Technical Report on Market-Based Reallocation of Water Resources Alternative

A Component of the Yakima River Basin Storage Feasibility Study
Ecology Publication Number 07-11-044

December 2007
Washington State Department of Ecology

Technical Report on Market-Based Reallocation of Water Resources Alternative

A Component of the Yakima River Basin Storage Feasibility Study

Ecology Publication Number 07-11-044

Prepared by:

Cascadia Law Group PLLC
ECO Northwest

Mary E. McCrea
Ernest Niemi

December 2007

Technical Report on Market-Based Reallocation of Water Resources Alternative

A Component of the Yakima River Basin Storage Feasibility Study

Ecology Publication Number 07-11-044

Prepared by:

Cascadia Law Group PLLC
ECO Northwest

Mary E. McCrea
Ernest Niemi

TABLE OF CONTENTS

INTRODUCTION

The primary objective of the Market-Based Reallocation of Water Resources Alternative is to reallocate water resources through a water market and/or water bank to:

- Improve streamflows for anadromous fish,
- Improve water supply for irrigated agriculture, and
- Meet future municipal water supply needs.

Secondary objectives of the alternative include:

- To increase the overall value of the goods and services derived from the basin's water resources, by reallocating water from low-value to high-value uses.
- To reduce the delay and cost of effecting transactions that reallocate water resources.
- To ensure that, before transactions are completed, appropriate consideration is given to the potential impacts on third parties.

The primary objective could be met by moving small increments of water to targeted areas, for example specific tributary stream reaches, and/or by moving large blocks of water where required. The large blocks may be transferred from a single water right owner, for example, an irrigation district, or small increments of water may be pooled and transferred as a single block to meet a larger demand.

It is widely recognized that water resources in the Yakima Basin are over-allocated in that the total rights to remove water from the basin's streams exceed the available water supply in certain years. This over-allocation has been confirmed by the adjudication of the surface water rights in Yakima Superior Court in the case of *Ecology v. Acquavella*. The over-allocation prompted an order by the court in 2005 ordering water rights with a priority date later than May 10, 1905 to be curtailed because of lack of water (Order Limiting Post-1905 Diversions entered March 10, 2005). One potential response to the over-allocation, and the focus of this alternative, is to shift the allocation of water and water rights to increase the value of the goods and services produced with the available supply of water for a given year or over a series of years. This alternative arises from the experience of the American economic system, which broadly relies on markets to allocate resources when the demand for them exceeds the supply. Economists recognize that markets generally can be efficient mechanisms for allocating resources to their highest-value uses.

Water markets and water banks are becoming popular suggestions as tools to resolve water supply problems. Traditional engineering approaches for augmenting water supplies such as new storage reservoirs come with a wider and deeper set of costs than do non-traditional methods (National Research Council, 2004; Howitt and Hansen, 2005). The search for non-traditional means to obtain new supplies of water (as opposed to "new water") points toward conservation in the use of existing supplies and/or reallocation of existing water rights (Howitt and Hansen, 2005). Conservation and reallocation can come with lower costs and provide more flexibility (Economic and Engineering Services, Inc., 2002; National Research Council, 2004).

They can be better for the economy both because of the lower costs and because they move water to the highest and best economic use. They can also result in reduced risk when compared with traditional approaches.

DISCUSSION

TERMS: WATER MARKETS, WATER BANKS, TRANSFERS AND TRANSACTIONS

Water markets and water banks are a lively topic of conversation among water managers and are commonly thrown out as *the* answer to water supply problems. Often, however, the terms are used without being defined and without any common understanding of how they are being used in any particular discussion. Authors agree there is no one definition. However, for a meaningful discussion and analysis of water markets and water banks, there must be a common understanding of the use of the terms. Water markets and water banks both are designed to facilitate the transfer of water and share many common attributes. Water markets are commonly part of a water banking system. However, there are important distinctions between the two.

Water Markets

In general, the term "water market" is used to denote voluntary transactions to temporarily or permanently transfer water from one person/entity to another (National Research Council, 2004; Brewer et al., 2007). Some authors distinguish a water market from a water bank by referring to a water market as a situation where a buyer and seller find each other and deal directly with one another (Lepper, undated). For purposes of this discussion, we use the term "water market" to refer to an institutional process designed to facilitate the voluntary transfer of water rights from a willing seller to a willing buyer on a permanent or temporary basis. A water market may be distinguished from a water bank in that a water right posted through the market continues to be used pending a transfer. In contrast, when a water right is deposited into the bank, it will not be used until it is withdrawn from the bank.

Water Banks

The term "water bank" is usually used in one of two ways: 1) physical storage of water for later use, or 2) a process to facilitate the transfer of water rights (Dellapenna, 2000; National Research Council, 2004). Physical storage of water may include storage in reservoirs and storage in underground aquifers. The use of the term to describe a process to facilitate transfer of water rights is broad and covers both a water bank and a water market. For purposes of the Market-based Reallocation of Water Resources Alternative, the term "water bank" means an institution designed 1) to accept deposit of a water use entitlement, which will not be used by the water right owner during the time it is in the bank, and 2) to make the entitlement available for withdrawal by the water right owner/depositor or another entity (Mentor and Morin, 2007). In the Yakima basin the State Trust Water Rights Program (TWRP) has been authorized for use as a water bank (RCW 90.42.110). Alternative 2C includes a proposal for a water bank for the Yakima River basin in the context of the TWRP and Alternative 2D proposes a new structure for a water bank outside of the TWRP.

Transfers

Reallocation of water involves the transfer of a water right and/or the use of water under a water right from one person or entity to another and any associated changes to one or more elements of

the transferred water right. The elements of a water right that need to be changed will depend upon the planned use(s) of the water right by the parties undertaking the transfer and may include a change in place of use, purpose of use (including adding a purpose of use to that already authorized under the existing water right), point of diversion or withdrawal, and season of use. A transfer from an agricultural user to a municipality usually involves changes to all the elements of a water right. A change from agriculture to instream flow requires a change in place of use, purpose of use, and elimination of the point of diversion.

Transactions

Reallocation of water from one person or entity to another also involves various forms of transactions. The term transaction refers to the form of the agreement between the owner of the water right and the party receiving the water right. The type of transaction plays a significant role in the willingness of water right owners and those seeking water to participate in a market or bank. The permanent sale of a water right results in the transfer of both the water and the water right. This would also be the ultimate outcome if an option to buy a water right were ultimately exercised. Temporary transfers by lease result in the water being transferred for the term of the lease and the water right being retained by the water right holder. Leases can take the form of a lease for a single season or year, or a long-term lease for multiple seasons or years. Leases can also be for split season where an irrigator uses his or her water right for the first half of the season and a party, usually one seeking water for instream flow, leases the water for the second half of the season during periods of low streamflow.

