Washington State Legislative Report

DRAFT

Columbia River Basin
Long-Term Water Supply and Demand Forecast

Water Banking Trends in Washington and Western States

November 2016

DRAFT

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Executive Summary

Water banks and water markets allow people and farms who face water use restrictions to purchase mitigation credits to allow water use. Water banks and markets are among the critical portfolio of tools needed to help address the complexities of water management—including drought risk, surface water-groundwater interactions, and legal and regulatory disputes and restrictions over water markets—thereby allowing scarce water resources to be allocated more efficiently.

Understanding how water markets are working and maturing in Washington can help help guide regulatory oversight and function of water banks, and clarify how water rights will move in response to water supply shortages, curtailments, demographic changes, and climate change. These are important elements that still need to be incorporated into the economic forecasting that influences the long-term supply and demand forecast for the Columbia River. This exploratory project describes water banking activities in Washington State and across the western United States—including the various administrative forms that water banks take, and the various forms that water transactions take in the context of water banking—and provide recommendations on how to improve and provide incentives for water banking in Washington.

Key findings:

- 24 banks currently operating (including self-mitigating banks), and seven developing water banks.
- Water banking activity across 11 western States has tended to increase in the last 12 years—since the publication of Clifford et al., 2004—in terms of the number of programs, the number of transactions, and the volume of water traded, with a great deal of variation in form, function, and growth across States.
- Water banking grew from two active banks in 2004 to 24 operating banks in 2016, with an additional seven banks in development (Figure ES-3). This expansion is driven primarily by regulatory imperatives such as groundwater closures (e.g. Upper Kittitas) and Supreme Court rulings (e.g. Postema v. Pollution Control Hearings Board), and encouraged by the need to maintain instream flows for fish.
- A number of options to improve water banking and water markets more generally in Washington exist, including:
    - Seek legislative clarity on mitigation criteria for streamlined bank operation. Mitigation criteria are currently in flux due to recent Supreme Court cases (Swinomish v. Ecology and Foster v. Ecology).
    - Clarify public interest criteria necessary for forming a water bank, since Ecology resources would be used to administer it. As currently structured, each new water bank creates new unfunded obligations on Ecology that detract from other legislatively-prioritized work.
    - Identify financing mechanisms appropriate for water banking, to provide Ecology cost-recovery for bank formation and operation.
    - Identify criteria for banks whose operation depends on water rights originating outside the watershed, to prevent unintended economic impacts.
    - Explore alternatives to conventional operations and monitoring for very small uses that drive bank costs up, including for metering and certified water right examinations.
    - Explore alternative contracting options, such as computer-aided transactions and options contracts for water.

This analysis provides a broad perspective on water bank and water market developments, which can provide ideas for future developments and improvements for the State of Washington.

Summary and Introduction

Water banking is a water management tool used from meeting water demand. Understanding how water banks are working and maturing in Washington State (Washington) is a key element to the economic forecasting component of the 2016 Water Supply and Demand Forecast. Knowledge of water banking helps clarify how water rights will move in response to water supply shortages, curtailments, demographic changes, and climate change. The purpose of this module is to describe water banking activities in Washington and across the Western United States, and provide recommendations on how to improve water banking in Washington. This module is intended to update a 2004 inventory authored by the Department of Ecology (Ecology) and WestWater Research titled "Analysis of Water Banks in the Western States" (Clifford et. al. 2004).

This chapter is designed to provide a general overview of what water banking is and of the organization of this report. Subsequent chapters describe the state of water banking in Washington and other states, barriers and/or constraints to water banking in Washington, and recommendation on how to incentivize and improve water banking.

Purpose of Water Banking

Water banking is an institutionalized process used to transfer water to new uses (MacDonnell, 1995). The water bank acts as an intermediary, bringing together buys and sells with known processes and procedures and some kind of public sanction for its activities (MacDonnell, 1995). The overall goal of a water bank is to facilitate water transfers using market forces. In Washington State, the legislature has identified additional objectives of water banking in RCW 90.42.100, which include:

- Making water supplies available when and where needed during times of drought;
- Improving streamflows and preserve instream values during fish critical periods;
- Reducing water transaction costs, time, and risk to purchaser;
- Faciliting fair and efficient reallocation of water from one beneficial use to another;
- Providing water supplies to offset impacts related to future development and the issues of new water rights;
- Facilitating water agreements that protect upstream community values while retaining flexibility to meet critical downstream water needs in times of scarcity

While water banking is used as a water management tool throughout the United States, the management and policy approaches to water banking has varied from state to state, and, within Washington, even from basin to basin.

