historically, legislation and operational procedures were not conducive to using water banking as mitigation for instream flow. However, recent legislation has marked a significant change by allocating a voluntary mechanism for providing instream flows in the lower Lemhi River during low flow periods.

Water Allocation

Within Idaho, surface water resources are considered to be "waters of the state" and property of the state. The right to use state water is obtained through appropriation by the state.[47] The allocation process is based upon the doctrines of prior appropriation, beneficial purpose and historical use. Also, the right to use unappropriated surface water, subterranean waters, or other sources is acquired only by appropriation under the application, permit and license procedures of the state.[48]

State Water Banking Policy Review

Idaho has a long history of water banking. In fact, the first informal water bank began in the early 1930's in the upper snake region.[49] This banking activity operated through a rental pool which allowed entities with surplus storage water to make it available to others who were water short in a particular year. The first recorded banking transfers occurred during the drought in 1932 when 14,700 acre-feet of water was rented at a rate of 17 cents per acre foot. Then in 1934, 40,000 acre-feet of water was rented for 25 cents

[47] Idaho Statutes, §42-101.

[48] Idaho Statutes, §42-103.

[49] MacDonnell, et al. 1994, "Using Water Banks to Promote More Flexible Water Use. Final Report US Geological Survey Award: 1434-92-2253.

per acre foot. Bank activity continued with no formal rules or pricing structure until 1937, when the Upper Valley Storage Pool was formed to establish Idaho's first formal rules on water banking. The rules established for this water bank have provided the foundation for future banking activity in Idaho as well as throughout the United States.

Even after the formation of the Upper Valley Storage Pool, banking or rental pool activity was largely informal and operated without specific legislative authority for many decades.[50] Then in 1979, the Idaho Legislature formalized the banking program.[51] The legislation set into law a 1976 policy recommendation of the state water plan which had called for the creation of a "water supply bank for the purpose of acquiring water rights or water entitlements from willing sellers for reallocation by sale or lease to other new or existing uses." Rather than forming a single water bank, Idaho has allowed for both a statewide water bank and local rental pools.

The statewide water bank is operated by the State Water Board and until recently was the only bank that could accept natural flow water rights. In contrast, the rental pools are operated at a local level and until recently were only authorized to bank and transfer storage water entitlements.[52]

The rental pools are operated by the local water districts. Since the 1979 legislation was adopted, five local rental pools have been created. While the rental pools share some common rules, each have developed unique operating procedures. In general, the rental pool rules establish priorities among depositors and renters. The rental pools have structured rules that give higher preference to irrigation use within local areas. Specifically, each of the rental pools have adopted a "last to fill" rule. Under this rule, water leased for non-irrigation uses outside the district are the last to be refilled in subsequent years. In effect, the last to fill provision creates a disincentive for depositors to lease water for environmental uses.

This disincentive has become a significant issue in recent years as more of the banked water is leased by the US Bureau of Reclamation to meet streamflow targets for salmon recovery efforts. In fact, salmon recovery within the state has prompted some of the more recent changes to Idaho's water banking legislation. In 1991, the Idaho Power Company working in cooperation with Bonneville Power Administration leased water from a rental pool to meet flow targets for salmon. At the time, the leases violated state law.

The 1979 legislation places several limitations on banking transfers. Specifically, leases that result in an out-of-state transfer of water are prohibited. The Idaho Water Resources Department has determined that instream flow leases violate this provision. The Idaho Legislature amended the banking statutes in 1992 to provide temporary and limited authority to the US Bureau of Reclamation to lease water from the rental pools or state water bank for flow augmentation in the lower Snake River Basin.[53] This provision has been extended three times and is currently scheduled to sunset on January 1, 2005.

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[50] Norm Young, Idaho Water Resources Department. Personal Communication. February 6, 1998.

[51] Idaho Code 42-1761 through 1766

[52] In 2001, the Idaho Legislature adopted changes to allow the transfer of natural flow rights for instream use through the newly created Lemhi River rental pool.

[53] Idaho Code 42-1763B.

In 2001, the Idaho Legislature adopted changes to banking statutes that allow the transfer of natural flow rights to instream use in the Lemhi River rental pool. This basin is the only one in the state where natural flow rights can be explicitly transferred to an instream flow use through the rental pool statutes.[54] The legislation was in response to litigation by the Western Watersheds Project against Lemhi River irrigators for alleged excess or illegal water diversions.[55] The new legislation marked a significant change in direction in Idaho's policy toward instream flows. The change created voluntary mechanism for providing instream flows in the lower Lemhi River during low flow periods. The change also showed a willingness on the part of the legislative body to develop flexible market based policies toward instream flow protection.

Currently, the State Supply Bank, the Shoshone-Bannock Bank, and five rental pools are operational within Idaho. However, the level of activity within each has varied significantly. Until recently, the State Bank facilitated transactions of exclusively *natural flow water*, while leaving the exchange of *stored water* to the Shoshone-Bannock Water Bank and the five rental pools.[56] Five water districts with reservoirs have opted into the bank system by creating water rental pools. The following sections provide a detailed description of the water banks and rental pools.

Water Banking Programs

Idaho State Water Supply Bank

Location:	Statewide
River Basin:	Statewide
Year Established:	1979
Year Active:	1995
Bank Format:	Institutional water bank which transfers natural flow water
Market Structure:	Clearinghouse which facilitates bilateral trades between willing buyers and sellers
Participation:	Supply – Open; Demand – Open
Activity:	Moderate
Pricing:	Market based through negotiations between buyer and seller
Price Range ($/AF/YR):	$11—Recommended
Regulatory Oversight:	Pre-reviewed by State
Administrator:	Idaho Department of Water Resources
Environmental Objective:	None

[54] Idaho Code 42-1765A.

[55] Thornberry, Ron. 2002. "A new course - Lemhi ranchers taking steps to protect farms - and fish." Idaho Falls Post Register. November 11.

[56] Glen Saxton, Idaho Department of Water Resources, personal communication October 23, 2003.

Program Description

The State Water Supply Bank was officially established in 1979. However, activity within the bank did not begin until 1995. Since 1995, participation has been sporadic. However, trading activity within the supply bank is expected to increase as a result of the Idaho Water Resources Department's participation in the National Fish and Wildlife Foundation water transaction program. The stated purpose of the bank or program is "to encourage the highest beneficial use of water; provide a source of adequate water supplies to benefit new and supplemental water uses; and provide a source of funding for improving water user facilities and efficiencies."[57]

A significant difference between the State Bank and the Rental Pools is that price in the Bank is suggested but not fixed. Lessors submit their application presenting their water rights to the Board. The application outlines the desired terms of the transaction, including an indication that the suggested rental rate is acceptable—currently at $11 per acre-foot, or a different suggested selling price. Suggested selling prices are usually lower than the fixed rental rate, although price is not what moves water rights in the State Bank. The State Bank operates under a "first in, first out" rule that prioritizes the rights in the bank, not according to price, but according to the order in which the right was placed in the bank. The board also considers other important factors, such as whether the rental of the right is consistent with conservation in Idaho and with local and state interests, as well as ensuring that the lessor leave rights idle while deposited in the bank.

All water deposited in the bank is protected from forfeiture. If the water right is leased, 90 percent of the lease valued is paid to the water right owner and 10 percent is paid to the board to cover administrative fees.

Trading Activity

Table 14
Idaho Water Supply Bank

Year	No. Deposits	Total Deposits (AF)	Total Withdrawals	Price/AF
1995	4	128		
1998	3	208		
1999	7	5453		
2000	8	3836		
2001	0	0	-	-
2002	19	2103		$11

Source: Idaho Department of Water Resources

[57] Idapa 37 Title 02 Chapter 03, 37.02.03 - Water Supply Bank Rules

[60] Ron Carlson, Idaho Department of Water Resources, personal conversation, October 24, 2003

Snake River Rental Pool (Water District #01)

Location:	North region of Idaho
River Basin:	Snake River Basin, Water District #1
Year Established:	1979
Year Active:	1979
Bank Format:	Leasing stored water
Market Structure:	Clearinghouse which facilitates bilateral trades between willing buyer and sellers
Participation:	Supply – Stored water; Demand – Open
Activity:	High
Pricing:	Fixed, Administrative
Price Range ($/AF/YR):	$3.00 for in- basin transfers, $10.50 for out-of-basin transfers
Regulatory Oversight:	Stored water
Administrator:	Water District #1
Environmental Objective:	None: Instream transactions encumbered by "last fill" policy

Program Description

The Water District #1 Rental Pool is in the Snake River Basin and is the largest and oldest of the rental pools. The rental pool is comprised of eight reservoirs with 4.1 million acre-feet of storage capacity. Historically, this rental pool represents approximately 90 percent of the total number of transactions of all the rental pools.[60] Created in 1979, this rental pool is administered by Water District #1.

Prices within the rental pool are administratively established. Prices within the bank are primarily based on the cost of delivery and are not reflective of market prices. In 1993, the Snake River rental pool decided to differentiate pricing for water used above or below Milner Dam. Pricing above Milner Dam was set as $2.95 per acre-foot annually. The rate was increased in 2003 to $3.00 per acre-foot. Prices for water delivered below Milner Dam are slightly higher. The current rate, which was set in 1996, is $10.50 per acre-foot. Prices are reviewed annually by the district. While the district has relied on an administrative pricing structure, the issue of moving to market based pricing structure is hotly debated annually during pricing reviews.[61]

Since 1995, approximately 90 percent of all water exchanged through the bank is released below Milner Dam. All water releases below Milner Dam were leased by the United States Bureau of Reclamation (USBR) for flow augmentation. The remainder of the

[61] Ron Carlson, Idaho Department of Water Resources, email to WestWater Research, October 30, 2003

water is used primarily for irrigation. Prior to 1995, significant volumes were released for hydropower generation.

As with all rental pools, Water District #1 Rental Pool maintains a last to fill provision. The provision states, "Any space evacuated to supply water for uses located below Milner Dam shall be assigned a priority date in the Watermaster's Water Right Accounting program that is later in time than all other reservoir water rights. This priority shall remain in place until the assigned right has been filled. The last to fill status may be incrementally reduced from year to year until the space has filled. Once the last to fill space has been filled, the priority of this space will revert back to the water right priority under which it accrued water prior to the lease."[62]

The USBR is by far the largest market participant in the rental pool and is leasing water for environmental purposes. While the lessors benefit financially from earning higher out of basin rate, they incur the risk associated with the probability of dry conditions in the following year. As a result of the last to fill provision, lessors are penalized if they lease the water to the USBR and the district's reservoirs fail to fill the following year. If the reservoirs do not fill in a given year, all lessors subjected to the last to fill provision share proportionately in shortages. The lessor may mitigate this risk by limiting the amount leased to the Bureau to quantity it can afford to lose the following year. The risk is not eliminated, rather is mitigated by reviewing the probability of dry conditions in that area and the historic carry over rates for that reservoir during dry years.[63]

Several environmental groups have approached the district regarding leases for environmental purposes. However, the Nature Conservancy is the only organization in addition to the Bureau to lease water from the rental pool for environmental purposes.

[62] Water District #1 Rental Pool Procedures, Rule 3.6.

[63] Ron Shirtleff, Water District #65 Watermaster , personal communication, October 29, 2003

Table 15
Snake River Rental Pool Trading Activity

Rental Activity Years	Water Offered (AF)	Rented for Irrigation (AF)	Rented for Hydro-Generation (AF)	Rented for Recharge (AF)	Rented for Fish Flow (AF)	**Total Rented (AF)**	Percent of Offered Water
1990	306,000	152,000	68,000	-	-	220,000	72 %
1991	205,113	85,677	99,000	-	-	184,677	90 %
1992	9,954	9,954	0	-	-	9,954	100 %
1993	408,240	38,974	249,000	-	-	287,974	71 %
1994	432,171	75,888	356,282	-	-	432,170	100 %
1995	582,405	37,197	-	71,093	255,000	363,290	62 %
1996	636,586	19,024	-	-	250,000	269,024	42 %
1997	693,305	11,328	-	-	224,500	235,828	34 %
1998	764,699	7,890	-	-	223,221	231,111	30 %
1999	727,461	9,136	-	-	148,397	157,533	22 %
2000	336,934	60,333	-	-	215,650	275,983	82 %
2001	56,942	56,942	-	-	0	56,942	100 %
2002	21,019	21,019	-	-	-	21,019	100 %

Source: Idaho Department of Water Resources

Boise River Rental Pool (Water District #63)

Location:	Western region of Idaho
River Basin:	Boise River Basin, Water District #63
Year Established:	1988
Year Active:	1988
Bank Format:	Leasing stored water
Market Structure:	Clearinghouse which facilitates bilateral trades between willing buyer and sellers
Participation:	Supply – Stored water; Demand – Open
Activity:	Moderate
Pricing:	Fixed, Administrative
Price Range ($/AF/YR):	$6.50 for in- basin transfers, $6.93 for out-of-basin transfers
Regulatory Oversight:	Stored water
Administrator:	Water District #63
Environmental Objective:	None: Instream transactions encumbered by "last fill" policy

Program Description

The Boise River Basin Rental Pool is located in the western portion of the state and is administered by Water District #63. This pool was created in 1988 and is comprised of three reservoirs.

Pricing is administratively determined by the water district and rates have varied little over time. Annual rental rates within the pool are $6.50 per acre-foot within the basin and $6.93 per acre-foot for out of basin leases. Fees are largely based on delivery costs and include a 10 percent administrative surcharge that is kept by the district. The remainder of the rental rate is paid to the depositor. Rental pricing structures and rates are annually reviewed by the rental pool advisory committee.

The USBR is the largest participant within the bank and leases water for environmental purposes. Like other rental pools, the Boise River Rental Pool maintains a last to fill provision. The provision states, "The space of storage water leased to the Rental Pool that is rented for users outside the hydrologic basin of the Boise River or below the confluence of the Boise River and the Snake River shall be the last space to fill in the ensuing year."[64] Again, this provision has significant impact on depositors that lease water to the USBR for flow augmentation. As a safeguard, some participants in the rental pool limit the amount of water they lease to the USBR to avoid supply constraints in the subsequent year.[65]

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[64] Water District 63 Rental Pool Procedures, Rule 3.5.

[65] Ron Shirtleff, Water District #65 Watermaster , personal communication October 29, 2003

Trading activity within the basin has been relatively constant with recent trading volumes ranging from 38,000 to 44,000 acre-feet. However, trading activity dropped significantly in 2001 due to continued drought conditions.

Table 16
Boise River Rental Pool Trading Activity

Rental Activity Years	Offered (AF)	Rented for Irrigation (AF)	Rented for Fish Passage (AF)	Miscellaneous (AF)	**Total Rented (AF)**	Percent of Offered
1990	11,182	11,182	-	-	11,182	100 %
1991	2,927	1,832	-	-	1,832	63 %
1992	1,832	4,753	-	-	4,753	259 %
1993	23,900	23,000	-	-	23,000	96 %
1994	40,703	4,753	35,950	-	40,703	100 %
1995	67,000	0	27,000	-	27,000	40 %
1996	38,588	575	38,000	13	38,588	100 %
1997	45,320	451	38,000	-	38,451	85 %
1998	42,767	1,835	40,932	-	42,767	100 %
1999	44,146	3,214	40,932	13	44,159	100 %
2000	44,892	2,767	40,932	41	43,740	97 %
2001	3,137	3,043	0	94	3,137	100 %
2002	2,317	2,230	-	87	2317	100 %

Source: Idaho Department of Water Resources

Payette River Rental Pool (Water District #65)

Location:	Western region of Idaho
River Basin:	Payette River Basin, Water District #65
Year Established:	1990
Year Active:	1990
Bank Format:	Leasing stored water
Market Structure:	Clearinghouse which facilitates bilateral trades between willing buyer and sellers
Participation:	Supply – Stored water; Demand – Open
Activity:	High
Pricing:	Fixed, Administrative

Price Range ($/AF/YR):	$3.20 for in- basin transfers, but $5.65 for out-of-basin transfers
Regulatory Oversight:	Stored water
Administrator:	Water District #65
Environmental Objective:	None: Instream transactions encumbered by "last fill" policy

Program Description

The Payette River Basin Rental Pool is located in the western portion of the state and is administered by Water District #65. The pool was created in 1990 and is comprised of three reservoirs.

Pricing is administratively determined by the water district and rates have varied little over time. Annual rental rates within the pool are $3.20 per acre-foot within the basin and $5.65 per acre-foot for transfers below the mouth of the Payette River. Rental fees received are split between the depositor, the water district, and the Idaho Water Resources Board. For leases within the basin, the depositor receives $2 per acre-foot the district receives $1 per acre-foot, and the board receives $0.20 per acre-foot. For transactions below the mouth of the Payette River, the depositor receives $4.23 per acre-foot, the district receives $1 per acre-foot, and the board receives $0.42 per acre-foot. Pricing is set by the Idaho Water Resources Board and is reviewed by the Advisory Committee on an as-requested basis. The last review occurred in 2001 when prices were increased to approach rates in other rental pools. The next review is scheduled for 2006.

The USBR is the largest participant within the bank and is leasing water for environmental purposes. Like other rental pools, the Payette River Rental Pool maintains a last to fill provision. The provision states that the space of storage water leased to the Rental Pool that is rented for users outside the hydrologic basin of the Payette River or below the confluence of the Payette River shall be the last space to fill in the ensuing year."[67]

Activity within the pool has been relatively constant with recent annual trading volumes ranging from 101,382 to 166,176 acre-feet. However, trading activity dropped significantly in 2000 due to continued drought conditions. Deposits were limited due to the lack of available water supplies. In 2002, the trading activity increased to levels prior to 2000 dry conditions.

The Payette River Rental Pool has a total capacity of approximately 177,000 acre-feet annually. The majority of the water deposited in the pool is leased by the USBR for flow augmentation. The pool also has a reputation of providing consistent volumes and historically has provided approximately 56 percent of the USBR total annual leasing requirements.

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[67] Water District 63 Rental Pool Procedures, Rule 3.5.