Transactions can result in immediate transfer of water and possibly water rights, or future secured transfers. The latter can be accomplished through option agreements. An example is a dry-year lease option wherein a party would secure the right to lease water in a future year if the forecasted water supply was below a number agreed to by the parties. This type of agreement may be made between a farmer who grows annual crops and who would be willing to forego planting in a water-short year and a farmer who grows perennial crops that must be watered each and every year.

Transactions also can involve more than just water and water rights. An agency such as Reclamation, for example, might purchase a water right together with the appurtenant land with the expectation that it would sever the water right from the land and leave the water in stream to increase instream flows.[1] As another example, a downstream landowner (or an irrigation district) might purchase upstream land plus its water right expecting to divert the water for use during dry years on property he or she currently owns.

[1] Ecology currently does not have statutory authority to purchase land and water together, it is restricted to the purchase of water only.

SURVEY OF WATER MARKETS AND WATER BANKS

Ecology and WestWater Research, LLC published an extensive review of water banks in the western United States (Ecology and WestWater Research, LLC. 2004). The report was briefly summarized in Clifford (2003). The report surveyed 18 states west of the Mississippi River and found that, excluding Washington, nine states had state-operated banks in some stage of development. Significantly, the authors found that the details of water banking vary greatly from state to state.

Idaho operates three separate rental pools as banks used to manage water stored in reservoirs. Idaho also has a water supply bank to deal with natural flow water rights and groundwater. California's water banks are primarily designed to meet drought year demands. The water "bank" in Texas actually functions more as a water market with an on-line bulletin board posting water rights for lease by river basin. One interesting aspect of the Texas bank is the fact it has two categories of water rights listed: one is for water rights that have been researched (validated) and then banked, and the second is for rights that are offered on a "buyer beware basis." The bank was authorized in 1995. As of 2003 there had been only one transaction through the bank (Clifford, 2003).

In New Mexico, a water bank was authorized to include groundwater, stored surface water and "native/direct flow surface water." New Mexico's Interstate Stream Commission (ISC) is to be a major water right purchaser and administrator of the bank. Significantly, the state legislature has mandated that the ISC purchase land with water rights, fallow the land and offer the water rights for lease. The ISC is to lease water rights through the bank to water right owners whose right is curtailed during dry years (Clifford, 2003).

Two notable programs in Oregon apply market-based activities to influence water management in the eastern region of the state. The Deschutes River Conservancy (DRC) is comprised of representatives from private and public interests in the Deschutes River Basin. In collaboration with landowners, agencies, and other organizations, the DRC employs auctions and other market-based tools to promote ecological restoration and support growing communities. Through temporary leases, permanent transfers, and conservation projects, it restored more than 100 cfs of flow to the Middle Deschutes River downstream of Bend in 2006. Although it has received federal funding, it currently relies on contributions from individuals, businesses, corporations, philanthropic foundations, and government agencies.

In the Upper Klamath Basin in Oregon, Reclamation has annually purchased water for instream flows since 2002 as part of its efforts to meet its obligations under the Endangered Species Act to assist threatened coho salmon. Under the program Reclamation originally offered a fixed price for water, but now solicits bids from individuals and entities willing to fallow land and forgo diverting surface water, or willing to pump groundwater to substitute for surface water. Its maximum purchases occurred in 2005 when it paid $4.6 million to secure 27,471 acre-feet from fallowing land and paid $2.3 million to construct wells and infrastructure to allow water users to change from surface diversions to withdrawal of groundwater. The program, originally called the Klamath Basin Pilot Water Bank, is now called the Water Supply Enhancement Study.

Arizona has developed a water banking system through the joint efforts of the Central Arizona Project (CAP) and the Arizona Water Banking Authority (AWBA). The AWBA was "created specifically to facilitate underground storage of any Colorado River water not needed for direct use in any year" (Dozier, 2005). The Colorado River is over-allocated, just as is the Yakima River. Because CAP has a junior priority to water on the Lower Colorado River, it needs to protect its water source for water-short years. Through the banking, Arizona diverts water not demanded in a given year and stores it underground through a variety of recharge facilities. According to Dozier, "Banking is Arizona's way of protecting against the CAP junior priority status. It is not a new supply for future growth. It provides for firming our Colorado River M&I [municipal and industrial] allocations to a reliable supply" (Dozier, 2005).

In Colorado where water markets have flourished, a water bank formally established in the Arkansas River Valley was not successful. "Colorado has one of the most active water markets in the world, with tens of thousands of acre-feet of water traded each year through private, voluntary transactions" (Lepper, undated). Much of the success in trading through the water market may be attributed to the water court system. In Colorado water courts are district courts, analogous to superior courts in Washington State, which conduct general business of the district court but also specialize in water cases. Whereas Ecology has both the responsibility of reviewing water right transfers and regulating the use of water rights, in Colorado the water court reviews transfers and the state engineer regulates the use of water and enforces orders of the court.[2]

Under the Colorado system, an application to transfer a water right is submitted to the court, which assigns it to the water referee. The referee investigates the truth of the statements in the application and any statements in opposition. The referee also consults with the division engineer for the region where the court operates. Approximately 95 percent of the applications are settled at the referee level without a court hearing (O'Leary, 2003).

Just as is the case in the Yakima basin, virtually every water right in Colorado has been adjudicated. The property interest is well defined, which has promoted stability of water markets in Colorado.[3] Colorado has favored the impartial court forum for water right decisions: "A separation of powers concept is at the heart of the plan" (O'Leary, 2003). The consistency of one judge making decisions and the impartiality of the process has made it very successful.

In contrast to the success of water markets in Colorado, a water bank program has struggled. The Colorado legislature passed a law authorizing a pilot water banking program in the Arkansas River Basin in 2001 (Sections 37-80.5-101 et seq., C.R.S. (2001)). Regulations to implement the program were adopted in 2002. The rules defined "water banking" to mean "temporarily placing legally stored water into an account within the Water Bank whereby that water is then leased, loaned, optioned or exchanged to another water user" (Rule 3, Definitions, paragraph 11). The ruled defined "water bank operator" to mean "the State Engineer, a delegated public entity or a delegated public-private partnership who administers the water bank and is entitled to charge a

[2] Water courts also adjudicate new water rights, which in Colorado is done one water right at a time. This is in contrast to Washington adjudications in which all the water rights in a prescribed area are adjudicated at one time.

[3] In addition to the basic elements of a water right, Colorado also confirms a consumptive use quantity of a water right, which provides better definition of the water right.

transaction fee for deposits, withdrawals, or both, sufficient to cover the bank's administrative costs" (Rule 3, Definitions, paragraph 12). The bank was operated by the Southeastern Colorado Water Activity Enterprise (SECWAE).