Water Banking Defined

The traditional definition for water banking is an institutional mechanism used to facilitate the legal transfer and market exchange of water (Clifford et. al. 2004). However, the term "water banking" is used to refer to a variety of water management practices that extend beyond the traditional definition. Although water banking definitions and approaches differ, the common goal is to move water to where it is needed most.

Banking is facilitated by an institution (the water bank) that operates as a broker, clearinghouse, or market-maker. A clearing house serves mainly as a repository for bid and offer information. Brokers connect or solicit buyers and sellers to create sales, and a market-maker attempts to identify buyers and price water to sell. Many banks pool water supplies from willing sellers and make them available as credits to willing buyers. Generally, a water bank also sets the rules of water bank operations, determines which rights can be banked, certifies water quantities entering and leaving banks, sets contract terms and prices, and facilitates the regulatory requirements (Figure 1). In Washington, many of these actions are defined in the Trust Water Right Agreement (TWRA) between the water bank and Ecology: determining which rights can be banked, certifies water quantities entering and leaving banks, and setting some of the rules of water bank operation such and quantities and locations of water banking.

Figure 1: Water Banking Overview

More detailed information regarding water banking function and approach in Washington is provided in Chapter 2.

Water Banking Authority

States authorize banking in a variety of ways. Authorization ranges from explicit water banking legislative action with oversite provided by state agencies and implied water banking policies and legislation that facilitates transfers, to watershed level actions, to the use of federal policies to support activities. In Washington, water banking has been authorized by the legislature through House Bill 1640 (2003) and the amendment of Chapter 90.42 of the Revised Code of Washington (RCW), with the Washington State Department of Ecology (Ecology) providing regulatory oversight.

Washington's water banking authority is described in Chapter 2. Chapter 3 provides a complete description of water banking activities in other states, and how these water banks are authorized.

Water Bank Functions

Water bankers provide various services to meet out-of-stream and instream water demands. Each trust water right agreement and the driving water management goal along with who the water bank serves will dictate the type of water bank model used and for what purposes. There are four structural/ownership models of water banking that have emerged in Washington. These different structures are generally based on funding type, bank administration, and bank purpose.

1. Public
2. Quasi-Government
3. Nongovernmental Organizations (NGO)
4. Private

Each model has different operating characteristics, structures, and roles. Chapter 2 provides more details about water bank models operating in Washington and the pros and cons of each model type.

Water Bank Models and Metrics

Water banks participate in water transactions for a variety of purposes and over varying water quantities, from

residential groundwater use mitigation of less than one acre-foot[1], to permitted water rights leases and sales for thousands of acre-feet. There are also differences in the amount of consumptive and non-consumptive water transacted from water banks based on purpose and types of water use. To compare different banks and model types, it is important to have a comparable unit and specific metrics such as cost per unit, and units transacted. For the purposes of this report, a unit of mitigation is the quantity of water a water bank does business in.

The most important emerging metric for water banking is basing transfers on consumptive use rather than total use. Consumptive use is defined in several Ecology laws, rules, and policies in varying ways, including:

- *"Water that is transpired by plants at the place of use, water that escapes from a reasonably efficient conveyance system or from the place of use but does not become return flows and water that is contained within a product or within a production byproduct", Policy 1210, Ecology.*
- *"Consumptive use includes crop evapotranspiration, and water evaporated during irrigation applications (e.g. spray, canopy and wind losses)", Guidance 1210, Ecology.*
- *"Consumptive use means use of water whereby there is a diminishment of the water source", WAC 173-500-050(5).*
- *"'Annual consumptive quantity' means the estimated or actual annual amount of water diverted pursuant to the water right, reduced by the estimated annual amount of return flows, averaged over the two years of greatest use within the most recent five-year period of continuous beneficial use of the water right", RCW 90.03.380.*

Consumptive use has emerged as a common water bank metric because in many over-appropriated or seasonally limited basins in Washington, downstream junior appropriators rely on return flows as part of their water supply availability. In such situations, any increase in consumptive use would result in actual or presumptive impairment of 3rd parties. As such, detailed calculation of consumptive use is becoming a standard in the water banking industry, often requiring engineers, hydrogeologists, or other scientific professionals to interpret historic beneficial use via aerial photo coupled with scientific literature and real-time data on consumptive use (e.g., Washington Irrigation Guide, AgriMet, AgWeatherNet, and others). A generalized figure on the consumptive water budget is shown in Figure 2.