[69] Bill Graham, Chief of Water Planning Bureau, Idaho Department of Water Resources, personal communication, October 28, 2003

Table 17
Payette River Rental Pool Trading Activity

Rental Activity Years	Offered (AF)	Rented for Irrigation (AF)	Rented for Hydro-Generation (AF)	Rented for Fish Flow (AF)	Total Rented (AF)	Percent of Offered Water
1990	65,881	0	63,700	-	63,700	97 %
1991	102,574	2,000	-	100,000	102,000	99 %
1992	1,832	4,753	-	-	4,753	259 %
1993	23,900	23,000	35,000	-	58,000	243 %
1994	5,000	3,432	35,950	62,000	101,382	2028 %
1995	155,915	4,061	7,958	145,000	157,019	101 %
1996	161,485	3,790	5,951	151,300	161,041	100 %
1997	159,500	3,325	0	155,000	158,325	99 %
1998	159,500	3,210	0	145,000	148,210	93 %
1999	165,000	4,304	0	160,000	164,304	100 %
2000	155,000	7,196	2,500	45,000	54,696	35 %
2001	62,280	31,222	2,600	0	33,822	54 %
2002	167,000	4,986	1,190	160,000	166,176	99 %

Source: Idaho Department of Water Resources

Payette River Basin on Lake Fork Creek Water Bank (Water District #65k)

Location:	Western region of Idaho
River Basin:	Payette River Basin on Lake Fork Creek, Water District #65-k
Year Established:	1999
Year Active:	1999
Bank Format:	Leasing stored water
Market Structure:	Clearinghouse which facilitates bilateral trades between willing buyer and sellers
Participation:	Supply – Stored water; Demand – Open
Activity:	High
Pricing:	Fixed, Administrative
Price Range ($/AF/YR):	NA Regulatory
Oversight:	Stored water
Administrator:	Water District #65-k
Environmental Objective:	None: Instream transactions encumbered by “last fill” policy

Program Description

Water District #65-k operates a Rental Pool on Lake Fork Creek, one of the tributaries to the Payette River in the western region of the state. Payette River tributaries are managed separately from the larger basin. This Rental Pool was created in 1999 and has one reservoir. The Pool rents stored water exclusively and is administered by the Rental Pool Committee, composed of the Advisory Committee to the Water District.

At this time, trading activity within the bank is limited, and the majority of the water is leased by the USBR for flow augmentation.

Lemhi River Rental Pool (Water District #74)

Location:	Eastern region of Idaho
River Basin:	Lemhi River Basin, Water District #74
Year Established:	2001
Year Active:	2001
Bank Format:	Institutional transfer of banks natural flow water
Market Structure:	Clearinghouse which facilitates bilateral trades between willing buyer and sellers
Participation:	Supply – Irrigation; Demand – USBR
Activity:	Limited
Pricing:	Fixed Price
Price Range ($/AF/YR):	$146
Regulatory Oversight:	Reviewed by the state
Administrator:	Water District #74
Environmental Objective:	Yes: Lease-bank program by USBR to meet minimum flows

Program Description

The Lemhi River Rental Pool is the most recent rental pool to form. The Lemhi program is unique because it is the only pool that can lease natural flow water rights. In fact, the Lemhi rental pool does not exchange any storage entitlements. The Lemhi River, located in eastern Idaho, has historically gone completely dry in certain reaches, particularly during diversion in the summer months. The rental pool was created in 2001 with the specific purpose of augmenting flows in the basin for salmon needs. The rental pool is administered by the Local Rental Committee which is comprised of the members of the Board of Directors for Lemhi Irrigation District.[69]

In addition the Lemhi River has a minimum stream flow requirement of 35 cfs that was put into place by the Idaho Water Resource Board to protect fish migration. The minimum flow requirement is subordinate to other existing senior water rights.[70] Yet a

[70] Bill Graham, Chief of Water Planning Bureau, Idaho Department of Water Resources, personal communication, October 28, 2003

critical flow level of 20 cfs has been identified by NOAA Fisheries. Regulatory action could be triggered if flows drop below that critical level. The rental pool was developed to maintain the critical flow quantity and to avoid regulatory and legal action against irrigators and landowners. During the dry and high-diversion months of summer, mainly in July, the Lemhi River Water Bank purchases on behalf of the USBR, between 20 and 25 cfs of water from local farms. [71]

The Lemhi River Rental Pool is also unique because it functions more as a leasing program than an actual bank. Unlike the other Idaho rental pools, the Lemhi was designed specifically to facilitate the USBR's leasing efforts to maintain flows in the river. In contrast, other rental pools have a history of water being leased for irrigation and other uses.

Pricing within the Lemhi River Rental Pool has also made a significant departure from the other rental programs. The annual rental rate within the Lemhi is $220 per acre, which represents a rate of approximately $146 per acre-foot. Rental rates within the Lemhi have caused controversy because the rates are significantly higher than in other rental pools. Rental rates are paid on an acre basis rather than an acre-foot quantity.

Rates were negotiated between the USBR and landowners in 2001, an extreme drought year for the basin as well as the rest of the region. According to program officials, the price was arbitrarily established and not based on any type of appraisal or valuation analysis. In the words of one program official, "It was the price necessary to get the landowners' attention."

Table 18
Lemhi River Water Bank

Year	Acres Leased	Equivalent Water (AF)
2001	670	1,005
2002	700	1,050
2003	855	1,283

Source: US Bureau of Reclamation

[71] Rick Sager, Water Master District #74, person communication October 28, 2003

Shoshone-Bannock Tribal Water Bank

Location:	Fort Hall Indian Reservation, eastern region of Idaho
River Basin:	Snake; Palisades and American Falls Reservoirs
Year Established:	1994
Year Active:	1994
Bank Format:	institutional and storage bank
Market Structure:	Clearinghouse which facilitates bilateral trades between willing buyer and sellers
Participation:	Supply – Tribal Federal Reserve Rights; Demand – Open
Activity:	Limited
Pricing:	Fixed, Administrative
Price Range ($/AF/YR):	$9.00
Regulatory Oversight:	Reviewed by state
Administrator:	Shoshone-Bannock Tribe
Environmental Objective:	Yes: Instream use identified as a beneficial use within the bank.

Program Description

The Shoshone-Bannock Water Bank was created in 1994 by the Shoshone-Bannock Tribe in order "to allow for rental for any beneficial use all or any part of the water accruing to the federal contract storage rights in the American Falls Reservoir and the Palisades Reservoir as described in Article 7.3.1 of the Agreement not used on Indian lands or otherwise required to fulfill the exchange established by Article 8 of the Michaud Contract."[72]

The 1990 Fort Hall Water Rights Settlement Agreement, approved by congress, authorized the creation of the water bank. The settlement confirmed the tribal water rights in the upper Snake River and provided for marketing opportunities. Specifically the tribe holds water in American Falls Reservoir and Palisades Reservoir.

The tribal bank operates slightly differently then the rental pools and state water banks. First, prices are not fixed and are determined by the market. Second, it is the only bank to expressly recognize instream flows as a beneficial use of bank water. Tribal water from American Falls may be rented below Milner Dam and is not subject to a last to fill provision. Final, the tribal bank allows lease terms to extend up to five years. However, longer terms can be negotiated between the tribe and the Idaho Water Resources Board.

[72] IDAPA 37, Title 02, Chapter 04, Shoshone-Bannock Tribal Water Supply Bank Rules

The tribal bank is administered by a committee consisting of the Fort Hall Indian Reservation Water Master, the District #1 Water Master and three representatives from

the tribe. The tribal bank gives preferences to local uses. Specifically, banking rules state tat Fort Hall Reservation water users maintain a first right to rent any tribal water deposited in the bank.[73]

Activity within the bank has been limited. Only one transaction has been completed, which occurred in 1999. The transaction included a 5-year lease for 39,000 acre-feet at a price of $9 per acre foot per year. While activity has been limited, the tribal bank is well positioned to supply water to the USBR for flow augmentation. During dry years, limited water is available from District #1 for use below Milner Dam. In recent years, this has limited the USBR's ability to satisfy flow requirements on the Snake River. Consequently, the tribal bank could attempt to supply water during dry years.

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[73] Tribal Rules 30.02.

[80] Montana Code Annotated §85-2-301.

Montana

Currently, no water banking activities are contemplated or operational in Montana. However, recent water leasing programs may pave the way for future banking programs.

Water Allocation

Within Montana, "water of the state" refers to surface and ground water resources. The water of the state is appropriated through a permit issuance process managed by the Department of Natural Resources and Conservation. The permit system follows the doctrines of prior appropriation and requires appropriation only for beneficial uses.[80]

State Water Banking Policy Review

No water banks exist in Montana, and no evidence suggests that the State has contemplated developing one. However, water market activity in the form of water leasing programs has recently increased. Rising market activity in a region indicates the possibility for ripeness of facilitating water banks.

Like most western states, Montana has acknowledged the value of instream flows for aquatic habitat and fisheries protection. In 1989, Montana adopted legislation that created a temporary program to allow the Department of Fish, Wildlife and Parks to lease water rights for the purpose of maintaining stream flows for fisheries benefits. Initially, the program was limited to ten basins. In 1995, Montana's leasing laws allowed private groups and individuals to lease water rights for fisheries benefits. Currently, Montana's leasing laws are temporary changes and are scheduled to sunset in 2005.

Subsequently, the State has developed three pilot-phase water leasing programs to address stream flow deficiencies throughout Montana. Montana's water leasing programs include:

- the Private Water Leasing Pilot Project,
- the Upper Fort Clark River Basin Instream Flow Pilot Program, and
- the Fish, Wildlife and Parks Water Leasing Pilot Program.

[80]Montana Code Annotated §85-2-301

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Although each program is unique, the basic concept for each program is the same. The overarching goal is to create entities interested in mitigating instream flows by allowing them to lease water rights and temporarily convert the water right to instream use. Each

program will be reviewed following the expiration of the pilot period. At that time, the programs may be reinstated, modified, or dissolved completely.

In addition, the Montana Water Trust and Trout Unlimited are actively leasing water to benefit fisheries and to help restore stream flows. However, these leasing programs are just one aspect of their operations. The Trust attempts to work with ranchers and farmers to develop more efficient use of their water, thereby freeing up extra water to be transferred or donated to instream use. Trout Unlimited focuses more on political lobbying to achieve its initiatives. Although both groups are actively attempting to aggregate water rights to facilitate stream flow goals, neither group intends to re-lease or sell these rights on an open market. Thus, neither group operates as a water bank.

Nevada

The Nevada water law provides provisions that facilitate water banking. In addition, the state is engaged in water banking activities including an interstate arrangement with Arizona. However, these banks provide limited information on a market driven banking system with multiple buyers and sellers. These banks operate primarily as storage programs and were not developed with the intended purpose of encouraging market exchanges.

Specifically, banking programs like the Truckee-Carson-Pyramid Lake and the proposed Walker Lake are structured more like storage facilities and instream flow maintenance programs than water banks. However, these programs have the potential for developing a market mechanism to facilitate water banking transactions between willing buyers and sellers.

Water Allocation

Surface water and groundwater are both considered public resources.[81] Regardless of source, the right to use water in Nevada is appropriated for beneficial and historical uses.[82] Water rights are allocated based on the doctrine of prior appropriation, and the state engineer issues water use permits.

State Water Banking Legislation Review

The most relevant legislation to water banking passed in 1996 and provided the following changes[83]:

> "The board may acquire water rights or other sources of water, within or outside the region, for future use in accordance with the adopted comprehensive plan. Any right or source of water belonging to a local

[81] Nevada Revises Statutes. Title 48 §533.025.

[82] Nevada Revises Statutes. Title 48 §533.030 and §533.045.

[83] Senate Bill 489, Section 27 was codified as Nevada Revises Statutes. Title 48 §540A.240.

> government or governmental agency within the region must be used in accordance with the adopted comprehensive plan. The board may impose a reasonable charge upon a person seeking a commitment from a public utility to provide water, for making water from a source so acquired available for that use."

The 1996 legislative debate focused specifically on Section 27.[84] At issue, was the intent of the legislation to create a water bank for acquiring water rights as part of a regional comprehensive plan. These plans are to be developed by local water planning commissions which oversee the supply of municipal and industrial water. If an acquisition is identified as part of the comprehensive plan, the acquired water is considered to be beneficial even if the intended use does not occur until well into the future. A charge may be imposed on a development which will be serviced by the water rights held by the bank.

In 1999, the potential for water banking was significantly enhanced by a federal regulation.[85] The Secretary of the Interior authorized an interstate banking program between Nevada, California and Arizona. Nevada and Arizona have further negotiated terms for the interstate banking project and completed the final agreements in December 2002 (see Legislative Update Section).

In addition, New Mexico State Engineer established a water banking program in 2000.[86] The engineers order mandated the creation of a groundwater banking program in the Truckee Meadows Groundwater Basin. The water bank is primarily an accounting system of water withdrawal and recharge for the water rights held by Sierra Pacific Energy Company.

The prospect of water banking is enhanced by two other aspects of the Nevada water code. First, Nevada policy allows water rights to be transferred.[87] Water rights may be severed from the appurtenant place of use if deemed beneficially or economically impracticable. The severed right is simultaneously transferred to another place of use without losing priority of right. A change in place of diversion or use as well as type of use is allowed through the permit process overseen by the state engineer.[88]

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[84] Sam McMullen, Lobbyist, Washoe Regional Water Planning Coalition. Minutes of the Senate Committee on Natural Resources, Sixty-eighth Session. May 31, 1995.

[85] Department of the Interior, Bureau of Reclamation. 43 CFR Part 414: Offstream Storage of Colorado River Water; and Development and Release of Intentionally Created Unused Apportionment in the Lower Division States. November 1, 1999.

[86] R. Michael Turnipseed, State Engineer, State of Nevada. Order 1161: Groundwater Banking Order Truckee Meadows Groundwater Basin. May 16, 2000.

[87] Nevada Revises Statutes. Title 48 §533.040.

[88] Nevada Revises Statutes. Title 48 §533.325.

Second, "stored water" is defined in Nevada as water stored underground with the intent to recover under a permit issued by the state engineer.[89] The groundwater must then be used for a beneficial purpose.[90]

Highlights of Legislative Updates

Interstate Banking Agreement

In December 2002, the final agreements were signed to authorize an interstate water banking program between Nevada and Arizona. This program required several agreements among numerous parties including the USBR, Colorado River Commission of Nevada (CRCN), the Southern Nevada Water Authority (SNWA), the Arizona Water Banking Authority (AWBA), and the Central Arizona Water Conservation District (CAWCD). The agreements include:

- Agreement for Interstate Water Banking. AWBA, SNWA, and CRCN. July 3, 2001.
- Agreement for the Development of Intentionally Created Unused Apportionment. AWBA and CAWCD. December 18, 2002.
- Storage and Interstate Release Agreement. USBR, AWBA, SNWA, and CRCN. December 18, 2002.

The agreements specify that the interstate banking program is valid until the earlier of June 1, 2050 or until all SNWA storage credits are recovered. The agreements include the following specific terms:

- Nevada can divert some or its entire share of the Colorado River water to Arizona or purchase some Arizona entitlements to Colorado River water.
- The unused Colorado River water will be injected into the ground creating long-term storage credits in Arizona facilities.
- The AWBA will store water for the SNWA only after meeting the needs of Arizona and only up to 1.2 million acre-feet of Colorado River water.
- Annually, the AWBA will develop a plan identifying the water available for storage and associated storage costs, while SNWA will request the amount it seeks to store.
- The SNWA is limited to recovering 100,000 acre-feet per year.
- The SNWA is responsible for all costs associated with acquiring, storing and recovering water.

Water Banking Programs

Interstate Water Bank

[89] Nevada Revises Statutes. Title 48 §534.016.

[90] Nevada Revises Statutes. Title 48 §534.020 and §533.055.

Location:	Southern Nevada
River Basin:	Colorado and the Central Arizona Project
Year Established:	2002
Year Active:	2002
Bank Format:	Long-term underground storage of excess surface water
Market Structure:	Non-Market
Participation:	Supply – Excess Colorado River Apportionments; Demand – Colorado River entitlement holders in Nevada
Activity:	Limited
Pricing:	Fixed, No market pricing as the administrators purchases CAP water at the administrative price set annually by the CAP
Price Range ($/AF/YR):	$78 based on a single transaction completed in 2002.
Regulatory Oversight:	Underground storage contracts overseen by a state permit process and governed by interstate agreements
Administrator:	Southern Nevada Water Authority, Arizona Water Bank Authority, Central Arizona Water Conservation District
Environmental Objective:	None. The primary objective is to store Colorado River water that is allocated to Arizona but not used in one year for use in a drier year.

Program Description

During years of delivery and storage, the AWBA will advise the Nevada parties on the availability and cost of groundwater storage. Based on this information, the SNWA will determine the quantity it seeks to store the following year. Then, the AWBA must approve the quantity and incorporated it into its plan of operation.

Under the interstate water banking agreement, Nevada may store Colorado River water that is either Nevada's unused basic or surplus apportionment or Arizona's basic or surplus apportionment.[91] If the water is apportioned to Nevada, the water shall be released by the Secretary of the Interior for Consumptive Use in Arizona. The AWBA will acquire Colorado River water. The Colorado River water will be diverted through the Central Arizona Project facilities operated by CAWCD and injected into Arizona storage facilities.

The AWBA will establish a long-term storage account with the Arizona Department of Water Resources for the SNWA. The AWBA will update the registry of long-term storage credits to be held in the SNWA account for every deposit in an Arizona storage facility. The storage of long-term credits is limited to 200,000 acre-feet annually and 1.2 million acre-feet over the period of the agreement.

[91] The apportionments are defined in the Decree entered by the United States Supreme Court in Arizona v. California, 376 US 340 (1964), as supplemented or amended.

The amount of water that is purchased from CAP is greater than the amount of storage credits. The purchased quantity is deducted by the delivery conveyance losses and a statutory contribution of five percent required to remain in the aquifer for the long-term health of the groundwater system.

During years of recovery, the parties participate in a three step process. First, the parties develop an interstate recovery schedule which outlines how Arizona will develop an "intentionally created unused apportionment" (ICUA)[92] of Colorado River water in Arizona. An ICUA can be achieved through two methods: 1) recovery and exchange, or 2) credit exchange. Under the recovery and exchange method, long-term storage credits are recovered by extracting and using stored water in exchange for otherwise diverted Colorado River water. Under the credit exchange, long-term storage credits are exchanged for Colorado River water that would have been delivered through the CAP system for groundwater storage. An ICUA can not exceed 100,000 acre-feet annually.

Second, the Secretary of the Interior must approve the ICUA and release the water for use in Nevada. The CAP subcontractors identified by the ICUA plan will not divert water creating the ICUA, and the SNWA water banking account will be debited by the amount of certified forbearance. The storage location used for recovery is at the discretion of the AWBA.

Finally, the Secretary of Interior will allow SNWA to divert the amount equivalent to the ICUA created in Arizona. The Colorado River water will be diverted to Nevada at its Saddle Island diversion in Lake Mead. Overall, the Secretary considers the diversion of ICUA by SNWA as a consumptive use in Nevada of unused Arizona apportionment made available by the Secretary.

The AWBA is a not-for-profit organization which imposes charges only to recover its costs.[93] SNWA is responsible for the operating, maintenance, and capital costs associated with their portion of water acquisition, delivery, storage, and recovery through the interstate banking with Arizona. The charges are computed on a price per acre-foot basis.

Trading Activity

In 2002, budget constraints in Arizona reduced AWBA's appropriation from the general fund by $1 million. Without these funds, the AWBA could not meet their planned storage deliveries in Pinal County. While the agreements were not completed, AWBA offered the unfunded storage capacity to Nevada.