Detailed rules and procedures were developed for putting water into the bank, listing and bidding procedures, transaction procedures and quantification procedures. By 2004, with few deposits and no withdrawals, the bank was abandoned by the SECWAE. Another group, the Upper Arkansas River Water Conservancy District has indicated it may try to revive the bank.

A similar group called the Lower Arkansas Valley Water Conservation District is proposing another water bank. Under this bank called the "Super Ditch," shareholders in eight canal companies in the valley would offer 25-40 year leases to other water users in the valley (McKeown, 2007). The bank would be owned and operated by farmers and they would decide how much of their water they wanted to lease.

A lesson learned from the Colorado experience is that even when water markets are successful in a state, water banks operating in the same state may have varying levels of success.

As evidenced by Ecology's survey of water banks in the western states and this discussion of water markets and water banks, there is no set formula to follow in designing a water market or a water bank. They should be structured to meet the demands and take advantage of the opportunities in the specific area where they will operate (MacDonnell, 1995). Consequently, rather than discuss the particulars of any one market or bank, the following sections discuss the elements that make up a market or bank and identify requirements for successful markets and banks. They also include a discussion of the specific challenges in the Yakima basin to satisfying the requirements for success. The proposed alternatives for market-based reallocation are comprised of different combinations of the elements discussed here.

ELEMENTS OF WATER MARKETS AND WATER BANKS

Organizational structure/function

A smoothly operating water market or bank would have one or more of the following components working together to provide distinct but interactive functions aimed toward reducing the cost of executing transactions in a timely manner.

- *Information clearinghouse.* Information is what allows markets to run smoothly. Potential sellers require information about who might be willing to buy water when, where, at what price, and under what conditions. Potential buyers require analogous information about potential sellers. Both require information about the outcomes of previous transactions to serve as reference points they can use to develop expectations and to navigate through the transaction process.

- *Brokerage.* In some cases, buyers and sellers might identify and deal directly with one another to execute a mutually satisfactory transaction. In other cases, though, a broker may help link a potential seller with a potential buyer and/or oversee the execution of mechanics of the transaction. This function is analogous to that of real estate brokers, who help home sellers put their properties on the market, help buyers find homes on the

market with the characteristics they seek, and, once a sale is initiated, oversee the execution of all the relevant paperwork.

- *Technical support.* Some of the information needed to effect a transaction will require legal expertise to sort through who has what water right, hydrologic expertise to link the water right to the actual streamflows that would be affected by the transaction, and institutional expertise to fit the transaction into the operations of Reclamation, Ecology, affected irrigation districts, and other entities.

- *Verification and conveyance.* Someone has to verify that the seller relinquished the water, the buyer received it, that both complied fully with the terms of the contract, and that obligations to third parties were not violated.

Choice of Administrator

There are several options for who will administer either a market or a bank. The entity that does so should be one that has the trust of water right holders, the agriculture community, environmental groups, and the resource management agencies. The entity should also have the expertise to provide the structure and functions discussed above. For a water bank under the authority of the TWRP, the law requires that Ecology is the administrator. Ecology could also administer a water market. For a water market or a water bank that operates under authority other than the TWRP, the administrator could be a private, non-profit organization, a private for-profit organization, or Ecology in combination with a private non-profit.

Price

The price of water can be set by the market and for water banks it can alternatively be a fixed price per unit of water (acre-foot, cfs). Table 3 in the Ecology and WestWater report (2004) summarizes the water banking programs surveyed. Of note is the fact that of the 23 banks listed, six had "high" activity, defined as more than 10 trades per year. All six used the fixed pricing method. Six additional banks had "moderate" activity- between five and 10 trades per year. Two of the six used fixed prices while four of the six relied upon market-based prices (Ecology and WestWater Research LLC, 2004).

Who can buy/lease or sell/lease water?

The answer to this question depends upon the goal of reallocation of water resources. If the goal of reallocation is to meet the demands of those who currently hold water rights but whose water rights are not adequate to meet their demands, the market or bank would be restricted to existing water right owners. In order to provide additional water for instream flow, water rights for instream flow would be considered to be existing water rights. If the goal is to provide water for new or expanded uses, then anyone desiring water should be able to buy or lease water through the market or bank.

REQUIREMENTS FOR SUCCESSFUL MARKETS/BANKS

Water markets and water banks share a number of basic requirements for successful operation. The primary requirements are discussed below. For each requirement, there is a general discussion followed by a discussion specific to the Yakima basin.

Clearly Defined Property Rights

A primary requirement for a successful water market or bank is property rights that are clearly defined, secure, enforceable, and transferable (National Research Council, 2004; Brewer et al., 2007). A corollary requirement is laws that define the property rights of things being bought or sold (Dellapenna, 2000). Water rights present challenges to the extent that water supply is uncertain, the rights have not been adjudicated, and a water right is a usufructuary right (a use right rather than a true ownership right) subject to state oversight (Brewer et al., 2007).

Evaluating water rights prior to posting through a market or deposit into a bank would improve the clarity, security and enforceability of rights being offered through a water market or a bank and improve the efficiency of operation of the market or bank. This would reduce much of the uncertainty in acquiring a water right and would focus the review of an application to transfer or change a water right on any potential impairment from the transfer, not the extent and validity of the right.

Yakima Basin: The requirements that a property right be clearly defined, secure, enforceable and transferable are largely met for surface water rights in the Yakima basin. The adjudication court is confirming the surface water rights for the entire Yakima basin. Proceedings in the trial court are expected to be completed in early 2008. Water rights are most clearly defined and secure immediately after being adjudicated by the superior court. The court's orders are evidence that the rights are enforceable. Ecology's continued regulatory oversight after completion of the adjudication should continue the enforceability of the rights. There is also a solid body of water laws and regulations that define the water rights, including the transferability of such rights.

There is a similar body of law governing groundwater rights as for surface water rights. However, groundwater rights are not being adjudicated by the court. As a result, groundwater rights are less defined and certain and not as well protected by regulatory enforcement. Private parties may bring an action in superior court to protect their groundwater rights, but Ecology is more constrained in its ability to regulate. Overall, surface water rights in the Yakima River Basin are much better candidates for transfers via a water bank or water market.

Willing Buyers and Sellers

An absolute must for a successful market or a bank is willing sellers and buyers. In concept, a market transaction would involve a potential seller and potential buyer negotiating with one another until they mutually agreed on the price and other terms and conditions of the transaction. In practice, such a process sometimes can occur, but things may work differently. Potential sellers and buyers may not know of one another and their respective interest in effecting a transaction. Or, if they do, they may not have enough information to undertake and complete a transaction quickly and at a reasonable cost. Perhaps most important, they may have no or little

basis on which to determine the reasonableness of different prices, terms, and conditions. Therefore, one of the important functions of a water market or bank is distribution of information regarding the water available for sale or lease, the price attached to each, and details of prior transactions.

Importantly, sellers must be willing to sell or lease all or part of their water right in a way that meets the demands and preferences of potential buyers/lessees. Additionally, there must be trust between the parties (Myrum, 2003). The trust underlying a given transaction must extend not just between the seller and the buyer, but also between them and the party responsible for conveying the water from the former to the latter. In order to have willing parties, the transactions through the market or bank must be transparent (National Research Council, 2004) and have predictable/consistent process and outcomes. To promote overall confidence in a market or bank, the terms, conditions, and outcomes of each transaction must be visible to all who might be affected by it and to those who might subsequently desire to effect their own transactions.

Yakima Basin: In the Yakima basin, the likely parties that may be willing to sell or lease water rights are those holding irrigation rights—individuals, irrigation districts, or canal or ditch companies. These same people and entities are potential buyers/lessees, along with municipalities and developers who wish to acquire water for municipal growth, and Ecology, Reclamation, and the non-profit organizations Washington Rivers Conservancy (WRC) and Washington Water Trust (WWT) who wish to acquire water for instream flow. At least in concept, more than one party could combine their interests as either a seller or buyer. For example, Ecology and a downstream irrigation district could jointly purchase an option on water from an upstream water right holder with the understanding that, during a dry year, they would take control of the water available under the water right and allocate it, in a prearranged manner, between instream flow and irrigation demands.

Information is key to access to the market or bank and to price setting (Myrum, 2003). Outreach and education conducted by a trusted entity, and widely available information are key to bringing willing buyers and sellers to the transactions. The necessity for trust extends to the entity doing the outreach.

Reasonable Transaction Costs

Transaction costs can keep a water market or water bank from reaching its full potential, or even kill it before it gets started. Potential sellers or buyers may not even consider participating in a transaction if they perceive that it will take too much time or be too complicated to get the deal done. Or, if they are potentially interested in effecting a transaction, they may back out if they find that the costs of completing the deal are too high.

Yakima Basin: By lowering the transaction costs Ecology (and/or others) potentially can provide a significant stimulus to the development and growth of a water market or water bank in the Yakima River basin. Ecology (and/or others) could lower transaction costs in several ways. When it seeks to buy water, it could publicize this fact widely and on a sustained basis, so that potential buyers and sellers can acclimatize themselves to the notion of water transactions and learn more about how transactions work, and how they might benefit from buying or selling

water. If it should attempt to promote transactions by others, it may make similar information available to give individuals a better understanding of how the market works and might benefit them.

Ecology (and/or others) could lower the costs of negotiating an agreement between a seller and buyer by publicizing information about actual past transactions, or about hypothetical future transactions, giving individuals better reference points for developing a better understanding of the process. It also might implement a process aimed at making it easier for buyers and sellers to find one another. When it is seeking to buy water, Ecology may publicize the price(s) at which it is prepared to purchase water, or it may initiate a reverse auction process aimed at making it easier for potential sellers of water to make this interest known.

The Yakima Transfer Working Group has been successful at reducing many aspects of the regulatory costs associated with water transactions. Established in 2001, it is a voluntary team of agencies and water users that provide technical review of proposed transactions, helping applicants identify those types of water right changes and transfers that can quickly and easily gain approval from the state. The role of this group could be expanded to help streamline the water transaction process, if appropriate.

Simplified and Improved Processes for Transferring Water Rights

At the top of the list of recommendations for successful markets and banks (and any type of reallocation of water rights) is to simplify and improve the process for approving water right transfers. Authors stress not just the need to remove impediments from existing laws, but to create a system that facilitates voluntary reallocation. The legal and institutional changes to facilitate reallocation of water should not just remove impediments, but should create a process specifically designed to manage voluntary reallocation (MacDonnell, 1995; Howitt and Hansen, 2005.) The transfer process should encourage flexibility and provide for many methods for trading water (Ecology and WestWater Research LLC, 2004). While emphasizing the need for fundamental changes in the transfer process, these same authors also stress that it is critical that changes to the system do not come at the cost of existing water right users, their communities, or natural systems (MacDonnell, 1995). There is a fine balance here.

> An important difference among states is found in the set of criteria used by the water authority in approving, amending, or denying a transfer. The more extensive the list of criteria, the more studies will have to be carried out, and the greater the room for disagreement. At the same time, a greater set of values is being safeguarded from damage by the transfer. We cannot, therefore, judge the desirability of alternative administrative systems simply by monetary transaction costs per acre-foot transferred. The range of public values being protected by the system must be assessed simultaneously (Howe et al., 1990).

Government approval of water right transfers is repeatedly identified as one of the most serious impediments to successful water markets and water banks. The approval processes are described as slow, costly and burdensome (Landry and Anderson, undated; Libecap, 2005; Brewer et al, 2007; MacDonnell, 1995). The literature identifies specific factors that contribute to the problems including the burden on an applicant who wishes to transfer a water right to prove a

negative—no impairment of existing rights (Dellapenna, 2000; MacDonnell, 1995); a consumptive use determination that is complex and costly (National Research Council, 2004); and the fact that transfers of an individual's water right out of an irrigation district require district board approval (Myrum, 2003). While simply the time required for the government to act on a transfer request can discourage parties from requesting a transfer of water, one of the biggest obstacles is the level of scrutiny applied to a water right to be transferred and the lack of trust in the government to approve a reasonable quantity for transfer.

Yakima Basin: Transfers of water rights are subject to statutory requirements, primarily RCW 90.03.380. Transfers of water into and out of the TWRP have additional requirements under RCW 90.38, 90.42, and Ecology's Trust Water Rights Guidelines and Trust Water Rights Guidance. The time required to process water right changes has been seen as an impediment to a successful market. Any proposal to streamline the transfer process should address possible legislative changes as well as changes in agency rules, policies and procedures.

A significant barrier to efficient and timely transfers of water is the waiting time for Ecology to consider the application. Ecology is required to process applications in the order in which they are received. Historically, applications for new water rights and change applications were all put into a single line to await processing, which could take several years to be completed. The time required for Ecology to review and decide on a change application has been reduced by legislation that established two lines of applications, one for new water right applications and one for changes (RCW 90.03.380(5)(b)). Additionally, certain change applications can be processed before earlier filed applications if they meet criteria in WAC 173-152-050 (referred to as the "Hillis Rule"). Priority processing could also be established by creating a new line for applications for transfers through a water market or for transfers to and from a water bank. Under priority processing the time is generally reduced from years to months.

Under the current system, Ecology is the entity that evaluates a water right transfer. The primary constraint on a water right transfer is that it must be made "without detriment or injury to existing rights" (junior or senior to the right being transferred). Because of that requirement, a transfer may not result in an increase in the consumptive use of the right.