A letter agreement was signed between SNWA and AWBA to facilitate the interstate banking prior to completion of all agreements. The AWBA amended its 2002 Annual Plan of operation to include storage of 40,000 acre-feet of interstate water on behalf of Nevada. The actual amount of water stored was 66,595 acre-feet. The long-term storage credits were accrued by storing water in Arizona groundwater savings facilities in Pinal County. In addition, 50,000 acre feet of long-term storage credits were transferred to the AWBA from CAWCD on behalf of Nevada. Therefore, the total deposits were 116,595

[92] Secretary of Interior. Water Banking Regulations.

[93] Gerry Wildeman, Technical Administrator, Arizona Water Banking Authority. Personnel Correspondence, December 9, 2003.

acre-feet, and the total storage credits after reduction for aquifer recovery were rounded to 111,000 acre-feet.

This early transaction suggests that the interstate water banking program may be effective for Nevada water management. However, future transactions are limited since the AWBA has the ability to purchase all extra water and utilize storage capacity if funding is available. For example, Arizona did not offer storage capacity to Nevada in 2003.

Table 19
Interstate Water Bank Transaction

Year	Beginning Balance (AF)	Long-term Storage Credits (AF)	Debits through ICUA (AF)	Ending Balance (AF)	Cost to Nevada	
					Total	Per AF
2002	0	111,000 (GSF)	0	111,000	$ 8,642,699 [94]	$ 78
2003	111,000	0	0	111,000	$ 0	$ 0

Source: Arizona Water Banking Authority. 2003. Annual Report 2002. Gerry Wildeman, Technical Administrator, Arizona Water Banking Authority. Personal Correspondence. December 9, 2003

Truckee Meadows Groundwater Bank

Location:	Washoe County
River Basin:	Truckee
Year Established:	2000
Year Active:	2000
Bank Format:	Long-term groundwater banking activity
Market Structure:	Non-Market withdrawal accounting system for one user
Participation:	Supply – Groundwater in Truckee Meadows Basin; Demand – Truckee Meadows Water Authority
Activity:	Limited
Pricing:	No pricing structure as the system is an accounting system to record the withdrawals and recharges of water by one entity
Price Range ($/AF/YR):	Not applicable since no pricing structure exists for bank
Regulatory Oversight:	Reviewed by state
Administrator:	Truckee Meadows Water Authority (formerly by the Sierra Pacific Power Company)
Environmental Objective:	None

[94] This total amount does not include reconciliation of interstate water deliveries which was charged and paid in 2003.

Program Description

As ordered by the Office of the State Engineers, the Truckee Meadows Water Authority manages its groundwater rights in the Truckee Meadows basin as banked resources.[95] The groundwater bank is based on an accounting system which records the water withdrawals and recharges.

The accounting system has specific operational procedures. First, the total long-term average that can be withdrawn from the basin is 15,950 acre-feet per year. This baseline determines the credits and debits of the water accounting system. Credits are realized during years when withdrawals are less than 15,950 acre-feet, and debits are created during years when withdrawals exceed 15,950 acre-feet. The bank can also be credited by water recharge as specified in the bank's recharge permit.

Trading Activity

The bank began operation in 2000. This structure is a water banking system. However, the facility is operated for a single entity. Therefore, no trading mechanism or pricing data exists for this bank.

[95] R. Michael Turnipseed, State Engineer, State of Nevada. Order 1161: Groundwater Banking Order Truckee Meadows Groundwater Basin. May 16, 2000.

New Mexico

Within New Mexico, water banking legislation has been limited. Currently, the state does not have a comprehensive water banking program. Specific legislation related to statewide water banking has been blocked by opposition which has included the New Mexico Acequia Association and other water irrigation and conservation districts.[96] However, a recent pilot water banking project has been approved for the Lower Pecos River Basin. In addition, other agencies are engaged in water management activities that function similarly to water banks.

Water Allocation

New Mexico regulates surface water under the prior appropriation doctrine. Many organizations are involved in the management of the water resources within New Mexico including the U.S. Bureau of Reclamation (USBR), the New Mexico State Engineer, the New Mexico Interstate Stream Commission (ISC), the Pecos River Compact Commission, the Lower Pecos River Basin Committee, as well as many irrigation, conservation districts, and acequias.[97] The agencies have authority over the supervision, measurement, appropriation and distribution of almost all water in New Mexico, including streams and rivers that cross state boundaries.

Groundwater resources are considered to be underground streams, channels, artesian basins, reservoirs or lakes, having reasonably ascertainable boundaries. These groundwater resources also belong to the public and are subject to appropriation for beneficial use.

State Water Banking Policy Review

[96] Michelle Henrie, attorney, Rodney, Dickason, Sloan, Akin & Robb, P.A. Personal Correspondence. October 27, 2003.

[97] Acequais is the Spanish word for "irrigation canal." In New Mexico, acequias also refer to public entities that allocate irrigation water to the landowners who are members of the acequias, similar to an irrigation district.

Historically, water banking legislation has not been successful. The failure of previous legislative attempts is largely due to opposition by the acequias.[98] However, the opposition by the acequias may be lessened by a new legislation which requires a transaction of a water right served by an acequia or community ditch to be approved by the acequia or community commissioners. [99] The commissioners may deny the change if determined to be detrimental to the acequia, community ditch, or its members.

The most significant legislative movement towards water banking was House Bill 421 introduced in 2002. This bill allows for a water banking program in a specified area over a limited time period (see section on Legislative Highlights). House Bill 421 was adopted as mitigation to the potential threat of non-compliance with The Pecos River Compact and Amended Decree.[100] The compact requires New Mexico to provide for the equitable division and apportionment of the Pecos River water across the Texas state-line.[101] In response to the 1988 Supreme Court Decree, the New Mexico Legislature declared that a potential water shortage crisis exists in the Pecos River basin and established the New Mexico Interstate Stream Commission (ISC) to investigate, protect, conserve and develop New Mexico's waters and stream systems.[102] In July 2001, the ISC established the Lower Pecos River Basin Committee consisting of water users within the region to assist the State in developing short-term and long-term strategies to deliver water to the state line.

Prior to the passage House Bill 421, the ISC had instituted a program which functioned similar to a water bank. Since 1991, the ISC has been leasing temporary water rights and purchasing permanent water rights. Essentially, water right holders sell the rights to the ISC which augments streamflow with exchanged water. For surface water rights, the seller forfeits its ability to divert water from the Pecos Basin. For ground water rights, the seller forfeits its ability to use the groundwater which is then pumped into the Pecos River. Both water rights increase the overall streamflow to the Texas state-line.

The ISC informal water banking activity has been funded by the legislature. In 1998, the legislature appropriated $18.5 million dollars from the Irrigation Works Construction Fund to be spent as follows: 1) $2 million per year for three years to purchase and lease water, 2) $12 million for water-rights acquisitions, and 3) $500,000 to prepare a long-term strategy for permanent compliance and a short-term action plan to respond to net shortfalls.

Water leasing arrangements, which function like temporary water banking activities, are allowed in New Mexico. The "Water-Use Leasing Act" allows an owner to lease his

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[98] Michelle Henrie, attorney, Rodney, Dickason, Sloan, Akin & Robb, P.A. Personal Correspondence. October 27, 2003.

[99] New Mexico Statutes Annotated § 72-5-24.1. 2003. New Mexico Statutes Annotated § 73-3-4.1. 2003.

[100] New Mexico Statutes Annotated § 72-15-19 et. Seq. 1949.

[101] New Mexico must deliver to Texas roughly 57 percent of water released from constructed projects (e.g., Summer Dam) and 50 percent of the unappropriated floodwaters that enter the lower river.

[102] New Mexico Statutes Annotated §72-1-2.2. 1991 New Mexico Statutes Annotated § 72-14. 1978. The statute authorizes the commission to negotiate compacts with other states to settle interstate controversies; to match appropriations by the U.S. Congress; to investigate and develop the water supplies of stream systems of the state; and to institute legal proceedings in the name of the state for planning, conservation, protection, and development of public waters.

water rights for immediate or future use by another.[103] Unused leased water may not cumulate from year to year. Prior to use, the lessee must request approval from the state engineer for the use and location of water application. In addition, the original right owner may face forfeiture of water rights following non-use by lessee.

Water banking activity may also have been limited in this state by the risk of forfeiture of water rights. Recent amendments to the forfeiture clause of the New Mexico's water code may create a regulatory environment more conducive to water banking programs.[104] The changes include the following provisions:

- Municipalities, counties, and public utilities may acquire and hold water rights for uses projected 40 years in the future without the risk of forfeiture;
- Water leased or placed in conservancy districts, irrigation districts, or acequias will not be forfeited for non-use; and
- Improved irrigation methods will not result in forfeiture of conserved water.[105]

Water users who choose to contribute water to specific banking programs now have protection from forfeiture of water right. Thus, the revised statute should promote water banking activities.

Highlights of Legislative Updates

House Bill 421 (2002)

During the 2002 legislative session, New Mexico approved the development of water bank(s) within the Lower Pecos River Basin, delineated between Fort Sumner Dam and the Texas state-line.[106] All transfers must be for the purpose of complying with the Pecos River Compact and remain within the basin. Specifically, all transfers must be used as "temporary replacement water" to augment flow. The replacement water will augment stream depletions caused by temporary continued use of water rights junior to the Compact Administration Date as determined by the State Engineer.

The Act specifies that the ISC is to adopt rules for water bank creation and operation. Currently, the rules proposed by the ISC are under review by the State Engineer.[107] The draft rules include the following criteria[108]:

[103] New Mexico Statutes Annotated §72-6-1 to §72-6-7. 1978.

[104] New Mexico Statutes Annotated § 72-5-28. 2002.

[105] Michelle Henrie, attorney, Rodney, Dickason, Sloan, Akin & Robb, P.A. Personal Correspondence. October 27, 2003.

[106] Gubbels, P.K. 2002. House Bill 421. 45th Legislature of the State of New Mexico 2nd Session. New Mexico Annotated Statutes § 72-1-2.3. 2003.

[107] Linda Gordon, The Office of the State Engineer. Personnel Correspondence. April 9, 2003.

[108] Interstate Stream Commission. 2003. Proposed Final Rules: Lower Pecos River Basin Water Banking Regulations.

- A water bank would be institutional in function with the goal of providing a temporary source of water through accrual, pooling, exchange, assignment or lease of water rights.
- A water bank may be created to facilitate the transfer of water without formal approval by the State Engineer.
- An application for a charter to operate a water bank may be submitted to the ISC by an irrigation district, a conservancy district, an artesian conservancy district, a community ditch, acequia or water user's association within the basin.
- The ISC will accept or deny an application.

Once operational, the bank will act as a broker between the depositor of rights and the buyer. The bank will operate in accordance to its specific charter and operational rules. However, the ISC has suggested the following procedures:

- An owner of senior water rights or water stored in ground or surface water reservoirs may contract with the water bank under a written agreement. The agreement is the deposit in the bank, and no actual water is transferred at that time.
- The depositor will pay an administration fee, and the water bank will have sole marketing rights for the banked water. The years during which the water is banked do not count towards the four-year non-use forfeiture provision.[109]
- Market activity and withdrawals are likely to increase if the State Engineer enacts a priority call in the region where a bank is established. Under a priority call, junior right holder diversions will be reduced or curtailed unless they obtain replacement water. The junior right holder may obtain replacement water from a water bank if supplies are available. This replacement water is used to augment streamflow and replace stream depletions.
- Prices will be determined through a bid process. A potential purchaser will submit bids for deposits to either the depositor or the bank, depending upon the specific structure of the bank charter.[110] If accepted by the depositor, the purchaser and depositor will enter into a transaction agreement for the exchange of real water. A purchaser must use the banked water for replacement of water rights cut off by priority administration.
- The water bank will submit to the ISC and State Engineer a monthly summary of deposit and transaction agreements.
- Based on the approved legislation, all bank charters and transaction agreements expire on December 31, 2005.
- No applications for bank charters have been submitted.

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[109] The forfeiture provision lowers the risk for depositors, but raises concerns from other water right holders that depositors might place unused water in the bank in order to defer forfeiture.

[110] The specific structure of trades will be determined under each water bank charter. No entity has filed a charter. Rebecca King, Interstate Stream Commission. Personnel Correspondence. November 26, 2003.l

House Bill 417 (2002)

Also during the 2002 Legislative Session, New Mexico approved a long-range plan to buy farmland and its associated water rights, pump groundwater into the river to supplement its flow, and increase water-saving methods in southeastern New Mexico. This plan functions like a water bank by transferring irrigation rights to instream flow rights.

Currently, the ISC is planning to purchase 6,000 acres of irrigated farmland in the CID and 12,000 acres of irrigation water rights upstream from Brantley Reservoir near Carlsbad. The objective of the program is to retire irrigated land and to use the surplus water to meet New Mexico's flow obligation in the Pecos River. In addition, approximately 20,000 acre-feet of groundwater could also be pumped into the river each year from the aquifer under Roswell and Artesia.

Other Legal Mandates

The State Engineer approved an Emergency Authorization to temporarily change place and purpose of use of groundwater to offset depletions to the Carlsbad Project Water resulting from modified reservoir operation at Sumner Reservoir. Legislation may be proposed to allow this type of transfer without authorization or on a permanent basis, whereby creating a water banking structure.

This water banking activity would be a mitigation effort for impacts on the bluntnose shiner, (Notropis simus pecosensis), a species listed as Threatened on February 20, 1987 under the Endangered Species Act. The USFWS has issued biological opinions recommending a minimum flow of 35 cubic feet per second (cfs) at the Acme gage on the Pecos River located north of Roswell. Currently, an Environmental Impact Statement is being prepared to address the impacts of the Carlsbad Project operations on the bluntnose shiner. One mitigation alternative identified by the USBR and the ISC is developing a water acquisition and management program which would function like a water bank.

Water Banking Programs

Pecos River Basin Water Bank(s)

Location:	Below Sumner Reservoir to Texas state-line
River Basin:	Lower Pecos River
Year Established:	2002
Year Active:	Not-to-Date
Bank Format:	Institutional transfers facilitated through a deposit contract (seller and bank) and transaction contract (seller and buyer) for temporary transfers
Market Structure:	Clearinghouse of bilateral trades between depositors and buyers
Participation:	Supply – Open; Demand – Interstate Stream Commission
Activity:	None
Pricing:	Market-based through bid process
Price Range ($/AF/YR):	No transactions to-date
Regulatory Oversight:	Reviewed by State at the time of withdrawal
Administrator:	Interstate Stream Commission (ISC)
Environmental Objective:	Yes: augment flows to protect the habitat of a federally protected species, bluntnose shiner

Program Description

The Water Banking Regulations allow water bank(s) to be created within the Lower Pecos River Basin. The purpose of the banks must be to comply with the Pecos River Compact whereby providing temporary replacement water to augment streamflow. This replacement water will address the stream depletions caused by use of water rights junior to the Compact Administration Date as determined by the State Engineer. Since the rules have not been approved, no entities have submitted applications to establish a water bank.

New Mexico has experienced drought conditions over the past few years. Under drought conditions, the ability to use excess irrigation water for release across the state line becomes difficult. The State Engineer has strongly considered enacting a "priority call" (e.g., priority curtailment or priority administration). Under a priority call, junior water rights would be cut off until the flows in the river increased enough to meet New Mexico's delivery obligation to Texas.[112] If water banks are established, they will help alleviate the reductions experienced by junior rights.

[112] Potentially impacted areas with junior water rights include the cities of Roswell and Ruidoso as well as upstream farmers. Senior water rights holders are CID and Acequias on the upper Pecos River. An economic impact study prepared for the ISC estimated economic damages associated with a priority call could total more than $200 million.

Trading Activity

No application for water banks have been submitted at this time. Therefore, no water banks are currently operational.

Pecos River Water Lease/Purchase Program

Location:	South of the City of Carlsbad
River Basin:	Lower Pecos River
Year Established:	1991
Year Active:	1992
Bank Format:	Institutional transfer of water rights
Market Structure:	Clearinghouse to facilitate bilateral trades of permanent purchases and temporary leases
Participation:	Supply – Open; Demand – Interstate Stream Commission
Activity:	Moderate
Pricing:	Market-based through negotiations between ISC and the Carlsbad Irrigation District
Price Range ($/AF/YR):	$50-$100
Regulatory Oversight:	Reviewed by state
Administrator:	Interstate Stream Commission (ISC)
Environmental Objective:	Yes: secondary objective to meeting flow compact with Texas

Program Description

Pursuant to NMSA § 72-1-2.2 (1991), the ISC began acquiring water rights through either 1) permanent purchase of water rights or irrigated lands from which the water rights could be separated or 2) annual leases from water right holders.[113] The ISC, USBR, and CID have entered into a Miscellaneous Purposes Contract which allows the ISC to transfer water allocated to lands owned or leased from other members of the CID to releases from Carlsbad Project facilities to the New Mexico-Texas State line for compliance with delivery obligations.

Trading Activity

ISC has maintained an annual lease with CID since the early 1990s. Historically, lease payments were $50 per acre-foot. However, drought conditions in 2001 limited available supplies and, as a result, lease rates increased to $100 per acre-foot. Lease rates have continued to hold at that level.

[113] Rebecca King, Interstate Stream Commission. Personnel Correspondence. August 2003.

Prior to 1995, the focus was on buying upstream water rights, and then it shifted to buying water rights downstream from Carlsbad under the governance by the State Engineer. The New Mexico Office of State Engineer and ISC report the purchases and leases within annual reports from 1996-1997 to 2001-2002. The following tables summarize program acquisitions and expenditures.

Table 20
ISC Total Expenditures for Pecos River Compact Acquisitions

Fiscal Year	Total Cost	Permanent Purchase Cost	Annual Lease Cost	Admin Cost	Water Rights (AF)	Yield at State Line from Retired Water Rights (AF)
1991-2002	$32.5 M	$19.4 M	$12.4 M	$0.7 M	27,300	8,600
1991-2001	$28.5 M	$16.3 M	$11.5 M	$0.7 M	25,500	6,800
1991-2000	$28 M	$16.3 M	$11 M	$0.5 M	25,500	6,800
1991-1999	$27.8 M	$16.3 M	$11 M	$0.5 M	25,500	6,800
1991-1997	$20.5M	$10.0 M	$10 M	$0.5 M	16,600	3,200

Source: OSE and ISC, Annual Reports from 1996-1997 to 2001-2002.

Table 21
Permanent Water Rights Purchases

Purchase Date	Seller	Purchase Price	Water Rights (AF)	Water Yield at state line (AF)	$/AF retired	$/AF state line
Nov-01	IMC Carlsbad	$3.05 M	2,985	1,800	$1,021	$1,693
Feb-99	City of Carlsbad	$6.3 M	8,900	3,600	$708	$1,750
Prior to 1997	Hondo County, Hamoun Farms	$10 M	16,600	3,200	$602	$3,125

Source: OSE and ISC, Annual Reports from 1996-1997 to 2001-2002.

ESA Mitigation on the Pecos River

Location:	Fort Sumner Dam to Texas State Line
River Basin:	Lower Pecos River
Year Established:	Proposed
Year Active:	2003; Emergency transaction in 2003 prior to official establishment of bank
Bank Format:	Institutional facilitation of temporary or permanent water transactions

Market Structure:	Clearinghouse of bilateral trades
Participation:	Supply – Carlsbad Irrigation District; Demand – USBR
Activity:	Limited
Pricing:	Market based Price
Range ($/AF/YR):	water exchange
Regulatory Oversight:	Reviewed by state
Administrator:	US Bureau of Reclamation (USBR)
Environmental Objective:	Yes: augment flows to protect the habitat of a federally protected species, bluntnose shiner

Program Description

As mitigation for dam operations along the Lower Pecos River, the USBR and CID propose to establish a banking program in the form of a "water swap" or "water exchange" project on the Pecos River. Under this proposal, the USBR and CID would amend the place and purpose of use of water stored in its reservoirs along the Pecos River. Water within the Carlsbad project originally stored for irrigation use, would be stored for flow mitigation under the banking proposal. Surface water stored in Sumner Reservoir would be released into the Pecos River during times and quantities required to maintain flow for the bluntnose shiner. To fulfill obligations to the surface water right holders further downstream, the USBR would deliver water to the farmers through acquisition of water rights, leasing agreements, or utilizing groundwater from USBR wells in the Carlsbad Irrigation District. The amount of water acquired will be based on the conveyance loss between the Sumner Reservoir and the point of diversion.

Trading Activity

The water bank is in the initial stages of development and activity is limited. The USBR transferred 500 acre-feet from irrigation use to the stored water for flow mitigation to be released from Sumner Reservoir. To offset this change, the USBR fallowed 178.58 acres of land and transfer 375 acre-feet of groundwater to Brantley Reservoir. The conveyance loss between Sumner Reservoir and Brantley Reservoir is 25 percent, thus the transfer quantity is 25 percent lower than the water stored in the Sumner Reservoir.

Oregon

Water banking activity in Oregon has just recently developed, primarily in response to potential Endangered Species Act (ESA) action and Oregon's concern for declining aquifers. Over the last three decades, Oregon has become one of the most environmentally conscious states in the country. The State has faced the challenge of balancing the concerns of the environmental movement while protecting traditional economic sectors such as logging and agriculture. Water banks have developed as a mechanism to address these concerns while mitigating the burdens placed upon the agricultural sector. Specifically, water lease banks are becoming a preferred method of addressing stream flow needs.

Water Allocation

Under Oregon law, all water is publicly owned and all rights to surface and ground water are allocated based on the principal of prior appropriation. The Oregon Water Resource Department is responsible for administering water rights with in the state.

State Water Banking Policy Review

Over the last few years, water banking policy discussions have been dominated by efforts to develop a ground water mitigation program in the Deschutes Basin. A study conducted by the Oregon Water Resources Department (OWRD) and the U.S. Geological Survey concluded that groundwater pumping within the basin was having a detrimental effect on surface water flows.[114] In response, the Deschutes Basin Groundwater Mitigation Rules were formed. Within the Rules was the first legislation which allowed for the creation of a water bank where mitigation credits could be bought and sold.[115] Soon after, the Deschutes Resources Conservancy, a private non-profit organization, developed the states first groundwater bank. Although, other lease programs in Oregon have been referred to as water banks, these leasing programs have only one purchaser and cannot be considered actual water banks.

[114] OAR 690-505-0600

[115] OAR 690-505-0665

Prior to the formation of the Deschutes Ground Water Mitigation Bank, the Deschutes Resources Conservancy had developed the Deschutes Water Exchange (DWE) which is active in leasing surface water for stream flow augmentation within the Deschutes basin. Participants who leased water to DWE were primarily members of local irrigation districts. Lease payments were initially based on the assessment cost that the water user had to pay the irrigation district for water delivery and, subsequently, on a fixed price per acre foot ($7 in 2003). The DWE conducted a reverse auction in 2003 to fill leases in the Ochoco Irrigation District..

The Oregon Water Trust, a private non-profit organization, has developed a similar water leasing program called the Walla Walla Lease Bank within the Walla Walla River Basin. The program was established in conjunction with Walla Walla Irrigation District and the Hudson Bay District Improvement Company. The purpose of the program was to help provide instream water to help meet flow targets established by U.S. Fish and Wildlife Service.

The largest of the leasing programs in Oregon is conducted by the U.S. Bureau of Reclamation within the Klamath basin. The Bureau's leasing strategy has two pilot programs: a surface water irrigation demand reduction program and a groundwater purchase program. Both programs are designed to protect fish and wildlife habitat above Keno dam. The programs were implemented in 2001, suspended in 2002, and restored for the 2003 irrigation season.

The Klamath Basin is also home to the Klamath Basin Rangeland Trust. The Rangeland Trust is a private non-profit organization that was formed by landowners in the Wood River Valley in 2002. In 2002 and 2003, the Trust acquired water leases for habitat restoration. The Rangeland Trust's primary source of funding for water acquisitions is provided by contracts with the Bureau.

Water Banking Programs

Deschutes Water Exchange Groundwater Mitigation Bank

Location:	Deschutes County
River Basin:	Deschutes
Year Established:	2003
Year Active:	2003
Bank Format:	Groundwater mitigation and institutional through mitigation credits
Market Structure:	Auction
Participation:	Supply – DWE Lease Bank; Demand – Groundwater applicants
Activity:	Limited
Pricing:	Market-based
Price Range ($/AF/YR):	$65/AF of consumptive use credit
Regulatory Oversight:	Oregon Water Resource Department

Administrator: Deschutes Water Exchange – Deschutes Resources Conservancy

Environmental Objective: Yes- Encourage conservation and reduce groundwater depletion

Program Description

On September 13, 2002, the Oregon Water Resources Commission enacted the Deschutes Basin Mitigation Bank and Mitigation Credit Rules to mitigate the impact of groundwater pumping in the Deschutes Basin.[116] This was in response to a study conducted by the OWRD and the U.S. Geological Survey which showed that there was potential for interference of Scenic Waterway flows through groundwater use. Soon thereafter, the Deschutes Water Exchange (DWE) created the Deschutes Groundwater Mitigation Bank. This program is the first groundwater bank created in Oregon.

The Deschutes Basin Mitigation Bank and Mitigation Credit Rules require groundwater permit applicants to fulfill certain mitigation obligations prior to issuance of the permit. The applicant's mitigation obligations are based on the consumptive use allowed by the requested permit and is measured in acre-feet. Mitigation credits can be created by public or private entities. Applicants have two ways in which to fulfill mitigation requirements. They may either purchase mitigation credits from a mitigation bank, or implement a mitigation project. Mitigation projects include:

- Allocation of conserved water when the applicant's portion of conserved water is allocated and legally protected for instream use;
- The transfer of an existing eligible surface water right to instream use;
- A permit to use water for artificial recharge of groundwater;
- A secondary permit to use stored water from an existing reservoir; provide the secondary permit is for instream use; or
- Other projects approved by OWRD that result in legally protected mitigation water.[117]

The Deschutes Ground Water Mitigation Bank is operated by the DWE, which implements mitigation projects, as well as projects involving instream leases and time-limited transfers in order to establish mitigation credits. These credits are then available by purchase or auction to individuals needing mitigation credits.[118] Temporary mitigation credits are available annually, and are renewable until permanent credits are available or obtained. The purchase of the number of mitigation credits equal to the number of acre-ft of mitigation required by the permit will satisfy a mitigation obligation.

The Deschutes Ground Water Mitigation Bank operates as a water bank in conjunction with the DWE leasing program, which provides the leases to back the mitigation credits, with the Bank effectively serving as a vehicle for financing the program. Under Oregon rules temporary credits require a reserve, which means that the DWE must lease two acre feet to provide 1 acre feet of credit to the market. This open market for buyers and sellers

[116] OAR 690-521-0100

[117] OAR 690-521-0300

[118] Deschutes Water Exchange web page. Available at www.deschutesrc.org.

is unlike the other programs in the state where there is only one predominate purchaser of the water who retains ownership of the water asset (e.g. USBR or Oregon Water Trust).

Trading Activity

In 2003 the Bank registered 574 acre feet of credits, of which 169 (including reserves) were purchased by a single buyer. Early results from 2004 include 18 customers acquiring 602 credits. Credits are sold at $65 an acre-foot of consumptive use credit plus an initial account set-up fee of $250.

Water Leasing Programs

Deschutes Water Exchange - Annual Water Leasing Program

Location:	Deschutes, Jefferson and Crook Counties
River Basin:	Deschutes
Year Established:	2001
Year Active:	2001, 2002, 2003
Bank Format:	Annual Lease Bank
Market Structure:	Bilateral Trades, Reverse Auction, Standing Price
Participation:	Supply open; Demand limited to DRC
Activity:	High
Pricing:	Administrative and Market-Based
Price Range ($/AF/YR):	$3.91 to $19.57
Regulatory Oversight:	Oregon Water Resources Department
Administrator:	Deschutes Water Exchange – Deschutes Resources Conservancy
Environmental Objective:	Yes- Stream flow augmentation in the upper Deschutes Basin.

Program Description

Under Oregon's Instream Leasing Program[119], water rights can be temporarily transferred instream through a lease. An annual lease counts as one year of beneficial use and puts the holder of the water right in compliance with the State's requirement to exercise a water right once every 5 years. The water is left instream and protected according to its priority date. The DWE's Annual Water Leasing Program is designed to encourage water right holders to lease water instream through the State's Instream Leasing Program. The Annual Leasing Program supplies the Groundwater Mitigation Bank with temporary mitigation credits, but the vast majority of leasing is for stream flow restoration purposes.

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[119] OAR 690.077

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The Deschutes Water Exchange leased over 7500 acre-feet of water in 2002 and 15,715 acre-feet in 2003 (update: over 24,000 acre-feet in 2004) from irrigators to enhance stream flow in Central Oregon's Deschutes basin. Prices offered by the Exchange range from $3.91 to $19.57 per acre-foot annually. The average acquisition price for the program was in the range of $6 per acre-foot in 2002 and 2003. Table 22 provides a summary of the prices for the program. The term of lease contracts are for the full irrigation season typically running from April 1 to November 1. Prices on an acre basis vary depending on the duty associated with the lands enrolled in the program. Payments on an acre basis have ranged from $7 to $40 per acre annually. Participants are primarily members of irrigation districts and most land enrolled in the program is used for forage crops such as hay, alfalfa, and pasture. Lease payments are primarily based on the assessment cost that the water user had to pay the irrigation district for water delivery.

Trading Activity

This is a new program so historical data on trading activity is limited. However, based on the past three years (and initial results from 2004), participation is growing at a rapid pace. The program was constant from 2001 to 2002 but in the last two years has grown at a rate of 8,000 acre-feet per year. In 2003 the program leased 2% of the irrigated land (3,400 of 160,000) in the upper Deschutes Basin.

Table 22
Annual Water Leasing Program 2001-2002

	2001			2002		
District	**Acres**	**Quantity (aft)**	**Price ($/aft)**	**Acres**	**Quantity (aft)**	**Price ($/aft)**
North Unit ID	864	1,428	$19.57	50	81	$7.00
Squaw Creek ID	-	-	-	326	722	$7.00
Ochoco ID	111	442	$6.51	114	343	$9.34
Tumalo ID	562	1,836	*	501	1,346	$6.76
Central Oregon ID	120	681	*	633	3,525	$3.91
Swalley ID	323	1805	*	185	1,031	*
Arnold ID	7	39	*	47	256	$5.02
Non-District	519	2,562	$11.43	176	537	$5.71
Totals	**2,507**	**8,793**		**2,031**	**7,840**	
Average Price			**$12.50**			**$6.39**

Source: Deschutes Water Exchange, 2003
* Denotes donated leases

Annual Water Leasing Program	2003		
District	**Acres**	**Quantity (aft)**	**Price ($/aft)**
North Unit ID	35	46	$6.89
Squaw Creek ID	293	881	$5.24
Ochoco ID	414	1,800	$10.36
Tumalo ID	493	2,589	$3.45
Central Oregon ID	1,192	6,638	$4.10
Swalley ID	319	1,782	$7.03
Arnold ID	54	300	$5.17
Non-District	614	1,679	$5.26
Totals	**3,413**	**15,715**	
Average Price			**$5.89**

Walla Walla Lease Bank

Location:	Umatilla County
River Basin:	Walla Walla
Year Established:	2001
Year Active:	2001
Bank Format:	Annual Lease Bank
Market Structure:	Bilateral Trades
Participation:	Supply limited to irrigation district members; demand limited to Oregon Water Trust
Activity:	Moderate to low
Pricing:	Fixed, Standing price
Price Range ($/AF/YR):	$15 to $18.52
Regulatory Oversight:	Oregon Water Resources Department
Administrator:	Oregon Water Trust
Environmental Objective:	Yes- Flow augmentation in the Walla Walla Basin.

Program Description

The Walla Walla lease bank is operated by the Oregon Water Trust and was established in 2001. The project was developed in cooperation with the Walla Walla River Irrigation

District and the Hudson Bay District Improvement Company. The lease bank developed in response to federal government flow targets to protect endangered species habitat. In 2000, the U.S Fish and Wildlife Service (USFWS) established a flow target of 18 cfs for the Walla Walla River. The USFWS increased the flow target in 2002 to 25 cfs. The lease bank was developed to assist the community in meeting present and future flow targets through voluntary transactions. To date, participants from the leasing program have been limited to members of the Walla Walla Irrigation District and non-district landowners.

For 2003, the bank is structured on a fixed offer price of $100 per acre for water rights that are determined to be senior and $20 per acre for water rights determined to be junior. All leases are one-year agreements that last the duration of the irrigation season. As a practical matter, most leases ran from March through October. Seniority is based on a priority date of 1903. Approximately 90 to 95 percent of leases include senior water rights.

Trading Activity

Participation in the leasing program has been limited, but increasing. During 2001, six landowners from the Walla Walla Irrigation District participated in the program and enrolled 58.37 acres totaling 0.73 cfs of water. The number of participants increased to 11 in 2002 with enrolled acres increasing to 91.61, providing 1.145 cfs of water.

Table 23
Walla Walla Lease Bank 2001-2002

Year	Participants	Acres	cfs	Acre-feet	Total Expenditures	$/aft
2001	6	58.37	0.730	238.5	$3,618.64	$15.00
2002	11	91.61	1.145	374.0	$6,962.36	$18.62

Source: Oregon Water Trust

USBR Klamath Basin Leasing Program

Location:	Oregon and California
River Basin:	Klamath
Year Established:	2001
Year Active:	2001
Bank Format:	Annual Lease Bank
Market Structure:	Reverse Auction and Bilateral Trades
Participation:	Supply open; demand limited to the USBR
Activity:	High
Pricing:	Market based in 2001 – Fixed price in 2002
Price Range ($/AF/YR):	$25-$75
Regulatory Oversight:	Oregon Water Resources Department
Administrator:	U.S. Bureau of Reclamation (USBR)
Environmental Objective:	Yes- Flow augmentation in the Klamath Basin

Program Description

The US Bureau of Reclamation initiated water-leasing efforts in 2001 to address low flow conditions in the Klamath River. The agency has developed several different programs that targeted groundwater and surface water sources, as well as specific regions within the basin. During 2001, the Bureau initiated two pilot programs – a groundwater purchase program and an irrigation demand reduction program. The programs were suspended in 2002. However, the Bureau entered into a contract agreement in 2002 with the Klamath Basin Rangeland Trust to lease water. For 2003, the Bureau has elected to reinstate the leasing programs, which are similar in structure to the 2001 programs.

Trading Activity

The following sections provide a summary of trading activity for each of the programs implemented and managed by the Bureau. Trading activity for each of the programs is reported separately due to changes in structure of programs implemented since 2001.

2001 Klamath Basin Groundwater Transactions

Due to extreme drought conditions in the Klamath Basin during 2001, the Bureau of Reclamation initiated the Groundwater Purchase Program. Through the program, bids were requested from local landowners to sell groundwater for fish and wildlife purposes. The Groundwater Purchase Program was announced midway through the irrigation season on August 17.

Offers were requested from willing sellers located above Keno Dam within the Klamath Project and the Upper Klamath Lake Watershed (excluding areas above Kirk Reef on the Williamson River). Offers were required to provide direct benefits to the Klamath Project water supplies. A total of 92 proposals representing 165,408 acre-feet were submitted and considered by the Bureau of Reclamation. The average bid price received was $49 per acre-foot.

Table 24
2001 Ground Water Purchase Summary

District	ST	No. Contract	Aft Contracted	Contract Value	Aft Delivered	Total Delivered Cost	$/aft
Klamath ID	OR	20	18,914	$639,411	14,030	$474,675	$35.02
Langell Valley ID	OR	3	6,487	$247,253	6,454	$246,079	$38.13
Tulelake ID	CA	10	36,153	$1,161,605	28,360	$913,316	$34.30
VB Ditch Co.	CA	2	3,292	$124,180	2,057	$74,595	$35.00
Program		**35**	**64,846**	**$2,172,449.00**	**50,901**	**$1,708,665.00**	**$35.61**

Source: US Bureau of Reclamation

After reviewing the proposals, the Bureau of Reclamation issued 35 contracts for a total of 64,864 acre-feet of water. Table 24 provides a summary of the 2001 participation. The lease contracts entered into by the Bureau of Reclamation included a 12-month term for a specified quantity of water. The majority of the water was delivered during the late summer and early fall months. All leases were uniform in structure. Lease rates ranged

from $25 to $52 per acre-foot.[120] The average lease rate for the accepted contracts was $35.61 per acre-foot and the median lease rate was $35 per acre-foot. The average lease rate in Oregon was $36.30 and the average lease rate in California was $34.41.

2001 Irrigation Demand Reduction Program

The Irrigation Demand Reduction Program was initiated to reduce demand from surface water in the Upper Klamath River Basin. The US Bureau of Reclamation solicited proposals from water users who were willing to reduce irrigation water demand through land idling. Proposals were limited to lands above Keno Dam. The water provided through the program was used for flow augmentation in support of federally protected species. Table 25 provides a summary of the Pilot Irrigation Demand Reduction Program activities for 2001.