Ecology interprets the statutory standard of no impairment as requiring that Ecology make a tentative determination of the validity and extent of the water right. This is required to ensure that there is valid legal authority for the right and that only the amount of the water right that has been continuously used and not relinquished is approved for transfer. If the application is to transfer water from one irrigation district to another, Ecology must receive concurrence from both districts before it may approve the transfer, while if the transfer is a change of place of use within a district, only the district board's approval is required and Ecology has no approval role (RCW 90.03.380(2)(3)).

In the Yakima basin, permanent transfers are under Ecology's jurisdiction. During the pendency of the adjudication, temporary transfers are under the jurisdiction of Yakima Superior Court. Federal laws and Reclamation water delivery contracts add a layer of complexity. The Water Transfer Working Group (WTWG) reviews all requests for transfer and makes recommendations to Ecology and the Court. The WTWG has improved the speed and operation of the transfer process. However, there remains room for improvement in the underlying transfer process.

The fact that Ecology conducts an analysis of the extent and validity of the right is viewed by many applicants as an impediment to water right owners applying to transfer their water rights. A system within a water market or water bank that provides for an initial confidential analysis of extent and validity of the right would encourage water right holders to participate. The confidential analysis could be done by the market administrator if it is a private entity and not subject to the laws of public disclosure or by an entity that works in conjunction with the market administrator for the express purpose of water rights evaluation.

In the Yakima basin, irrigation districts hold large water rights and the reallocation of any significant blocks of water will likely involve an irrigation district. By statute, irrigation districts may change the place of use of water within the district without approval by Ecology (RCW 90.03.380(3)). Efficient reallocation of water within adjoining irrigation districts may also be accomplished under existing state law. Two or more irrigation districts may also form a Board of Joint Control (BOJC). By doing so, the districts can change the place of use of water rights within the area of jurisdiction of the BOJC, i.e., the combined boundaries of the districts, simply by notifying Ecology and any Indian tribe requesting such notice (RCW 87.80.13092)(c),(d)). The Roza Irrigation District and the Sunnyside Division formed the Roza-Sunnyside Board of Joint Control (RSBOJC) on August 13, 1996. Among other long-term actions and benefits cited by Roza and Sunnyside for formation of the RSBOJC is internal management and potential joint projects for water distribution facilities and water management activities of adopted water conservation programs.

An identified barrier to water right transfers outside of the district is the authority of the irrigation districts to prevent such transfers. RCW 90.03.380(2) requires that when water is proposed to be transferred from one district to another, Ecology must receive concurrence from the districts that the transfer "will not adversely affect the ability to deliver water to other landowners or impair the financial integrity of the districts." A proposed solution is to clarify transferability of water rights held by members of irrigation districts by specifying the conditions under which the organization could deny the transfer. If in the Yakima basin the authority of the districts to prevent out-of-district transfers is preventing otherwise desirable transfers, Ecology could seek a legislative change to shift the burden to the districts to show that such a transfer would adversely affect the delivery of water or the financial integrity of the districts.

Consideration of Third-Party Interests

Third-party impacts raise concerns not about how a proposed transaction would affect the water right of a third party, but about how it would affect public values, the viability of a particular industry, and/or the prosperity of a community. Many are concerned about how transactions will affect the quantity, timing, and quality of instream flows and habitat for salmon, steelhead, and other aquatic species. Those whose livelihoods are linked to irrigated agriculture can be concerned that shifting the pattern of irrigation from one part of the basin to another, or diverting water away from irrigation all together, will undermine the viability of irrigation districts, and weaken the overall agricultural industry. Members of local communities can be concerned that changes in the allocation and use of water can affect their quality of life and economic outlook. Some in the farming community as well as others fear that a fully functional market would accelerate the flow of water away from irrigation and stimulate urban development across the landscape.

One author has stated that third-party impacts may be the greatest impediment to successful water right transfers, which are at the heart of any successful water market or bank (MacDonnell, 1995). The fact that third-party impacts are a very real concern is evidenced by a resolution passed by the Okanogan County Commissioners that "prohibits" water for irrigation being transferred out of the county. Most recently the Commission passed a Resolution requesting the legislature enact a law entitled the Rural County Water Protection Act. Under the requested Act, when a water right is proposed to be transferred out of Okanogan County, or any county east of the Cascades, the county and any resident of the county would be given a first right of refusal to match the selling price within 60 days of notice of the proposed sale and allow the water to be kept in the county (*Methow Valley News*, October 10, 2007). The resolutions adopted reflect a serious concern about the potential impact of water transfers on the agricultural section and the local economy.

Yakima Basin: As discussed above, RCW 90.03.380 requires that a transfer may not impair other existing water rights. Ecology has the authority and is charged with considering impacts on the public interest when it issues a new water right (RCW 90.03.290). The Supreme Court has ruled that Ecology may not consider the public interest when making decisions on applications to transfer surface water rights although it may do so when making such decisions regarding groundwater rights (*Pend Oreille Co. PUD No. 1 v. Ecology*, 146 Wn.2d 778, 797(2002)). (Because the Legislature omitted consideration of the public interest from RCW 90.03.380 where it included such a requirement in other closely related statutes, we conclude that Legislative intent is clear that a "public interest" test is not a proper consideration when Ecology acts on a change application under RCW 90.03.380). If an inability to consider third-party impacts is impeding the transfer process because of the concerns of local communities and other interest groups, Ecology could seek legislative changes to the transfer statute.[4]

Trust

Significantly, in the Yakima basin some landowners have stated concerns about a lack of trust in Ecology and the agency has acknowledged that fact (Ecology, 2006). It has been difficult for Ecology to establish and maintain trust with water right owners because of its regulatory role and its position as plaintiff in the adjudication where the agency's responsibility has been to ensure that the court received properly supported claims for water rights. Specifically, with respect to the transfer of water rights, Ecology is charged with the responsibility to conduct a tentative determination of the extent and validity of a water right sought to be transferred, which often puts the agency at odds with water right owners. Some water right owners have expressed a concern that if they subject their water rights to an evaluation by Ecology, Ecology will relinquish part of their right.

Based on successful experiences in other areas, there is a need for an entity or entities, who are non-regulatory and perceived to be neutral, to work in the Yakima basin to do outreach and education to let water right owners know about the potential opportunities they may have to sell,

[4] The statewide trust water rights statute does require that before a trust water right is exercised Ecology must first determine "that neither water rights existing at the time the trust water right is established, nor the public interest will be impaired" (RCW 90.42.040(4)).

lease or donate their water rights. There is also a need for an entity or entities to conduct an initial, confidential evaluation of the water right of a person or entity that intends to transfer all or a portion of the right. Private, non-profit or for-profit organizations can conduct confidential evaluations and keep them confidential because they are not subject to the public disclosure laws as are all public agencies, including Ecology. Furthermore, such organizations do not pose any threat to the water right owner because they have no regulatory role and do not relinquish water rights.

INFLUENCE OF MARKET CONDITIONS

In addition to consideration of the requirements for a successful water market or bank, the evolution of the proposed alternative for market-based reallocation of water resources will be influenced by the underlying market conditions, i.e., the interaction of the demand for and the supply of water within the context of the existing distribution of water rights. This influence already exists, insofar as some demands for water exceed the supply available through existing water rights, and, absent a transaction, higher-value demands can go unmet while lower-value demands are satisfied.

Changes in this influence will materialize through a mixture of climatic, hydrologic, and economic forces, including these:

- An increase in the price of one irrigated crop, relative to the prices of others, will, all else equal, increase the demand for water by the farmers that grow it, relative to the demands of those who do not.

- Climatic changes that increase the supply of water in streams in the winter and spring and decrease the supply in the summer and fall will, all else equal, decrease and increase the value of water during the two periods, respectively.

- Climatic changes that increase temperatures and rates of evapotranspiration will, all else equal, reduce and warm streamflows, and increase the demand for water to provide fish and wildlife habitat. Higher temperatures and faster evapotranspiration also will, all else equal, increase the irrigation demand for water and some municipal-industrial demands for water.

- Climatic changes that increase temperatures may, all else equal, make it possible for frost-sensitive, high-value crops to be grown at higher elevations in the basin, and increase the demand for water in these areas relative to the demand elsewhere.

- An increase in the basin's population will, all else equal, increase the municipal-industrial demand for water.

- A continuation of recent trends will, all else equal, increase the demand for recreational opportunities, scenic vistas, healthy fish habitat, and other water-related services, relative to the demand for most water-related commodities.

Within the context established by the market conditions in the Yakima River basin, the evolution of this alternative will be shaped by the legal, institutional, economic and operational characteristics of the water-trading marketplace.

PROPOSED MARKET-BASED REALLOCATION ALTERNATIVES

It is important to design a water market or water bank to fit the particular characteristics and needs of the location where it will operate. Perhaps the most significant characteristic of the Yakima basin is that some time in 2008 all surface water rights in the basin will have been adjudicated by the Yakima County Superior Court. This means a higher degree of certainty regarding surface water rights and a reduced need to investigate historic use of the right for purposes of transferring and reallocating water. It also means that there is a tremendous amount of information readily available about water use distribution in the basin: who has water, who needs water—how much and when.

The following alternative frameworks for water markets and water banks are based on the discussion and analysis above, taking into account characteristics of the Yakima basin water rights, water supply and water demand. The first group of alternatives for a water market (Alternative 2A) and a water bank (Alternative 2C) are each based on existing laws and structures with some suggestions for streamlining and efficiency. The second group of alternatives under each category (Alternatives 2B and 2D) calls for substantial changes to the laws and structures currently in existence. The final two alternatives are specific to irrigation districts. As discussed above, there are multiple variables in the structure and operation of water markets and water banks. The following discussion presents six alternative combinations of characteristics that could comprise the market or bank.

Alternative 2A: Water Market Using Existing Authority

The Water Market Using Existing Authority Alternative is a market that would bring sellers and buyers together and operate under existing laws and regulations regarding water right transfers with minor changes to improve efficiency. The market would be administered by a private non-profit entity that would operate solely as a clearinghouse. The administrator would post information about the water rights of willing sellers and information about water rights willing buyers are seeking. Information would include the location of the water right, the elements of the right including quantity (Q_i and Q_a), point of diversion, place of use, purpose of use, season of use, and priority date.

The market would accept a water right for posting based on evidence of confirmation by the adjudication court. If more than five years has passed since entry of the Conditional Final Order for the water right, a water right evaluated by a Certified Water Rights Examiner would be accepted for posting. Certified Water Rights Examiners would work with water right owners to provide a confidential evaluation of the water rights and calculate the consumptive use portion eligible for change. The state would certify such examiners through training and testing. A presumption would be established that documentation provided by a Certified Water Rights Examiner in support of a water right transfer is valid. When an application is filed to transfer a water right that is signed by such an examiner, Ecology would conduct an abbreviated evaluation. Thus, the examiner's findings would be relied upon by the water right owner and also by Ecology thereby improving the speed and efficiency of water right transfers. This alternative would require legislation to authorize the certification of water rights examiners.

The administrator would conduct outreach and education regarding the existence of the market and opportunities it provides. The administrator would also track all transactions carried out through the market to provide others with information about previous transactions. In order to facilitate the reallocation of water, the market would be restricted to buyers/lessees who hold current water rights and to those acquiring water for instream flow. Prices would be determined by market forces and by negotiations between buyers and sellers. A transaction fee would be charged to help fund the administration of the market.

When a sale or lease of a water right occurred through the market, the water right transfer process would be based on existing statutes, implemented in slightly different ways from Ecology's current practices. The primary statutory requirement is that a transfer may not impair any existing water rights. Translated into actual practice, Ecology's focus is the validity and extent of the right being transferred and the consumptive use of the current and proposed use. The extent and validity of the rights have been determined by the Yakima Superior Court in the adjudication and for those rights five or more years after a Conditional Final Order, would be validated by a Certified Water Rights Examiner. The determination of potential injury from the transfer would thus come down to the consumptive use analysis. This analysis needs to be simplified and more transparent.

A suggested approach is to use a table that shows the consumptive use and return flow expected from the different types of applications systems (center-pivot; sprinklers; drip, etc.) for the various crops grown in the Yakima Basin.[5] This table should be made readily available to the public. Most importantly, it should be applied uniformly without variation. The fact that there may be more site-specific information that could be used to determine consumptive use more precisely is acknowledged. However, the trade-off here is efficiency, transparency and confidence in the transfer process, which should outweigh any perceived benefit from a more complex, specific analysis. This suggestion would not require any legislative or rule amendments. Rather it would simplify Ecology's policies and procedures.

As part of this market alternative, Ecology could amend its rule to create a separate line for processing applications to transfer water rights that are being acquired through the market. This would provide an incentive to conduct transactions through the market. Given the review of the extent and validity of the water right prior to posting in the market, it would be appropriate to provide a separate line for processing these transfer requests.

Alternative 2B: Open Water Market

This alternative provides the framework for a more wide-open and active market. The market would offer more services to sellers and buyers, and the transfer approval process would require legislative changes. The administrator of this market would operate not only as an information clearinghouse like it would under Alternative 2A, but it would also function as a broker that would oversee the mechanics of the transaction. This function is analogous to a real estate broker in that the administrator would help sellers post and price water for sale or lease and help buyers find water on the market that meets their needs. The administrator would offer technical

[5] For Washington, the *Washington Irrigation Guide* commonly referred to as *WIG*, provides the necessary data on crop water requirements.

support to move the transfer through the regulatory process. The administrator would also offer verification services to confirm the seller no longer uses the right, the buyer received it, and both parties complied with the contract.