Table 25
2001 Irrigation Demand Reduction Program

Proposals Received	555
Total Acreage Proposed for Enrollment	51,000
Proposals Accepted By USBR	176
Proposals withdrawn	14
Total Proposals	162
Acreage Enrolled	15,563
CA Acreage	6,331
OR Acreage	9,332
Total Water Enrolled (AFT)	37,543
Total Cost	$2,761,419
Average Unit Cost ($/AFT)	$74
Average Unit Cost ($/acre)	$177.43

Source: US Bureau of Reclamation

The US Bureau of Reclamation received 555 proposals totaling 51,000 acres of land, representing 10 percent of the land in the federal irrigation project. A total of 162 proposals were accepted. The total acreage included in the program was 15,563 with 60 percent located in Oregon and the remaining 40 percent located in California. A total of 37,543 acre-feet of water were enrolled in the program. However, only a portion of the water accepted in the program was actually available. Due to the extensive drought conditions, much of the leased water was not available and therefore could not be used to improve habitat condition for federally protected species.

Crop information for enrolled lands is confidential. However, the US Bureau of Reclamation has indicated that the predominant crop types enrolled were pasture, grass

[120] Lease rates are reported in 2001 dollars.

hay, and alfalfa.[121] Enrollment acreage for mint, potatoes, and other higher valued crops was minimal.

The total cost of the program was $2.76 million and the average price paid for water $74 per acre-foot. Unit prices ranged from $25 to $119 per acre-foot. The average unit price is higher if calculated based on the actual quantity of water delivered through the program. Approximately 15 percent of the water was available for delivery and used for flow augmentation. The average price for the contract that provided water was $60 per acre-foot, with contract prices ranging from $25 to $98 per acre-foot.

2003 Leasing Programs

The 2003 leasing program is composed of two parts: crop idling, and groundwater substitution. In 2003, the program leased over 35,000 acre-feet of water through crop idling and nearly 25,000 acre-feet of groundwater to enhance instream flow in the Klamath River Basin in both Oregon and California.

The average weighted price in 2003 was approximately $76.73 per acre-foot the crop idling program, and $75.00 per acre-foot of groundwater. The term of lease contracts are for the full year's irrigation season typically running from April 15 to October 15. Participants are primarily members of irrigation districts and water was used primarily for forage crops such as hay, alfalfa, and pasture.

This is a new program so historical data on trading activity is limited. In 2003, the average amount of water leased in each transaction through crop idling was 159 acre-feet; groundwater transactions averaged 261 acre-feet.

[121] Gary Baker, US Bureau of Reclamation. Personal communication. October 26, 2002.

Table 26
USBR Klamath Leasing Program 2003

Crop Idling Program Summary			Groundwater Replacement Program Summary		
Proposals		**Count**	**Proposals**		**Count**
	Proposals Submitted	337		Proposals Submitted	188
	Contracts Offered	244		Contracts Accepted	95
	Contracts Accepted	223			
Acreage		**Acres**	**Acreage**		**Acres**
	Total Submitted	23,110		Total Submitted	24,709
	Acres Selected	14,477		Acres Selected	11,706
By State	CA	2,335	By State	CA	6,101
	OR	12,142		OR	5,604
Crop Type	Alfalfa	4,351			
	Annual Crops	4,403			
	Pasture/Hay	5,552			
	Mint	169			
Water Supply		**Acre-feet**	**Water Supply**		**Acre-feet**
	Total Submitted	49,239		Total Submitted	56,007
	Total Contracted	35,420		Total Contracted	24,786
	Avg Contract Qty	159		Avg Contract Qty	261
	Avg AFT/Acre	2		Avg AFT/Acre	2
Acquisition Expenditures			**Acquisition Expenditures**		
	Total Obligated	$2,714,148.00		Total Obligated	$1,858,981.00
	Avg Per Proposal	$ 12,171.00		Avg Per Proposal	$ 19,568.00
	Avg Per Acre-Foot	$ 76.63		Avg Per Acre-Foot	$ 75.00
	Avg Per Acre	$ 187.48		Avg Per Acre	$ 158.81

Source: US Bureau of Reclamation

Klamath Basin Rangeland Trust

Location:	Klamath County
River Basin:	Wood
Year Established:	2002
Year Active:	2002
Bank Format:	Annual Lease Bank
Market Structure:	Bilateral Trades
Participation:	Supply open; demand
Activity:	Low
Pricing:	Market based, Negotiable with individual landowners
Price Range ($/AF/YR):	$82.16
Regulatory Oversight:	Oregon Water Resources Department
Administrator:	Klamath Basin Rangeland Trust
Environmental Objective:	Yes- Flow augmentation in the upper Klamath Basin

Program Description

The USBR entered into an agreement with the Klamath Basin Rangeland Trust in 2002, which was formed by landowners in the Wood River Valley. The Rangeland Trust contract provided a mechanism for bundling multiple lease agreements. In 2002, the trust enrolled a total of 3,161 acres in the program. The majority of the enrolled land was irrigated pasture owned by the founder of the trust. As a part of the lease agreement, landowners agreed to reduce livestock numbers by 80 percent during the term of the lease. Habitat restoration and monitoring expenses were incorporated into the lease agreement. The estimated water provided through the leases was 12,800 acre-feet. The total cost of the program, including restoration and monitoring cost, was $633,000, with a unit value of $82.16 per acre-foot.

Several aspects of the Rangeland Trust have been controversial. First, there was no published standard for determining the value of the water. The price that was set for the 3,161 acres enrolled in 2002 was based on negotiations between the Trust and the USBR. Second, it is disputed how much in-stream water was actually yielded from the program. Evidence suggests that some of the acres which were enrolled in the program had not been irrigated in years past, and would not have been irrigated in 2002.

In 2003, the Rangeland Trust received $948,000 from the federal government that it used to enroll nearly 9,000 acres. The enrolled lands were chosen based on factors such as soil type, crop type, and land topography. It is unknown precisely how much money each individual land owner received per acre. The average price per acre enrolled is $105. The USBR and Trust have not released enrollment data from 2003. That information is expected to be available sometime in 2004.

The unit value for water leased by the Rangeland Trust was set during a negotiation process in Washington D.C. One of the criticisms of the Rangeland Trust has been that the price established was not based on the actual value of water in the basin, but rather on the negotiation skills of the parties.

Texas

Several efforts have been initiated to establish water banking within the state of Texas. These initiatives include:

- 1993 legislation creating the Texas Water Bank and
- 1997 legislation establishing the Texas Water Trust.

In addition, the Edwards Aquifer Authority created a Groundwater Trust to facilitate the transfers of groundwater withdrawal rights. However, banking transactions within the state have been limited.

In 1997, Senate Bill 1 required regional planning groups to establish management plans for their resources, and these plans encourage water right transfers including water banking activities. Based on this legislation, many agencies are actively creating water transaction agreements. These agreements include the collaboration among the following entities:

- Guadalupe-Blanco River Authority (GBRA), the San Antonio River Authority (SARA), and the San Antonio Water System (SAWS);
- Lower Colorado River Authority (LCRA) and SAWS; and
- Brazos River Authority and Mesa Water.

While these activities will significantly influence water policy in Texas, the transfers are not expected to be facilitated through banking activities. Therefore, the proposed programs are not discussed further in this report.

In addition, regulatory statues are favorable towards water banking by allowing water right transfers and protecting water rights from cancellation if held in a water bank. However, the development of water banking has been relatively slow despite these numerous legislative efforts.

Water Allocation

Within Texas, surface water and groundwater are regulated under separate and distinct legal doctrines. Surface water is considered public property or state water, and the right to use state water is obtained through appropriation by the state. The allocation process is based upon the doctrines of prior appropriation, beneficial purpose and historical use. Appropriate rights give priority to time sequence and preferred uses. For example, water rights for domestic/municipal uses are superior to rights for other uses. The Texas

Commission on Environmental Quality (TCEQ) is responsible for regulating and allocating surface water rights.

In contrast, groundwater is considered private property and is regulated under the rule-of-capture unless within groundwater conservation districts.[123] In general, a landowner may pump as much groundwater as can be sustained by area wells.[124] However, conservation districts are now being formed and placing limits on groundwater production. For example, limits may be set based on tract size or the spacing of wells. The district may place restrictions to protect, conserve, and recharge groundwater supplies.

State Water Banking Policy Review

Water banking activities in Texas took a major leap forward in 1993 with the passage of Senate Bill 1030 which created the Texas Water Bank.[126] Overall, the bank is to provide adequate water supplies through the facilitation of water right transfers between voluntary buyers and sellers within the State of Texas. The bank is not based on physical storage of rights. Rather, the bank utilizes a "bulletin board" approach to match buyers with sellers. The bank is administered by the Texas Water Development Board (TWDB). Water rights can be transferred either temporarily or permanently and will most likely require a permit modification. Under the Texas Water Bank, water rights refer to the authority to impound, divert, or use state water, groundwater water, or water from any source.

In addition, the 73rd Legislature passed Senate Bill 1477 which created the Edwards Aquifer Authority Act.[127] The authority has since created a Groundwater Trust to act as a water bank for withdrawal permits. The Groundwater Trust provides for the acquisition, deposit, transfer, and withdrawal of permitted withdrawal rights between willing sellers and buyers in the Edwards Aquifer area. The Edwards Aquifer is the primary source of water for many municipal and agricultural uses including the City of San Antonio.

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[123] Texas Statues, Water Code, Chapter 36 "Groundwater Conservation District."

[124] Landry, Clay. A Free Market Solution to Groundwater Allocation in Texas: A Critical Assessment of the House Natural Resources Committee Interim Report on Groundwater. Prepared for The Texas Public Policy Foundation.

[126] Texas Legislative Session 73. Chapter 647, Section 1. The bill was codified as Subchapter K "Texas Water Bank" in Chapter 15 of the Texas Statues, Water Code. Chapter 359 "Water Banking" was added to the Texas Administrative Code, Title 31, Part 10. These rules were adopted by the TWDB to oversee the operation of the Texas Water Bank and the Texas Water Trust.

[127] This legislation was enacted to protect the unique groundwater resources and establish the Edwards Aquifer Authority as a mechanism for defining and managing groundwater rights in the Edwards Aquifer. The Edwards Aquifer spans nearly 180 miles in south central Texas and provides the sole source of water to municipal, agricultural, and industrial uses in the area. Also, many threatened and endangered species are dependent upon this water source.

The next major legislative activity creating impetus for water banking was the enactment of Senate Bill 1 in 1997.[128] This bill created a significant change in water management procedures within Texas and addresses the state water policy in six major categories:

- Drought response management;
- Water management, marketing, and transfers;
- Surface water and groundwater supplies;
- Financial assistance to local governments;
- Small communities assistance; and
- Water data collection and dissemination.

Senate Bill 1 requires the TWDB to establish the Texas Water Trust which functions as a component of the Texas Water Bank.[129] The purpose of the trust is to acquire water rights for environmental and aquatic preservation purposes.

Senate Bill 1 requires the Edwards Aquifer Authority to develop a groundwater management plant. This plan will be submitted to the TWDB and will address many groundwater issues including the conjunctive management issues of groundwater and surface water. The plan is currently under review.

Water management activities including banking activity have historically been overseen by 23 river authorities established by the Texas Legislature.[130] Each river authority is an agency of the state which seeks to develop and manage the water resources of an entire river basin. However, Senate Bill 1 focuses on 16 regional water planning areas. Article 1 provides major directives and specific timelines for regional planning activities:

- September 1998: TWDB to designated regional water planning areas
- September 2000: Each planning group to submit water plans to TWDB
- September 2001: TWDB to adopt comprehensive water plan to be updated every five years

The planning efforts focused on local and regional input with the goal of increasing the public acceptance. Planning groups for the 16 regions, consisting of more than 450 representatives, worked over three years to develop their individual plans. These plans have been compiled into the document entitled Water for Texas—2002 which is the first State Water Plan to be adopted by the TWDB since the passage of 1997 Senate Bill 1. These regional planning activities have identified future water demand and potential solutions for increasing demand pressures. While water banking was not identified as a primary management strategy, surface water and groundwater transfers are incorporated into several of the regional planning efforts. The transfer projects function like a physical bank with a seller and a buyer without the bank as a mediator

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[128] Texas Legislative Session 75(R). Senate Bill 1: State Water Plan. Effective September 1, 1997.

[129] The Texas Water Trust was created in 1997 with the adoption of Chapter 1010, Section 2.16 by the 75th Texas Legislature.

[130] Texas Water Development Board. http://www.twdb.state.tx.us/mapping/index.asp

Highlights of Legislative Updates

Senate Bill 1639

As a result of the 1997 Senate Bill 1, water supply programs have been approved by the TWBD since 2001. These projects are testing the limits of many aspects of the Water Code including surface and ground water regulation, inter-basins transfer restrictions, and environmental flow requirements. A number of senate bills were introduced in the 78th Legislature related to the water code that will affect the operations of water banking within Texas due to the impact on appropriation and transferability of water rights within the state.

For example, Senate Bill 1639 deals with the regulation of the waters of the state, including the spacing and production of groundwater and the control of instream flows.[131] However, this bill includes language that may affect the Water Trust. The Study Commission on Water for Environmental Flows was created as a result of this bill. The primary function of the commission is to study the policy implication of balancing demands with aquatic system preservation including use of the Texas Water Trust as a mechanism for transferring permitted use to instream flows to meet environmental needs.

Water Banking Programs

Texas Water Bank

Location:	Statewide
River Basin:	Statewide
Year Established:	1993
Year Active:	1994
Bank Format:	Institutional facilitation of permanent and temporary transfers
Market Structure:	Clearinghouse for bilateral trades using an online bulletin board; ability to act as market-maker by purchasing water rights in its own name
Participation:	Supply – Open; Demand – Open
Activity:	Limited
Pricing:	Market based as negotiated between willing buyers and sellers
Price Range ($/AF/YR):	NA
Regulatory Oversight:	Reviewed by State
Administrator:	Texas Water Development Board (TWDB)
Environmental Objective:	Yes, encourages water conservation

[131] Texas Legislative Session 78(R). Senate Bill 1639. Effective June 1, 2003.

Program Description

The Texas Water Bank is administered by the TWDB. One of the primary functions of the bank is to act as a clearinghouse of water marketing information including water availability, pricing, and environmental considerations. Specifically, the TWDB maintains registries of water bank deposits, sellers and buyers as well as negotiates acceptable sale price and terms. In addition, the TWDB may act as a water broker or market-maker by purchasing and transferring water rights in its own name. The TWDB encourages water users to implement conservation practices and contribute the conserved water to the bank.[132]

The Texas Water Bank utilizes an application to indicate a transaction. A water right holder submits an Application for Deposit form, which quantifies the amount of water to be marketed for either a sale or lease.[134] The TWBD reviews the deposit application and evaluates the nature and availability of water rights. The application is accepted or denied. This step serves to provide a prequalification of the right to facilitate faster transfer reviews. A water right deposited in the bank is protected from cancellation by the TCEQ for an initial term up to ten years. [135]

Water right deposits may be withdrawn by the TWDB under specific circumstances by the depositor, or through a purchase or lease. A formal regulatory review is initiated at the time of a withdrawal. Most surface water transactions will require regulatory approval by the TCEQ prior to withdrawal.[136]

A fee system has been implemented to offset the operational costs of the bank. An initial deposit fee is paid by the water right owner upon acceptance of the right into the bank. The deposit fee is 1 percent of the asking price of the water right, with maximum fee of $50 per right. In addition, a transfer fee is levied upon the sale or lease of the right. The transfer fee is 9/10 of 1 percent of the sale on lease value. In general, fees collected are not sufficient to cover the full operational cost of the bank.[137]

The development of other banks and water transfers are allowed outside of the state program. Therefore, the TWDB does assist in the development of regional water banks. These regional banks will follow the same procedures as the statewide bank. Currently, however, no regional water banks have be proposed or implemented.[138]

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[132] Texas Administrative Code, Title 31, Part 10, Chapter 359 “Water Banking.”

[134] Texas Water Bank Application for Deposit.

[135] Texas Water Code, § 15.704. 1997.

[136] Texas Administrative Code, Title 31, Part 10, Chapter 359 “Water Banking”

[137] Matt Nelson, Texas Water Development Board. Personal Communication, November 21, 2003

137

[138] Matt Nelson, Texas Water Development Board. Personal Correspondence. November 21,2003.

Trading Activity

Since its initiative, the Texas Water Bank has experienced limited activity and has executed only one transaction in the ten years of operation.[139] Table 27 summarizes the single transaction completed through the bank. The low activity is the result of several factors including limited public awareness of the Texas Water Bank, inadequate rules for groundwater banking, and water right cancellation statutes.[140] In addition, regional brokers are in effect competing with the bank by matching private buyers and sellers.

The TWDB maintains registry lists for water bank deposits, registry of sellers, and registry of buyers.[141] The registries are available through its website. Approved deposits are listed as water bank deposits, while the registry of sellers provides an advertising mechanism for sellers who have not deposited their water rights in the bank. The majority of the water deposits in the bank are related to surface water rights, and these deposits are protected from cancellation by the TCEQ for an initial term up to ten years.[142]

The registry of buyers provides information on potential buyers who have requested to be listed.

Table 27
Texas Water Bank Transaction

Basin of Origin	Basin of Buyer	AF/YR	Location	Term	Posted	Completed
Guadalupe River	Guadalupe River	396 (transferred from agricultural to municipal use)	San Marcos River	5-Year Lease (with possibility of extending lease)	3/4/1997	1997

Source: Texas Water development Board

[139] Most large scale transactions of water in the state occur directly between the Buyer and Seller, outside the Water Bank.

[140] Yoskowitz, David W. 2001. Evaluation of the Texas Water Bank. Technical Report No. 14, Texas Center for Border Economic and Enterprise Development, Texas A&M International University.

[141] http://www.twdb.state.tx.us/assistance/WaterBank/waterbankMain.asp

[142] Matt Nelson, Texas Water Development Board. Personal Correspondence. November 21,2003.

Table 28
Texas Water Bank: Registry of Deposits

Basin of Origin	AF/YR	Location	Term	Posted
Rio Grande	47	Zapata County	Lease or Sale	2/27/03
Colorado (Celery Creek)	27.93	Near City of Menard	Lease	5/1/00
Colorado (San Saba River)	23	Menard County	Lease	6/5/01
Colorado (Colorado River)	203	Mills County, North of Richland Springs	5-year lease @$50 per AF/YR	8/21/01
Colorado (Clear Creek thence San Saba)	41.47	Menard County, West of Menard	Lease @ $50 per AF/YR	7/16/02

Source: Texas Water development Board.

Table 29
Texas Water Bank: Registry of Sellers

Basin of Origin	Quantity	Location	Term	Registered
Rio Grande	743 AF	Presidio County	Sell or Lease	11/9/00
Rio Grande (Groundwater)	90 mgd	Val Verde County		
Rio Grande (groundwater)	6 mgd	Val Verde County		8/24/00
Rio Grande (potable water)	0.3 mgd	Zapata County		
Guadalupe River	1500 AF	Near Victoria	Lease (prefer long-term)	
San Antonio (Elam Creek)	27 AF	Bandera County		
San Antonio River	284 AF	Goliad County	Lease for irrigation	
San Antonio River	86 AF	Goliad County	Lease for irrigation	
San Antonio River (Elm Bayou)	500 AF	Near Tivoli	Lease (prefer long-term)	
Colorado (South Llano River)	25 AF	Kimble County, near Junction	Lease	8/6/01
Colorado (South Llano River)	120 AF	Kimble County, near Junction	Lease	8/6/01
Colorado (San Saba River)	100 AF	Menard County, west of Menard	Sell	2/16/01
Colorado	140 AF	San Saba County	Lease	
Colorado	1000 AF	San Saba County		
Guadalupe River	262.7 AF	Victoria County	Sell or Lease	10/14/02
Nueces	720 AF	Uvalde County	Lease	
Brazos (Brazos River)	125 AF	Robertson County	Lease at $34.50 per AF	1/26/03

Source: Texas Water development Board.

Table 30
Texas Water Bank: Registry of Buyers

Basin Buyer	AF/YR	Location	Term
Canadian (Lake Meredith)	Seasonal (not provided)	Near City of Canyon	
San Antonio (Medina River)	3,000	Upstream of Lake Medina	Purchase or Trade

Source: Texas Water development Board.

Texas Water Trust

Location: Statewide

River Basin: Statewide

Year Established: 1997

Year Active: 1998

Bank Format: Institutional facilitation of permanent and temporary transfers

Market Structure: Clearinghouse for bilateral trades

Participation: Supply – Open; Demand – Texas Water Trust

Activity: Limited

Pricing: Market based Price

Range ($/AF/YR): Donations Regulatory

Oversight: Reviewed by State

Administrator: Texas Water Development Board (TWDB)

Environmental Objective: Yes: Water rights specifically for instream use.

Program Description

The TWDB administers the Texas Water Trust as a component of the Texas Water Bank.[143] However, this trust is specifically for holding water rights dedicated to environmental purposes such as instream flows, water quality, and aquatic habitat. In effect, the Trust does not operate as a separate bank. Rather, the Trust provides a mechanism for the TWDB to procure and hold instream water rights.

Water rights are deposited into the trust upon review by the TWDB and the Parks and Wildlife Department. Water rights will be held by the trust for a contractual term or in perpetuity. The deposit fee associated with the Texas Water Bank is waived by the TWDB.

[143] Chapter 359 of the Administrative Rules also applies to the Trust. In addition, specific rules have been adopted for governing the Trust.

Trading Activity

Trading activity within the Trust has been limited. Only one deposit consisting of two irrigation rights held by the Texas Parks and Wildlife Department has occurred. No private deposits have occurred, nor has the state allocated funding for the purchase or lease of water rights. The first deposit has already been made to the trust, and consists of two irrigation water rights owned by the Parks and Wildlife Department. These irrigation rights are being converted to "non-consumptive instream use" rights.

Table 31
Texas Water Trust Deposits

Depositor	Receiving Basin	AF/YR	Location	Term	Posted
Parks and Wildlife Department	Rio Grande	1,236	Hudspeth County	Lease in perpetuity	Aug 18, 2003

Source: Texas Water development Board.

Edwards Aquifer Authority Groundwater Trust

Location:	Central Texas including San Antonio
River Basin:	Edwards Aquifer
Year Established:	2001
Year Active:	2002
Bank Format:	Groundwater banking and institutional facilitation of temporary and permanent transfer of withdrawal permits
Market Structure:	Clearinghouse to facilitate bilateral trades
Participation:	Supply – Aquifer withdrawal permits; Demand – Aquifer withdrawal permits
Activity:	None
Pricing:	Market based
Price Range ($/AF/YR):	No transaction to-date
Regulatory Oversight:	Reviewed by State
Administrator:	Edwards Aquifer Authority
Environmental Objective:	Yes: encourage conservation and reduce groundwater depletion

Program Description

The Edwards Aquifer Authority operates a groundwater trust. This trust, first proposed as a Regional Water Bank, was identified as a management objective in the Authority's 1998 Groundwater Management Plan.

The Edwards Aquifer Authority issues permits for the withdrawals from the aquifer. These permits may be transferred between parties within the boundaries of the aquifer. The attended purpose of the Groundwater Trust is to provide for the acquisition, deposit, transfer, and withdrawal of permitted Edwards Aquifer withdrawal rights between willing sellers and buyers.

Trading Activity

No transfers have been facilitated through the trust. Rather, permit transfers are being facilitated by private third parties familiar with the local water market.[144] The trust has been operating more like a bulletin board service for marketing water permits available for lease or sale. Permit holders who wish to dispose of their water assets may submit an information sheet to the Edwards Aquifer Authority. The authority reviews the form, determines the validity of the permit, and then posts the offering on the "bulletin board."

[144] Rick Illgner, Program Manager, Edwards Aquifer Authority. Personal Correspondence. December 2, 2003.

Utah

Currently, no water banking activities are being proposed or are operational in Utah. Limited policy discussions examining water banking programs have occurred within the state.

Water Allocation

Surface water and groundwater are considered public property and managed by the guiding principle of historic and beneficial use of water rights.[145] In Utah, water rights are allocated either by a decree, a certificate of appropriation, a diligence claim to the use of surface or underground water, or a water user's claim filed in general determination proceedings. Water rights are transferred by deed in substantially the same manner as in real estate.[146] The right to use unappropriated public waters is obtained through an application process overseen by the state engineer and must be for a beneficial purpose. The overall water allocation principle is prior appropriation or the one first in time shall be first in right.[147]

State Water Banking Policy Review

Utah has no formal water banking program. However, the state has a specific statute regulating the transfer of water rights that could be utilized to allow banking. A water right is transferred by deed in a similar manner to a real estate transaction. Any water right holder may temporarily or permanently change the point of diversion, place of use, and/or type of use. An application must be submitted and approved by the state engineer for any transfer, and no change will be permitted that impairs any vested right without just compensation. A change does not affect the priority of the original application.[148] While the state has no formal process for transferring water rights during dry years,

[145] Utah Code §73-1-1. 1953. Utah Code §73-1-3. 1953.

[146] Utah Code §73-1-10. 2003.

[147] Utah Code §73-3-1. 1953.

[148] Utah Code §73-3-3. 2001.

entities have cooperated on numerous occasions to increase water supplies during drought years without legislative mandate.[149]

Water banking is feasible under forfeiture statutes without resulting in the loss of right. Utah has enacted a policy of water right forfeiture to ensure the maximum use and benefit of its scarce water resources. If a water right has not been used within five years, the right may revert to the public by abandonment or forfeiture. However, the forfeiture provision does not apply to water stored in reservoirs for present or future use. In addition, an extension of time may be granted for reasonable causes for nonuse which include holding a water right for reasonable future requirements, water conservation or efficiency practices, or the operation of groundwater recharge recovery programs approved by the state engineer. [150]

Under state law, 'beneficial use' does include instream flows. However, no formal mitigation programs have been established or funded. The Division of Wildlife Resources or the Division of Parks and Recreation may purchase a water right for the purpose of changing its purpose of use to instream flow augmentation on a natural or altered stream channel. These state entities may only purchase water rights with funds explicitly appropriated for this purpose by the Legislature or accept donated water rights. The application for change of use shall demonstrate how the change propagates fish, preserves or enhances natural stream environment, or improves public recreation.[151] At present, water rights can be converted to instream flows only if those rights are ceded to one of these two state entities.[152]

Although Utah does not have any formal water banks, three municipal water storage programs are operational. Excess surface water is stored or banked in a groundwater aquifer for use during dry years. Under this banking structure, the buyer and seller are the same entity. [153] Jordan Valley Water Conservancy District and Brigham City treat captured water, inject treated water into underground aquifers, and extract water during the dry summer months. Washington County captures water seeping from the Sands Hollow Reservoir and extracts the water during summer months.[154] This type of banking activity is not further considered under this study as it does not have an instream objective nor involve market transfer between multiple parties.

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[149] Todd Stonely, River Basin Planning Chief, Utah Division of Water Resources. Personal Correspondence. 11/19/03.

[150] Utah Code §73-1-4. 2003.

[151] Utah Code §73-3-3. 2001.

[152] Todd Stonely, River Basin Planning Chief, Utah Division of Water Resources. Personal Correspondence. 11/19/03.

[153] Todd Stonely, River Basin Planning Chief, Utah Division of Water Resources. Personal Correspondence. 11/19/03.

[154] Richard Bay, Assistant General Manager and Chief Engineer, Jordan Valley Water Conservancy District. Personal Correspondence. 11/19/03.

Highlights of Legislative Updates

The former governor Michael Levitz, now head of the US Environmental Protection Agency, proposed marketing Utah's unused portion of its Colorado River water allotment to downstream states. The governor wanted to execute a temporary lease of Utah's excess water in attempts to gain economic benefit from the transfer. California has been using surplus flows from the upper basin states including Utah for many years without charge. This proposal would execute a charge for this use. However, this proposal faced strong opposition and has been shelved.

Washington

Interest in water banking in Washington State has increased in recent years due to a series of unusually dry years. During the 2003 Legislature, a pilot water banking program for the Yakima Basin was approved. This program is not the first effort to establish water banking within the state. A lease bank in the Okanogan Basin was developed in 2001 through a cooperative agreement between the Washington Water Trust, the Colville Confederated Tribes, and the Okanogan Irrigation District.

In addition, the Columbia Basin Irrigation Project and East Columbia Irrigation District have operated water sharing programs since the late 1980s that provide functions similar to water banking.[155] Irrigators enroll water into the district program to avoid payment on the operation and maintenance charge. Irrigators who hold early or late season contracts are leased the enrolled water at the assessment rate.[156] While these programs provide some services offered by a water bank, these programs primarily serve to reallocate surplus water within the districts. This type of water management tool is common among irrigation districts through the western US. These programs offer the potential to evolve into a more formal banking program that would provide exchanges between district and non district uses. For this analysis, these types of irrigation district programs are not included in the review.

Water Allocation

Under Washington law, all water is publicly owned and all rights to surface and groundwater are allocated based on the principles of prior appropriation. The Washington State Department of Ecology is responsible for administering and regulating water rights within the state. Washington has had a statewide Trust Water statute (RCW 90.42) since 1991. It allows water to be held in trust temporarily or permanently without relinquishing. It was amended several times in recent years to allow additional uses of the trust program. The most recent amendment authorized its use for water banking in the Yakima River basin.

155 MacDonnell, Lawrence J. et al. 1994. Using Water Banks to Promote More Flexible Water Use. Final Report submitted to the US Geological Survey. Report Number 1434-92-2253.

156 Economics of Columbia River Initiative. 2004. Final Report to the Washington Department of Ecology and CRI Economics Advisory Committee. January 12.

State Water Banking Policy Review

Water banking is new to Washington State. Recent water acquisitions in several regions of the state could be considered to be water banking, but have not been termed or institutionalized as such. During the 2003 legislative session, RCW 90.42 was amended by the legislature to authorize Ecology to use the Trust Water Right Program to affect water banking in the Yakima basin. A report on this effort is due to the Legislature at the end of 2004. In this legislation, Ecology is specifically authorized to facilitate third party water transfers or "mitigation banking" in the Yakima basin.

Yakima Basin Water Transfer Program, 2001 to Present

Location:	Yakima
River Basin:	Yakima
Year Established:	2001
Years Active:	2001 to present
Bank Format:	Temporary Leases
Market Structure:	Bilateral Trades
Participation:	Supply – Open; Demand – Open
Activity:	High
Pricing:	Market Based
Price Range ($/AF/YR):	$0 - $495 (in 2001 drought)
Regulatory Oversight:	Washington Department of Ecology and the US Bureau of Reclamation
Administrator:	Yakima River Basin Water Enhancement Project – Water Transfer Working Group
Environmental Objective:	Some of the 2001 water right transfers were targeted to increase flows to benefit fish populations during critical periods. The program continues to address many types of transfers, including those with environmental benefits.

Program Description

In response to drought conditions in the Yakima River basin in 2001, the Washington State Department of Ecology and U.S. Bureau of Reclamation (USBR) instituted an emergency leasing program to facilitate short-term water transfers and alleviate the impacts of the drought. The drought leasing program was developed by the Yakima River Basin Water Enhancement Project – Conservation Advisory Group (CAG).

The CAG was created by Congress, with a six member board, appointed by the Secretary of Interior, including representatives from the Yakama Nation, irrigation districts, Washington State University Agricultural Extension Program, and the Washington State Department of Fish and Wildlife. The purpose of the CAG is to provide recommendations to the Secretary on water conservation within the basin. The

CAG recommended the temporary transfer program in 2001 due to the extreme drought conditions.

Under the CAG, a water transfer working group (WTWG), which included representatives from more organizations and agencies than the original CAG membership, was established to develop a process for a "fast-track" response to temporary transfer requests in 2001. The objective of the process was to provide a final determination of transfer requests within 15 calendar days of the transfer submission. The quick turn around of transfer requests was possible because all of the key agencies and organizations needed to provide regulatory and environmental review of the proposals were represented on the WTWG. The CAG established criteria for the WTWG to use when reviewing transfer submissions that served to expedite the review process. The criteria included:

- The total available water supply must remain neutral as a result of the transfer.
- The transfer must result in equivalent reduction in consumptive use.
- Irrigated land from the original place of use is fallowed during transfer period.
- The seller demonstrated intent to use water in 2001.
- The new use is a beneficial use.
- The water right is valid, and the seller can demonstrate historic use.
- The seller demonstrated historic availability of water at seller's point of diversion during transfer period.
- The seller demonstrated evidence of no adverse impacts on instream flow
- The transfer satisfies operational considerations within the USBR Yakima Project reservoir operations.

The WTWG established guidelines for information that should be submitted with transfer applications. If the criteria were not met or information was not fully provided by applicants, the transfer applications were delayed. Applications were reviewed by the WTWG and recommendations were made to the Washington State Department of Ecology.

While the Yakima Basin water transfer program was not initially designed as a water bank, it served many of the same functions. The program provided a mechanism to facilitate transfers between buyers and sellers. One of the primary advantages of the transfer program not often seen in other banking programs is the ability to expedite transfers. Few banking programs offer a quick and responsive review timeline. As a result, banks are unable to respond to short term emergency needs. In addition, participants were attracted to the program because of this expedited service.

The 2001 water transfers in the Yakima Basin included point of diversion changes as well as land fallowing. Water buyers during the season primarily included the Roza Irrigation District, the Washington State Department of Ecology, USBR, the Kittitas Reclamation District, and the City of Roslyn. Sellers mainly included several irrigation districts and ditch companies. Prices paid for water ranged from $0 to $495 per acre-foot (AF) during 2001.

The Roza Irrigation District (RID) was the largest buyer during the 2001 season. RID holds water rights that are subject to curtailment or are pro-ratable during dry years. In addition, the district includes approximately 60,000 acres of irrigated land largely consisting of high-valued, permanent crops. Because the district holds pro-ratable

water rights and was facing a severe supply shortage, it decided to supplement USBR supplies with water leases. RID initially offered $150 per acre for other irrigators to fallow cropland and lease their water to the district but had to increase the price to $250 per acre (approximately $125/AF) to interest enough sellers. RID paid between $70 and $125 per acre-foot for water leased during the 2001 season.

Trading Activity

During the 2001 drought emergency nearly 61,000 acre-feet of water was transferred between May and October through water leases and changes in points of diversion. In total, 9,942 acres were fallowed in the basin in 2001 as a result of the transactions. While lands were fallowed, the transfers prevented high valued permanent crops such as orchards and vineyards from going dry. These crops are vital to the local economy and temporary water shortages can have significant and long-term impacts on yields. The average price paid during the drought emergency was $116 per acre-foot.

While the Yakima Basin drought year water transfer process was instituted in 2001 to respond to an emergency situation and to facilitate expenditure of state emergency drought funds to increase instream flows, the WTWG is still meeting to expedite beneficial transfers of water in the Yakima Basin. This process for expediting transfers is a key element in the design of future water banking efforts in the Yakima Basin.

Table 32 summarizes the water leases involving fallowed land in the Yakima Basin during 2001.