As with Alternative 2A, the administrator would be a private, non-profit organization. The operation of the market would be funded by transaction fees. Another option is for a private, for-profit entity to administer the market and charge commissions as well as fees on transactions, including perhaps a use fee for water transferred through the market. The price for water would be market-driven, and anyone could buy or lease water through the market regardless of whether they currently have water rights.

The most significant difference from the Water Market Using Existing Authority would be the process for review and approval of the water right transfer. The challenges for the water right transfer process are to make the process more efficient, flexible and "user friendly," so that it does not discourage people from entering a water market or water bank, but actually gives impetus to the market or bank. At the same time the process must protect existing water rights from injury. The positive and unique situation in the Yakima basin makes it possible to create a water market that goes well beyond the current water right transfer process.

Under this alternative, Washington would adopt the "Colorado process" for use in the Yakima River basin. The water court, which would be part of the Yakima County Superior Court, would conduct the general business of the superior court but would also specialize in water cases and the water court would review water right transfers and Ecology would regulate the use of water and enforce orders of the court.

An application to transfer a water right would be submitted to the court, which would assign it to the water referee. The referee would investigate the truth of the statements in the application and any statements in opposition. The referee would also consult with the Central Regional Office of Ecology.

The infrastructure for such a system is already in place in the Yakima basin. The Yakima County Superior Court has conducted the adjudication and is extremely knowledgeable about water rights and Reclamation systems operation in the basin. The Referee's Office has worked closely with the court and has similar knowledge. To implement this alternative would require legislative action to fund the court and referee and to transfer the authority to decide water right transfer applications from Ecology to the court.

Alternative 2C: Water Banking Using Existing Trust Water Rights Program

As defined for this document, a water bank means an institution designed to accept the temporary or permanent deposit of a water right, which 1) will not be used by the water right owner while it is in the bank, and 2) will be made available for withdrawal by another water user on a temporary or permanent basis. The primary differences between a water market and a water bank are that in a water market a water right holder is seeking a direct transaction with someone who wants to buy or lease their water. In a bank, a water right holder deposits their water right into the bank on a permanent or temporary basis, and the bank makes the water available to a third party. The transactions are between the water-right holder and the bank on the one hand,

and the bank and the third party on the other hand. The bank may pool water rights deposited by multiple water right holders to make larger blocks of water available for sale or lease. Another important distinction is that because water rights deposited to a bank are not being beneficially used while they are on deposit they must be protected from relinquishment.

Under this alternative, the existing TWRP would function as the bank. Water rights can be temporarily or permanently transferred to trust.[6] Those water rights that are temporarily transferred to trust may be withdrawn by the depositor for their own use or be transferred to another person or entity. Those water rights permanently transferred to trust are either to be used according to the terms of the transfer or may be used by Ecology for any recognized beneficial use. Significantly, a water right is protected from relinquishment as long as it is in trust (RCW 90.38.040(6)).

RCW 90.42.100 specifically authorizes Ecology to use the TWRP for water banking purposes in the Yakima basin. The statute does not define "water banking," but does list several purposes:

> (2) Water banking may be used for one or more of the following purposes:
>
> (a) To authorize the use of trust water rights to mitigate for water resource impacts, future water supply needs, or any beneficial use under chapter 90.03, 90.44, or 90.54 RCW, consistent with any terms and conditions established by the transferor, except that return flows from water rights authorized in whole or in part for any purpose shall remain available as part of the Yakima basin's total water supply available and to satisfy existing rights for other downstream uses and users;
>
> (b) To document transfers of water rights to and from the trust water rights program; and
>
> (c) To provide a source of water rights the department can make available to third parties on a temporary or permanent basis for any beneficial use under chapter 90.03, 90.44, or 90.54 RCW.

Ecology is authorized to acquire water rights, including storage rights, by purchase, lease, donation or other means, except condemnation, on a temporary or permanent basis. RCW 90.38.020(1)(a),(3). When the TWRP is used as a bank, Ecology is the banker and can use the water itself or make it directly available to third parties.

The use of the TWRP suffers from some of the problems that have reduced the success of other banks. In particular the requirements for approval of water right transfers can be complex and time consuming. The statute requires that when a water right is transferred to the TWRP for administration for water banking purposes that the water right is reviewed under RCW 90.03.380

[6] For purposes of the TWRP in the Yakima basin, a "trust water right" is defined as "[t]hat portion of an existing water right, constituting net water savings, that is no longer required to be diverted for beneficial use due to installation of a water conservation project that improves an existing system. The term 'trust water right' also applies to any other water right acquired by the department under this chapter for management in the Yakima River basin trust water rights program" (RCW 90.38.010(3)). Trust water rights may be held by the department for instream flows, irrigation use, or other beneficial use" (RCW 90.38.040(3)).

1) at the time it is transferred into trust, and 2) in some situations, when the right is transferred out of trust (RCW 90.42.110). The application for the transfer into trust "must indicate the reach or reaches of the stream where the trust water right will be established before the transfer of the water right to the TWRP and "identify any reasonably foreseeable future temporary or permanent beneficial uses for which the water right may be used by a third party upon transfer from the TWRP." If the future place of use or other elements of the right are not identified when the right goes into trust, "another review under RCW 90.03.380 will be necessary at the time of a proposed transfer from the trust water [rights] program" (RCW 90.42.110).

The amendments that established use of the TWRP for banking purposes paid particular attention to any possible impairment of other rights, including water rights specific to Reclamation's Yakima Project (RCW 90.42.110(3)(4)). Similar provisions were included in two other sections of the amendments and provide insight into concerns that may be raised to use of the TWRP as a water bank (RCW 90.42.135; 90.42.138).[7]

Alternative 2D: Non-Regulatory Water Bank

Under this alternative, a bank would be formed outside of the TWRP. The bank could be administered by a private, non-governmental entity, which could either be a non-profit or for-profit organization, or by a non-regulatory governmental agency. The bank could offer a standing price for the purchase of water rights and for temporary deposits of water rights to be made available for lease, or negotiate on a case-by-case basis. The water right holder would be compensated regardless of whether the bank was able to sell or lease the rights and regardless of the price the bank received. Because the water rights would not be used while on deposit with the bank, changes to statute would be required to protect the rights from relinquishment.

The extent and validity of the right would be established prior to deposit in the bank. As with Alternative A, a water right confirmed in the adjudication within five years of deposit would be accepted as confirmed by the court. If more than five years had passed, the right could be certified by a Certified Water Rights Examiner.