Table 32
Summary of Yakima Basin Water Exchange Program, 2001

				PLACE OF USE			TRANSFER PERIOD		QUANTITY TRANSFERRED			
#	TYPE	ACRES	SOURCE	FROM	TO	PURPOSE OF USE	FROM	TO	AF (TWSA Neutral)	CFS	AF Diverted	$/AF
1	Fallowed land	42.71	Main	Cascade Irrigation District	KRD	Irrigation	06/07/01	09/30/01	85.42	3.340	85.42	0.00
2	Not Approved		Trib	Teanaway - Mundy	City of Roslyn	Irrigation					0.00	0.00
3	Point of Diversion Change	N/A	Main/Trib	Various	Kittitas Reclamation District	Irrigation / Ditch Protection	05/03/01	09/30/01	38,082.00	190.000	38,082.00	0.00
4	Fallowed land	20.00	Trib	Trendwest - Swauk Creek	City of Roslyn / WDOE Trust	Irrigation/Instream Flow	07/12/01	09/30/01	24.43	0.710	24.43	0.00
5	Point of Diversion Change & Fallowed land	868.31	Main/Tribs	Trendwest	KRD	Irrigation	05/03/01	09/30/01	3,955.00	21.000	3,955.00	0.74
6	Point of Diversion Change & Fallowed land	85.00	Main	Lamb	KRD	Irrigation / Ditch Protection	05/03/01	09/30/01	1,046.00	4.000	1,046.00	0.81
7	USBR Leased Rights/Fallowed land	93.00	Trib	Teanaway - Cromarty Leases	USBR/Instream Flow	Instream Flow	07/12/01	09/30/01	178.60	0.660	178.60	62.54
8	Fallowed land, no diversion reduction - relied on increased return flows	216.65	Naches	South Naches ID	RID	Irrigation	06/07/01	09/30/01	777.30	6.500	777.30	69.68
9	Fallowed land	15.70	Trib	Wenas Creek - Rupel	RID	Irrigation	05/24/01	09/30/01	47.10	0.314	47.10	83.34
10	Fallowed land	113.90	Main	Taylor Ditch - Monson	RID	Irrigation	06/28/01	09/30/01	321.11	1.710	321.11	88.68
11	Fallowed land	127.20	Naches	Naches-Selah I)	RID	Irrigation	06/07/01	09/30/01	342.16	1.257	342.16	92.94
12	Fallowed land	1611.73	Main	Fowler Ditch Assn.	RID	Irrigation	09/15/01	09/30/01	144.01	12.520	144.01	104.16
13	Fallowed land	101.00	Trib	Teanaway -	RID	Irrigation	05/24/01	09/30/01	78.70	2.020	78.70	110.00

				Cromarty								
14	Fallowed land	50.00	Trib	Swauk Creek - Coe	RID	Irrigation	05/24/01	09/30/01	67.20	3.290	61.40	110.00
15	Fallowed land	89.60	Naches	Naches-Selah ID	RID	Irrigation	06/28/01	09/30/01	203.04	0.950	203.04	110.32
16	Fallowed land	235.00	Trib	Teanaway - Masterson	RID	Irrigation	05/24/01	09/30/01	500.00	4.800	500.00	117.50
17	Pump back, no fallowing	N/A	Mainstem/ Return flows	Sunnyside Division	Roza Irrigation District (RID)	Irrigation	05/03/01	09/30/01	2,533.00	8.400	1613.00	118.26
18	Pump back, no fallowing	N/A	Main/Return flows	Sunnyside Division	RID	Irrigation	05/03/01	09/30/01	1,266.00	4.200	756.00	118.26
19	Pump back, no fallowing	N/A	Main/Return flows	Sunnyside Division	RID	Irrigation	05/24/01	09/30/01	579.00	2.000	437.00	118.26
20	Fallowed land	674.39	Main	Sunnyside Division	RID	Irrigation	05/03/01	09/30/01	1,504.52	4.960	1431.00	125.00
21	Fallowed land	821.35	Main	Sunnyside Division	RID	Irrigation	05/03/01	09/30/01	1,796.00	6.000	1821.00	125.00
22	Fallowed land	1317.00	Main	Sunnyside Division	RID	Irrigation	05/10/01	09/30/01	2,745.00	9.200	2680.00	125.00
23	Fallowed land	752.00	Main	Sunnyside Division	RID	Irrigation	05/24/01	09/30/01	1,491.00	5.000	1433.00	125.00
24	Fallowed land	430.00	Main	Sunnyside Division	RID	Irrigation	05/24/01	09/30/01	808.00	2.700	797.00	125.00
25	Fallowed land	889.00	Main	Sunnyside Division	RID	Irrigation	06/07/01	09/30/01	1,538.00	6.400	1510.00	125.00
26	Fallowed land	534.00	Main	Sunnyside Division	RID	Irrigation	06/07/01	09/30/01	871.00	3.800	901.00	125.00
27	Fallowed land	629.00	Main	Sunnyside Division	RID	Irrigation	06/21/01	09/30/01	901.00	4.500	777.00	125.00
28	Fallowed land	161.00	Main	Sunnyside Division	RID	Irrigation	06/28/01	09/30/01	230.00	1.100	223.00	125.00
29	Fallowed land	220.00	Main	Moeur/Stewart	WDOE/Trust	Instream Flow	06/14/01	09/30/01	638.30	6.690	638.30	129.25
30	Fallowed land	31.40	Trib	Swauk Creek - Burke	City of Roslyn	Irrigation	07/26/01	09/30/01	54.00	0.296	54.00	222.22
31	Fallowed land	16.00	Trib	Teanaway - Cernick	City of Roslyn	Irrigation	08/02/01	09/30/01	12.10	0.140	12.10	495.87

Source: US Bureau of Reclamation

Salmon Creek Water Lease Bank

Location:	Okanogan County, WA
River Basin:	Salmon Creek, Tributary to the Okanogan River
Year Established:	2000
Years Active:	2000 - 2002
Bank Format:	Annual Lease Bank
Market Structure:	Standing Offer Price
Participation:	Supply – limited to Okanogan Irrigation District members Demand – Washington Water Trust
Activity:	Moderate to High
Pricing:	Fixed Price Negotiated Between the Washington Water Trust and Okanogan Irrigation District.
Price Range ($/AF/YR):	$45 - $58
Regulatory Oversight:	Washington Department of Ecology
Administrator:	Washington Water Trust, Colville Nation, and the Okanogan Irrigation District
Environmental Objective:	Provide flows in Salmon Creek for summer steelhead and spring Chinook.

Program Description

The Washington Water Trust, with funding provided by BPA, has leased over 4,550 acre-feet of water from irrigators in the Okanogan Irrigation District to enhance streamflow in Salmon Creek in an effort to restore populations of summer steelhead and spring Chinook. The Washington Water Trust is a private non-profit organization established in 1998 that is dedicated to streamflow restoration and water quality improvement in rivers and streams in the state of Washington. The Salmon Creek water-leasing program was established in 2000.

Prices paid by the Washington Water Trust have been negotiated with the Okanogan Irrigation (OID) District Board and have been set at a fixed price for all participating acres in the district. The term of lease contracts are for the full irrigation season typically running from April 15 to October 15. However, storage in the basin has allowed the leased water to be used outside of the irrigation season as well as carried over from one year to the next. Prices on an acre basis have increased from $135 in 2000 to $175 in 2002. During that period, OID irrigation assessment fees have averaged approximately $120 per acre. Participants are all members of the irrigation district and are required to pay the district assessment fee on acres enrolled in the water-leasing program. Participating acres have primarily involved idle land previously used to produce orchard crops. Other participating acres were primarily used to grow pasture and hay crops.

Trading Activity

Table 33 presents summary information on the Salmon Creek Water Leasing Program. Program participation nearly doubled between 2000 and 2002. During the bank's first year of operations, 42 irrigators enrolled 322 acres in the program. In 2002, 60 irrigators enrolled 624 acres, leaving approximately 1,900 feet of water for use as instream flows in lower Salmon Creek. In 2003, OID elected to not participate in the water-leasing program due to poor water supply conditions in upstream storage facilities and concern about meeting the district's water needs for permanent crops.

Table 33
Salmon Creek Water Leasing Program, 2000-2003

Year	Acres	$/Acre	AF	$/AF
2000	322	$135	966	$45
2001	573	$145	1719	$48
2002	624.36	$175	1873.08	$58
2003	No Water Leasing Program			

Source: Washington Water Trust and Okanogan Irrigation District.

Table 34 provides detail on the participating acres in the program. More than 80 percent of the acreage consisted of recently pulled orchard crops (primarily low valued red and golden delicious apples) and acreage that had been idle for a number of years. The remaining acreage participating in the program included small fields of pasture and alfalfa.

Table 34
Participating Acreage 2002

Crop	2002 Acres
Alfalfa	69
No Crop	135
Pasture	34
Pulled Orchard	373
Unknown	13
Total	**624**

Source: Okanogan Irrigation District and Okanogan County Assessor's Office.

Wyoming

Wyoming has the least active water market of all prior-appropriation states. Existing transfer policies limit the potential for water banking initiatives.

Water Allocation

Within Wyoming, surface water and groundwater resources are regulated as public property. Water is allocated based upon the doctrine beneficial uses and lists the order of preferred uses in the following order[157]:

> Water for drinking purposes;
>
> Water for municipal purposes;
>
> Water for the use of steam engines and for general railway use, water for culinary, laundry, bathing, refrigerating (including the manufacture of ice), for steam and hot water heating plants, and steam power plants; and industrial purposes.

State Water Banking Legislation Review

No water banks exist in Wyoming, and no evidence suggests that the State has contemplated developing one. Although Wyoming has enacted legislation for instream flow protection and temporary transfers, these statutes offer essentially no opportunity for water right holders to transfer water instream. However, recent interest has emerged to amend Wyoming's water laws to allow for increased market activity in the form of instream flow leasing programs. Based on other market experience, rising market activity in a region indicates the ripeness for facilitating water banks.

In the 1950's, Wyoming enacted a statute which allowed irrigators to temporarily transfer water to an "industrial" or "other uses" for up to a two year period. The primary purpose of this law at its time of passage was to provide additional water for highway and railroad construction. Advocates of instream flow protection have attempted to use this statute to provide a source of water for instream uses on a

[157] Wyoming Statutes § 41-3-102

temporary basis by claiming that recreation is an industry. So far, this approach has been ineffective due to the strict interpretation of the term "industrial."

Wyoming's 1986 instream flow law does allow private water right holders to change the use of an existing water right to instream flow. However, the original water right holder must give up ownership of the right to the state, which has proven to be a significant disincentive. Few irrigators are willing to permanently sever their water from the land. The instream flow law is also burdened by bureaucratic processes and analyses that are not required for the transfer of any other kind of water right. This system makes acquisition of water for instream flows an extremely slow and contentious process. In fact, the first instream flow filing submitted was on the Clarks Fork of the Yellowstone River in November of 1986. The filing has yet to be adjudicated.

Until Wyoming creates a more flexible approach to temporary transfers and/or instream protection, non-irrigation water leasing programs and water banking will remain non-existent. Although some groups have attempted to restructure the statute to conform to water policies adopted in other states, progress has been slow at best.

Acknowledgements

This analysis of water banking programs and policies in the Western States is a compilation of information gathered from many published papers, organizations, and individuals. The Washington Department of Ecology and WestWater Research wish to thank all those that contributed to report. We would especially like to acknowledge Lawrence MacDonnell for providing the foundation for the analysis through his report entitled, " Using Water Banks to Promote More Flexible Water Use," published by the United Stated Geological Survey in 1994. We have listed in the bibliography the people whose work, guidance, and resources are reflected in this review of water banking as an emerging, flexible management tool to meet growing and changing water demands throughout the United States.

Bibliography

General

Bell, Craig. Western States Water Council. Personal Communication. June 12, 2002.

Howe, Charles W. 1994. "Issues in the Design and Operation of a Water Bank: Using Water Banks to Promote More Flexible Water Use" Final Report submitted to the US Geological Survey. MacDonnell et al.

Isley, Stan. United States Bureau of Reclamation, Pacific Northwest Region. Personal Communication. March 18, 2002.

Landry, Clay J. 2003. "Review of Western U.S. Water Leasing Programs." Prepared for Washington Department of Ecology.

MacDonnell, Lawrence J. 1994. "Using Water Banks to Promote More Flexible Water Use." Final Project Report, United States Geological Survey, Award Number: 1434-92-2253.

Market Demand and Feasibility Analysis for Semitropic Groundwater Banking Programs. 2003. WestWater Research L.L.C.

The Natural Heritage Institute. 2001. Designing Successful Groundwater Programs in the Central Valley: Lessons from Experience. Berkeley, CA. www.N-W-I.org.

Raloff, J. 2000. "Liquid Assets: A New Breed of Bankers is Helping Communities Save for Un-Rainy Days." Science News 157: 72-74.

Arizona

Arizona 44th Legislature. 1999. "House Bill 2463."

Arizona 42nd Legislature. 1996. "House Bill 2494: Arizona Water Banking Authority."

Arizona Water Banking Authority. 2003. "Arizona Water Banking Authority Annual Report 2002."

Arizona Water Banking Authority. 2002. "Annual Plan of Operation 2003."

Arizona Water Banking Authority. 2002. "Resolution 2002-1 of the Arizona Water Banking Authority."

Arizona Water Banking Authority and Central Arizona Water Conservation District. 2002. "Agreement for the Development of Intentionally Created Unused Apportionment."

Arizona Water Banking Authority, Secretary of the Interior, Southern Nevada Water Authority, Colorado River Commission of Nevada. 2002. "Storage and Interstate Release Agreement."

Arizona Water Banking Authority, Southern Nevada Water Authority, and Colorado River Commission of Nevada. 2001. "Agreement for Interstate Water Banking."

Central Arizona Project
Website (http://www.cap-az.com/operations/index.cfm?action=map&subSection=14)

Department of the Interior, Bureau of Reclamation. 1999. "43 CFR Part 414: Offstream Storage of Colorado River Water; and Development and Release of Intentionally Created Unused Apportionment in the Lower Division States."

United States Secretary of Interior. 1999. "Water Banking Regulations."

United States Supreme Court. 1964. "Arizona v. California, 376 US 340 (1964), as supplemented or amended."

Wildeman, Gerry. Arizona Water Banking Authority. Personal Correspondence. December, 2003.

Wildeman, Gerry. Arizona Water Banking Authority. Personal Correspondence. April, 2002.

California

Aldridge, Bob. California Department of Water Resources, State Water Project Analysis Office. Personal Correspondence. April 2, 2002.

Aldridge, Bob. California Department of Water Resources, State Water Project Analysis Office. Personal Correspondence. January 30, 2002.

Association of Ground Water Agencies. 2001. "Groundwater and Surface Water in Southern California,"

California Department of Water Resources. 2001. "DWR Announces 2002 Dry Year Water Purchase Program." Press Release.

California Department of Water Resources. 2001. "DWR Program Encourages Voluntary Water Purchases." Press Release.

California Department of Water Resources, the Resources Agency. 2002. "Memorandum of Understanding Regarding the Department of Water Resources 2002 Dry Year Water Purchase Program."

California Department of Water Resources, State Water Project Analysis Office. 1993. "Water Transfers in California: Translating Concept into Reality."

California Department of Water Resources, Water Transfers Office. 2002. "Groundwater Substitution Transfers—How to Make Them Work in the Sacramento Valley in 2002." Water Transfers Papers for Water Transfers in 2002 Involving the Department of Water Resources.

California Department of Water Resources, Water Transfers Office. 2002. "Information to Parties Interested in Making Water Available to the Environmental Water Account or the State's 2002 Dry Year Water Purchase Program." Water Transfers Papers for Water Transfers in 2002 Involving the Department of Water Resources.

California Department of Water Resources, Water Transfers Office. 2002. "Water Transfers Based on Crop Shifting and Crop Idling—How to Make Them Work in the Sacramento Valley in 2002." Water Transfers Papers for Water Transfers in 2002 Involving the Department of Water Resources.

California General Assembly. 1999. "Assembly Bill 1584."

Diamant, Adam. EPRI Solutions. Personal Communication. April 10, 2002.

Fua, Dan. California Department of Water Resources, State Water Project Analysis Office. Personal Correspondence. May 20-21, 2002.

Geimer, Teresa. California Department of Water Resources, State Water Project Analysis Office. Personal Correspondence. January 13, 2004.

Howitt, R. N. Moore, and R. T. Smith. 1992. "A Retrospective on California's 1991 Emergency Drought Water Bank." Reports prepared for the California Department of Water Resources.

Jercich, Scott. A. 1997. " California's 1995 Water Bank Program: Purchasing Water Supply Options." Journal of Water Resources Planning and Management. January/February. pp 59-65.

Littleton et al.. 1995. Cited in Yolles, P. L. 2000. Update 2000: Progress and Limitation in Developing a Water Market in California. Water Resources Update.

Semitropic Water Storage District. Personal Correspondence. 2003.

Thomas, G. A. 2001. "Designing Successful Groundwater Banking Programs in the Central Valley: Lessons from Experience." Natural Heritage Institute.

Vogel, Nancy. April 9, 2002. "Water Exchanges Help State Through Dry Years." Los Angeles Times.

Water Education Foundation. 1996. "Layperson's Guide to Water Marketing & Transfers"

Colorado

American Groundwater Association, data originally supplied by groundwater basin managers

"Arkansas River Basin Water Bank Rules."

Colorado 64th General Assembly. 2003. "House Bill 03-1318: Concerning the Creation of Water Banks to Operate in Each Water Division, and, in Connection Therewith, Making an Appropriation."

Colorado General Assembly. 2001. "House Bill 01-1354: Concerning the Creation of Water Banks to Operate in Each Water Division, and, in Connection Therewith, Making an Appropriation."

Colorado State Engineer. 2001. "Rules Governing the Arkansas River Water Bank Pilot Program."

Grantham, Joseph. Colorado Division of Water Resources. Personal Correspondence. December 12, 2003.

Grantham, Joseph. Colorado Division of Water Resources. Personal Correspondence. March - April, 2003.

Southeastern Colorado Water Conservation District.

Idaho

Bridgeclark, Cynthia. Idaho Department of Water Resources. Personal Correspondence. October 30, 2003.

Carlson, Ron. Idaho Department of Water Resources. Personal Correspondence. October 24, 2003.

Graham, Bill. Chief of Water Planning Bureau, Department of Water Resources. Personal Correspondence. October 28, 2003.

Idaho Administrative Code. "37.02.03: Water Supply Bank Rules."

Idaho Water Resources Board. "About the Water Supply Bank." http://www.idwr.state.id.us/planpol/watplan/planning/waterbank.htm

Idaho Water Resources Board. "Water Rights in the Water Supply Bank." http://www.idwr.state.id.us/planpol/watplan/planning/Bankrights.htm

Martin, Gail. Paralegal, Shoshone Bannock Tribes Water Resources. Personal Correspondence. October 29, 2003.

MacDonnell, et al. 1994, "Using Water Banks to Promote More Flexible Water Use. Final Report US Geological Survey Award: 1434-92-2253

Sager, Rick. Water Master, District #74. Personal Correspondence October 28, 2003.

Saxton, Glen. Idaho Department of Water Resources. Personal Correspondence. October 23, 2003.

Saxton, Glen. Idaho Department of Water Resources. Personal Correspondence. February, 2002.

Shirtleff, Ron. Water Master , Water District #65. Personal Correspondence. October 29, 2003.

"Shoshone-Bannock Tribal Water Supply Bank Rules."

Thornberry, Ron. 2002. "A new course - Lemhi ranchers taking steps to protect farms - and fish." Idaho Falls Post Register. November 11.

U.S. Bureau of Reclamation.

Water District 1. "Rental Pool Procedures, Rule 3.6."

Water District 63. "Rental Pool Procedures, Rule 3.5."

Young, Norm. Idaho Water Resources Department. Personal Correspondence.. February 6, 1998.

Montana

Aber, Jesse. Governor's Drought Advisory Committee and Water Resources Planner. Personal Correspondence. March 4, 2002.

Lee, Sonja. October 4, 2002. "Water Rights Extend to Recreation Use: Montana Supreme Court Overturns Water Court's 1988 Decision." Great Falls Tribune

McLane, Mike. "Instream Flow Protection: Strategies in Montana Water Law." Montana Department of Natural Resources.

Nevada

McMullen, Sam. 1995. "Minutes of the Senate Committee on Natural Resources, Sixty-eighth Session." May 31.

Narayanan, Rangesan. University of Nevada, Reno. Personal Correspondence. December, 2003.

Nevada Legislature. 1996. "Senate Bill 489"

Singletary, Loretta. 2001."Water Banking in the Walker River Basin: Barriers and Opportunities." University of Nevada: Reno.

Taylor, Tracy. Deputy State Engineer. Personnel Correspondence. March 29, 2002.

Tracy, John. Desert Research Institute. Personal Correspondence. December 19, 2003.

Turnipseed, R. Michael. State Engineer, State of Nevada. 2000. "Order 1161: Groundwater Banking Order Truckee Meadows Groundwater Basin.

Wildeman, Gerry Technical Administrator, Arizona Water Banking Authority. Personnel Correspondence, December 9, 2003.

New Mexico

Bureau of Reclamation and Carlsbad Irrigation District. 2003. "Emergency Authorization to Temporarily Change Place and Purpose of Use of Groundwater to Offset Depletions to Carlsbad Project Water Resulting from Modified Reservoir Operations at Sumner Reservoir." Emergency Authorization RA-434, Approved August 1, 2003.

Bureau of Reclamation Albuquerque Area Office and State of New Mexico Interstate Stream Commission. 2002. "Environmental Study to be Prepared." Newsletter of the Carlsbad Project Water Operations & Water Supply Conservation EIS.

Bureau of Reclamation Albuquerque Area Office and State of New Mexico Interstate Stream Commission. 2002. "Pecos Bluntnose Shiner Studies." Newsletter of the Carlsbad Project Water Operations & Water Supply Conservation EIS.

Carlsbad Project Water Operations & Water Supply Conservation EIS. 2002. "Project Background Fact Sheet."

Gordon, Linda. New Mexico Office of State Engineer. Personal Correspondence. April 9, 2002.

Grant, Bob. Personal Correspondence. November 2003.

Grant, Bob and Sue Beffort. 2002. "Water Banking: Panacea or Placebo?" New Mexico Water Resources Research Institute.

Gubbels, P.K. 2002. House Bill 421. 45th Legislature of the State of New Mexico 2nd Session. New Mexico Annotated Statutes § 72-1-2.3. 2003.

Henrie, Michelle. Rodney, Dickason, Sloan, Akin & Robb. Personal Correspondence. October 27, 2003.

Interstate Stream Commission. 2003. Proposed Final Rules: Lower Pecos River Basin Water Banking Regulations

King, Rebecca. New Mexico Office of State Engineer. Personal Correspondence. November 26, 2003.

King, Rebecca. New Mexico Office of State Engineer. Personal Correspondence. August, 2003.

Klett, Cathy Ortega. New Mexico Water Resources Research Institute. Personal Correspondence. February 26, 2002.

New Mexico 45th Legislature. 2002. "Senate Bill 271: An Act Relating to Water; Providing for the Purchase of Water Rights Along the Pecos River Basin for Compliance with the Pecos River Compact; Providing for the Purpose and Extending the Expenditure Period."

New Mexico 45th Legislature. 2002. "House Bill 421: An Act Relating to Water; Providing for a Pecos River Basin Water Bank to Facilitate Compliance with the Interstate Compact."

New Mexico 45th Legislature. 2002. "House Bill 417: Purchase Water Rights in Pecos River Basin."

New Mexico Office of the State Engineer. 2003. "Final Rules: Lower Pecos River Basin Water Banking Regulations."

New Mexico Office of the State Engineer and New Mexico Interstate Stream Commission. 2002. "Annual Report."

New Mexico Office of the State Engineer and New Mexico Interstate Stream Commission. 2001. "Annual Report."

New Mexico Office of the State Engineer and New Mexico Interstate Stream Commission. 2000. "Annual Report."

New Mexico Office of the State Engineer and New Mexico Interstate Stream Commission. 1999. "Annual Report."

New Mexico Office of the State Engineer and New Mexico Interstate Stream Commission. 1998. "Annual Report."

New Mexico Office of the State Engineer and New Mexico Interstate Stream Commission. 1997. "Annual Report."

Rhoton, Sara. New Mexico Interstate Stream Commission. Personal Correspondence. October 9, 2003.

Salem, Nancy. February 25, 2002. "Open the Gates: After Years Dammed Up in the Legislature, Water-Banking Advocates Win a Chance to Prove their Point on the Lower Pecos." Albuquerque Tribune.

Turney, Tom. New Mexico Office of State Engineer. Personal Correspondence. February 25, 2002.

Oregon

Achterman, Gail. Deschutes Resources Conservancy. Personal Correspondence. March 26, 2002.

Achterman, Gail and Ray Hartwell. Deschutes Resources Conservancy. Personal Correspondence. April 8, 2002.

Aylward, Bruce. Deschutes Resources Conservancy. Personal Correspondence. July 29, 2002.

Baker, Gary. United States Bureau of Reclamation. Personal Correspondence. October 26, 2002.

"Deschutes Water Exchange Annual Water Leasing Program: 2003 Bid Auction-Ochoco Irrigation District Results Summary."

Niemi, E., A. Fifield, and E. Whitelaw. 2001. "Irrigation, Economic Growth, and the Ecosystem in the Upper Klamath Basin." ECONorthwest: Eugene, OR.

Oregon Water Resources Department, Division 521. 2002. "Deschutes Basin Mitigation Bank Rules."

Oregon Water Trust

Rice, Bob. Oregon Water Resources Department. Personal Correspondence. March, 2002.

Simon, Benjamin. Deschutes Resources Conservancy. Personal Correspondence. March 6, 2002.

Texas

Beckett, Dan. Texas Water Development Board. Personal Correspondence. March, 2002.

Edwards Aquifer Authority. 1998. Groundwater Management Plan 1998-2008.

Illgner, Rick. Program Manager, Edwards Aquifer Authority. Personal Correspondence. December 2, 2003.

Landry, Clay. "A Free Market Solution to Groundwater Allocation in Texas: A Critical Assessment of the House Natural Resources Committee Interim Report on Groundwater." Prepared for The Texas Public Policy Foundation.

Nelson, Matt. Texas Water Development Board. Personal Correspondence. December 3, 2003.

Nelson, Matt. Texas Water Development Board. Personal Correspondence. November 21, 2003.

Texas 73rd Legislature. 1993. "Senate Bill 1030: An Act Relating to Creation and Operation of a Water Bank and the Establishment and Collection of Associated Fees."

Texas 73rd Legislature. 1993. "Senate Bill 1477."

Texas 75th Legislature. 1997. "Senate Bill 1: State Water Plan."

Texas 78th Legislature. 2003. "Senate Bill 1639: An Act Relating to Regulating the Waters of the State, Including the Spacing and Production of Groundwater and the Control of Instream Flows."

Texas Water Bank. 2003. "Texas Water Bank Application for Deposit."

Texas Water Bank. 2003. "Texas Water Bank Participant Responsibilities."

Texas Water Development Board. 2003. "Water Bank Fee Schedule, Adopted March 19, 2003.

Texas Water Development Board. 2003. http://www.twdb.state.tx.us/mapping/index.asp

Texas Water Development Board. 2003. "Texas Water Bank Registry." http://www.twdb.state.tx.us/assistance/WaterBank/waterbankMain.asp

Yoskowitz, David W. 2001. "Evaluation of the Texas Water Bank." Technical Report No. 14. Texas Center for Border Economic and Enterprise Development, Texas A&M International University.

Yoskowitz, David. W. 1999. "Critical Analysis of the Texas Water Bank as a Marketing Institution." Forum of the Association for Arid Lands Studies XV(1): pp. 117-126. International Center for Arid and Semiarid Land Studies, Texas Tech University, Lubbock.

Utah

Bay, Richard. Assistant General Manager and Chief Engineer, Jordan Valley Water Conservancy District. Personal Correspondence. November 19, 2003.

King, Ron. Utah Department of Natural Resources. Personal Correspondence. February 26, 2002.

Stonely, Todd . River Basin Planning Chief, Utah Division of Water Resources. Personal Correspondence. November 11, 2003.

Washington

Seattle Public Utilities. 2002. "Proposed Draft Water Bank."

Vadas, Bob. Department of Fish and Wildlife, Washington. Personal Communication February 28, 2002.

Washington Water Acquisition Strategy, Washington Department of Ecology, 2003

2000 Report to the Legislature Water Rights Purchasing Pilot Project, Progress Report and Recommendations, Washington Department of Ecology, 2000

Dykstra, Peter. Washington Water Trust, Personal Communication.

Wyoming

Vore, Ron. Wyoming Water Development Commission. Personal Correspondence. March 11, 2002.

Water Terms Glossary

Acre-foot

A technical term used to describe a volume of water. An acre-foot equals 325,851 gallons, or enough to cover one acre (43,560 sq. ft., or about the size of a football field) with one foot of water. An acre-foot is also enough water to meet the demands of a family of four for a year.

Adjudication

The process where all those claiming the right to use water from a water source are joined in a single legal action to determine the rights and priorities for the use of the water.

Appropriate

The acts necessary to create a right to make a private use of water.

Appropriation

The establishment of a water right by diversion, due diligence and beneficial use. Must be adjudicated to establish seniority of right.

Aquifer

An underground body of rock or unconsolidated material that is sufficiently permeable to transmit a significant amount of ground water to wells or springs. In an unconfined aquifer, the saturated upper surface is a changing water table under atmospheric pressure. In a confined (artesian) aquifer, the water is maintained under pressure between two relatively impermeable beds of rock..

Aquifer Storage and Recovery (ASR)

A water resource management technique whereby a confined aquifer is artificially recharged via surface spreading and percolation or an injection well. The water is stored for a period of time and subsequently recovered to meet water demands. The same well is used for both recharge and recovery. Water stored in these subsurface reservoirs is protected from losses associated with evaporation, transpiration, seepage, and contamination.

Beneficial Use

The measure, the basis, and the limit of the appropriator's right to use water. Beneficial use includes domestic, irrigation, stock, mining uses, and may include recreation, fish and wildlife, or other uses, depending on state law.

Broker

An agent, individual, or public or private organization that connects or solicits buyers and sellers of water to create sales.

Capital Cost

The estimated construction cost of developing new water supplies which do not include routine operating and maintenance costs.

Clearinghouse

An agency or other type of entity that serves mainly as a repository for bid and offer information and facilitates the regulatory requirements for trades.

Conjunctive Water Banking

The act of coordinating between surface water and groundwater water banking facilities for optimal use. For example, surface water may be stored in a groundwater bank during wet-years and withdrawn during dry years. Groundwater recharge can be either achieved through 1) direct recharge with surface water injection wells or spreading basins, or 2) in-lieu recharge whereby surface water is used instead of groundwater and the water not extracted is considered stored. On the other hand, surface water may be banked in a reservoir and groundwater withdrawn for use, whereby increasing the water supply in the surface water bank.

Consumptive Use

The amount of water consumed during use that does not return to a water system.

Contingent Transfer

A temporary transfer that is contingent on specific market, climate, water supply, or other trigger events. For example, the transfer contract may be contingent on a specific factor such as a dry-year, high water demand year, or supply interruption.

Current Supplies

Amount of water that can be used today without future improvements based on water rights, water quality, infrastructure limitations, and contract restrictions.

Drought

A sustained period of dryness caused by a prolonged period of below-average precipitation.

Drought-of-Record

The period in years of the most severe or extreme drought occurring during the time for which climatic records are available.

Dry-year

A year with below average precipitation and/or runoff.

Firm Yield

The maximum quantity of water that can be guaranteed from a reservoir during each year of the drought of record.

Gross Water

The amount of water withdrawal from the water source combined with recycled and reused water.

Groundwater Appropriation / Permit System

Administrative regulation and management of groundwater through a permit system by specifying limits on the number of permits issued, pumping rates, and over-development of the aquifer.

Groundwater Banking

A system that facilities the transfer of water by placing excess water in a groundwater aquifer to be used by the original water user at a later date or to be sold to another water user. This banking structure requires the physical transfer of water, not just the transfer of paper rights.

Historic Use

The documented diversion and consumptive use of water over a period of years that determines the true value of a water right.

Hydrologic Condition

The classification of the level of precipitation and/or runoff within a watershed.

Institutional Water Banking

A system or organization that facilitates the transfer of water by bringing buyers and sellers together and negotiating the legal and regulatory procedures necessary to change the location and/or use of existing water rights. Institutional water banking may be based solely on paper transfers of water rights and does not require a physical structure to store the water.

Instream Use

A type of end application of water use that does not require withdrawal from the source. Examples of instream uses are recreational, navigational, and ecosystem preservation.

Interstate Water

Waterbody that flows from one state to another in which the states have some water rights. Interstate waters are governed by compacts and are subject to federal law.

Intrastate Water

Waterbody that flows only within one state and are subject to that state's law.

Junior Water Right

Water rights that were established more recently than senior rights. The more recent a date on a water right, the more "junior" it is relative to water rights with older issuance dates. All water rights are defined in relation to other rights, and a water right holder only acquires the right to use a specific quantity of water under specified conditions. Therefore, when limited water is available, junior rights cannot be exercised until all senior rights have been satisfied. See Prior Appropriation Doctrine.

Major Reservoir

A reservoir with a storage capacity of more than 5,000 acre-feet.

Market-maker

An agency or other type of entity that creates liquidity in the market by standing ready to purchase water or sell reserve water within predetermined price ranges. The purpose of the market-maker is to ensure that trades occur even when counter parties (buyers or sellers) are not present or available in the market. In addition, the market-maker can provide a valuable service in creating and maintaining liquidity in newly formed markets that are thinly traded

Minimum Instream Flow

The minimum flow level that is required within a waterbody as stipulated by regulatory or statutory provisions which are usually determined to protect aquatic habitat. States generally issue water rights for water that is available in excess of the established minimum instream flow.

Municipal Use

Water used or provided by a municipality, water utility, etc. generally for use by residents, but also for commercial and industrial purposes.

New Water

Water not previously available in the system, created by reducing irrecoverable losses or flow to unusable water bodies (such as the ocean or inland salt sinks).

No-injury Rule

Basis for prohibiting transfers that would harm another legal user of the water.

Non-market

A water bank structure that is not designed to respond to market forces or use market based pricing, such as an entity (perhaps a state agency) which purchases or leases water from multiple buyers at a fixed price.

Normal-year

A year with average precipitation and/or runoff.

Operating and Maintenance Costs

Annual expenses incurred during operation of water supply projects which may include costs related to labor, materials, energy, and wheeling fees.

Paper Water Right

An existing water right that has not been historically exercised. Future consumption of paper water usually results in decrease of water supply available to others.

Per Capita Water Use

The amount of water a person uses during any given year, including all municipal uses.

Permanent Transfer

The buyer acquires the water right in perpetuity usually for a one-time fixed fee.

Point of Diversion

A specifically named place where water is removed from a waterbody.

Price Elasticity

A measure of the sensitivity of price to a change in demand. If demand is elastic, the quantity purchased will drop sharply as the price increases. If demand is inelastic, the quantity purchased will not change significantly as the price increases.

Prior Appropriation Doctrine

The surface water law system developed in the western United States which provides that one who is first in time to divert and apply water to a beneficial use has a prior right to use the water in the event of water shortage. Under modern statutes, approval must usually be secured from some state agency before acquiring a new water right or making a change in use of water.

Priority Date

The date of a water right establishment or the officially recognized date associated with a water right. The rights established by application have the application date as the date of priority. Relative to other water rights, the priority date may make a water right senior (predating other rights) or junior (subordinate to other rights). See Prior Appropriation Doctrine.

Real Water Right

A water right that the holder is legally entitled to use and historically has been consumed.

Reasonable Use Doctrine

A management policy that allows a landowner to withdraw groundwater for reasonable uses on the overlying land without liability for harm to adjoining landowners. Any

beneficial use on the overlying land is considered reasonable. Also known as the "American Rule."

Recharge

The addition of water to groundwater through either 1) direct recharge with surface water injection wells or spreading basins, or 2) in-lieu recharge whereby surface water is used instead of groundwater and the water not extracted is considered stored.

Reliability

The probability that the water supply will be available at the time of desired use. For example, the reliability of limited water supplies is reduced during dry-years.

Riparian Rights

The surface water law system prevailing in the eastern United States which grants to a landowner bordering a waterbody the right to make reasonable use of the water on that land if the use does not interfere with reasonable uses of other riparian landowners.

Rural Area

A county that does not have a metropolitan statistical area in its boundaries (as defined by the U.S. Department of Commerce).

Semi-Arid Region

A region which has annual average precipitation of 10 to 20 inches.

Senior Water Right

Water rights that are older (more senior) than those of junior rights. All water rights are defined in relation to other rights, and a water right holder only acquires the right to use a specific quantity of water under specified conditions. Thus, when limited water is available, senior rights are satisfied first in the order of their Priority Date.

Spot-Market transfers

The buyer acquires a short-term water right whose price will greatly vary depending on the current conditions surrounding the water quantity, water quality, storage capacity, conveyance capacity.

Storage or Storage Right

Water interrupted in its natural gravity flow and detained for a later beneficial use.

Surface Water Banking

A system that facilities the transfer of water by placing excess water in a surface water reservoirs to be used by the original water user at a later date or to be sold to another water user. This banking structure requires the physical transfer of water, not just the transfer of paper rights.

Temporary Transfer

The buyer acquires the water right either through short-term or long-term leases, and the contract structure usually consists of a fixed upfront payment and additional take payments when the water is transferred. The underlying water right is retained by the original owner. The use of the water is temporarily transferred to a counter party.

Transferability

The ability to convey water from the source to the point of desired use. Transferability is limited due to infrastructure and regulatory constraints.

Unmet Needs

The portion of the demand for water that exceeds available water supply plus all of the recommended water management strategies included in a regional water plan.

Water Bank

An agency or other type of entity that aggregates water supplies from willing sellers and facilitates their sale to willing buyers.

Water Banking

A transfer of water from willing sellers to other water users, usually from a low-valued use to higher-valued uses. Most banking occurs within a localized region due to the cost and infrastructure requirements to transport water long distances as well as regulatory provisions that limit the transfer and movement of water. Water banking involves many functions including determining the quantity of bankable water, limiting who can purchase or rent from the bank, setting contract terms, and dealing with any regulatory agencies.

Water Court

A special division of a district court with a district judge designated as the water judge to deal with certain specific water matters principally related to adjudication and change of point of diversion.

Water Demand

An economic term used to express the relationship between water withdrawal and price. Economic theory suggests that changes in price will alter water withdrawal, known as price elasticity. Water demand become more inelastic (i.e., withdrawal independent of price) for essential domestic uses or when the price is too low.

Water Management Strategy

A recommended solution to meet a projected need for water.

Water Right

A legal authorization to use a certain amount of water for a specific beneficial purpose(s). Water rights are identified in the form of permits or certificates. A permit is

the right to develop a water use on a specified schedule with reasonable progress under specific conditions such as protection of senior water right holders. A certificate is granted once the water right development schedule and all the conditions have been satisfied. Water rights typically specify:

- source of water;
- point of diversion or withdrawal;
- purpose of use;
- quantity of water that may be used;
- location of use;
- conditions, such as seasonal use; and
- priority date.

Water Right Transfer

The reallocation of a water right which may occur through a water banking mechanism.

Water Supply

The quantity of water available at a given time.

Water Use

The act of applying water to different types of end applications which can be either instream, require withdrawal from the system, and/or result in water consumption.

Water User Group

All municipalities with a population greater than 500 or entities identified by a regional water planning group for which water demands and available water supplies have been analyzed and plans developed to meet water needs. Residential use in municipalities with less than 500 in population or outside of municipalities, manufacturing, irrigation, live-stock, steam-electric power generation, and mining categories are aggregated at the county level.

Water Withdrawal

The amount of water extracted or produced from the source. Extraction may occur through pumping of an aquifer or a surface water intake.

Watershed

The land area that drains into the defined waterbody.

Wet-year

A year with above average precipitation and/or runoff.