The transfer of the water right would be reviewed at the time the water right is sold or leased from the bank. Because the extent and validity of the right would be established prior to deposit with the bank, the review of the transfer would be limited to the issue of impairment. The review could be conducted by Ecology as explained for Alternative A or through a water court as recommended in Alternative B. Whichever approach is chosen, the goal should be to simplify the transfer process and create certainty and trust. Just as suggested for the market alternatives, water right transfers from the bank to a third party would be processed through a separate line that would allow priority processing.

[7] Other concerns raised by various groups regarding use of the TWRP as a water bank include the following: use of the TWRP as a bank will lead to increased use of water if the water right had only been partially used prior to the transfer; use of the TWRP as a bank will possibly lead to speculation- bank a water right until the demand and price go up; use of the TWRP will lead to a public resource becoming more privatized; and environmental groups will acquire a disproportionate share of the water because they are well funded (Ecology, 2006).

Alternative 2E: Drought Year Transfers Outside of Irrigation Districts

This alternative is intended to free up transfers of water outside of an irrigation district during drought years. As discussed above, under current law, Ecology must receive the concurrence of an irrigation district where water is proposed to be transferred outside of the district. RCW 90.03.380(2). Under this alternative, irrigation districts would be required to allow transfer of up to 30 percent of the total water supply allotted to the district in years when the state declares a drought under RCW 43.83B.405. A system would be established to allow a member of the district to petition for the temporary transfer of water under their water right to Reclamation to be managed as part of its Total Water Supply Available (TWSA). The member would fallow the acres associated with the transferred water. The member would be paid by Reclamation, Ecology or a water bank established for that purpose, which would in turn be paid by the recipient of the transferred water. Prices would be set by a process, yet to be determined, that may have Reclamation, Ecology or a water bank setting fixed prices or the different parties negotiating prices specific to individual transactions.

Alternative 2F: Irrigation District Bank

Under this alternative, an irrigation district would act as a bank during both good water years and years of drought. The difference from Alternative 2E is that the district would act as the bank rather than Reclamation or Ecology. A district would send out a call for water to their members at a fixed price. Water right holders within the district would decide to fallow all or a portion of their land for all or a portion of the irrigation season and bank their water with the district. The district could pool the banked water and identify blocks of water that they are willing to sell to junior districts or others. By selling large blocks the districts would have more pricing power. The districts would take a portion of the selling price and manage water use.

CONCLUSION

Water markets and water banks have operated with mixed success in the western United States. The Yakima basin has elements and infrastructure in place that may increase the chances for a successful water market. The guiding principle in creating a market or bank is to take advantage of the characteristics of the local situation and design the process to meet the specific needs of the area. The guiding words are creativity and patience. Water markets and water banks do not develop quickly even under the best of circumstances.

REFERENCES

Bingenheimer, P., reviewer. No date. "What Conclusions Can Be Drawn About Water Allocations and Water Markets in Light of the California Drought Emergency Water Banks of 1991 and 1992?" Water Allocation: California, USA; Sustainable Development Case Studies, Colby College. www.colby.edu/personal/t/thtieten/wat-ca.html, accessed 08/14/2007.

Brewer, J., R. Glennon, A. Ker, and G.D. Libecap. 2007. Water Markets in the West: Prices, Trading, and Contractual Forms. National Bureau of Economic Research Working Paper No. 13002. March 2007.

Brown, T.C. 2006. "Trends in Water Market Activity and Price in the Western United States." Water Resources Research Vol. 42. Rocky Mountain Research Station, U.S. Forest Service. Sept. 8, 2006.

Clifford, P. 2003. "Water Banking Programs in Other States." April 21, 2003. Obtained 08/28/2007 from http://www.roundtableassociates.com/ywe/Bank%20Documents/water%20banking%20programs%20survey.htm.

Dellapenna, J.W. 2000. "The Importance of Getting Names Right: The Myth of Markets for Water." 25 Wm. & Mary Envtl. L. & Pol'y Rev. 317. Symposium Issue II – Water Rights and Watershed Management: Planning for the Future. Winter 2000.

Dozier, L.R. "How Does the CAP Water Bank Influence Short-Term and Long-term Water Supply Vulnerability in the Basin?" Obtained 10/2007 from http://wwa.colorado.edu/resources/colorado_river/hard_times_conference/Dozier_NRLC presentation.pdf.

Economic and Engineering Services Inc. 2002. Voluntary Water Transfers as a Strategy for Meeting Planning Objectives. Technical Memorandum, Yakima River Basin Watershed Plan. January 2002.

Hanak, E. 2003. "Who Should Be Allowed to Sell Water in California? Third-Party Issues and the Water Market." Public Policy Institute of California. 2003.

Howe, C.W., C. S. Boggs, and P. Butler. 1990. "Transaction Costs as Determinants of Water Transfers." Focus on Natural Resources Theory University of Colorado Law Review.

Howitt, R. and K. Hansen. 2005. "The Evolving Western Water Markets." Choice Magazine. 1st Qtr. 2005. Obtained 08/14/2007 from http://www.choicesmagazine.org/2005-1/environment/2005-1-12.htm.

Jaeger, W.K. 2004. "Potential Benefits of Water Banks and Water Transfers." Water Allocation in the Klamath Reclamation Project Brief #2, Oregon State University Extension Service. January 2004.

Landry, C.J. and T.L. Anderson. No date. "The Rising Tide of Water Markets." Political Economy Research Center.

Lepper, T. No date. "Banking on a Better Day: Water Banking in the Arkansas Valley." Department of Sociology, Colorado State University.

Libecap, G.D. 2005. "Rescuing Water Markets: Lessons from Owens Valley." PERC Policy Series, Dufresne Foundation Special Issue. January 2005.

MacDonnell, L.J. 1995. "Water Banks: Untangling the Gordian Knot of Western Water." Mineral Law Institute, University of Colorado. 1995.

Mentor, J. and J. Morin. 2007. "Water Banking: Mirage or Delusion?" Washington-American Water Resources Association (WA-AWRA) Section Newsletter. July-August 2007.

Myrum, T. 2003. "Concerns with Water Trading." Washington State Water Resources Association. Northwest Water Trading and Marketing Seminar, Portland, Oregon. June 5, 2003.

National Research Council of the National Academies. 2004. Managing the Columbia River: Instream Flows, Water Withdrawals and Salmon Survival.

O'Leary, M.C. 2003. "An Analysis of the Colorado Water Court System." Prepared for the New Mexico Office of the State Engineer by Utton Transboundary Resources Center, University of New Mexico School of Law. January 10, 2003.

Washington State Department of Ecology. 2006. 2006 Report to the Legislature: Water Banking in Washington State. Water Resource Program Publications. December 2006.

Washington State Department of Ecology and WestWater Research. 2004. Analysis of Water Banks in the Western States. Ecology Publication Number 04-11-011. July 2004.