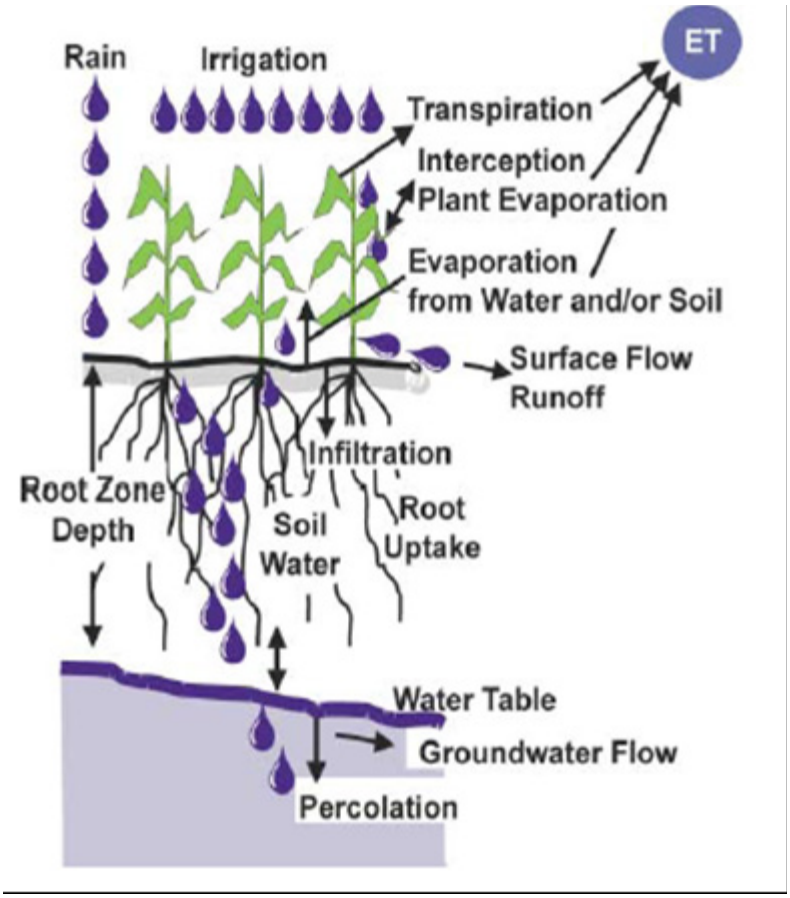

Figure 2: Consumptive Use Components[2]

1 An acre-foot is a unit of volume equal to the amount of water required to cover on acre of land with a foot of water. There are 325,851 gallons in one acre-foot.

2 "Irrigation Efficiency, Encyclopedia of Water Science", Howell, 2003.

Water Banking Seeding Mechanisms

There are two primary concepts of water availability that drive water banking and seeding mechanisms: physical availability and legal availability. Some water banks make water physically available from their supply for withdrawal/diversion. Other water banks simply address legal availability so a new diversion/withdrawal will not impair another user.

An example of a water bank that supplies physical water is the Lake Roosevelt Incremental Storage Release Project. For this bank, water is made physically available for use by storing and releasing water from Lake Roosevelt (Figure 3). The Lake Roosevelt bank is discussed in more detail in section 2.3. Individual users who desire water from this bank must enter into a water service contract with Ecology's Office of Columbia River, along with a permit to use water. All the users from this bank physically access some of the water that is released, although there is some flexibility on the timing of releases relative to the timing of diversions, which are intended to maximize fish benefit in the Columbia River.

Examples of banks trying to solve legal availability issues are the Yakima Basin water banks. In the Yakima Basin, the Bureau of Reclamation withdrew all unappropriated water on May 10, 1905 for the development of several irrigation projects. Because of this, any new use in the Yakima basin must be neutral with respect to the Yakima Basin's total water supply available (TWSA) at a gaging station on the Yakima River known as Parker

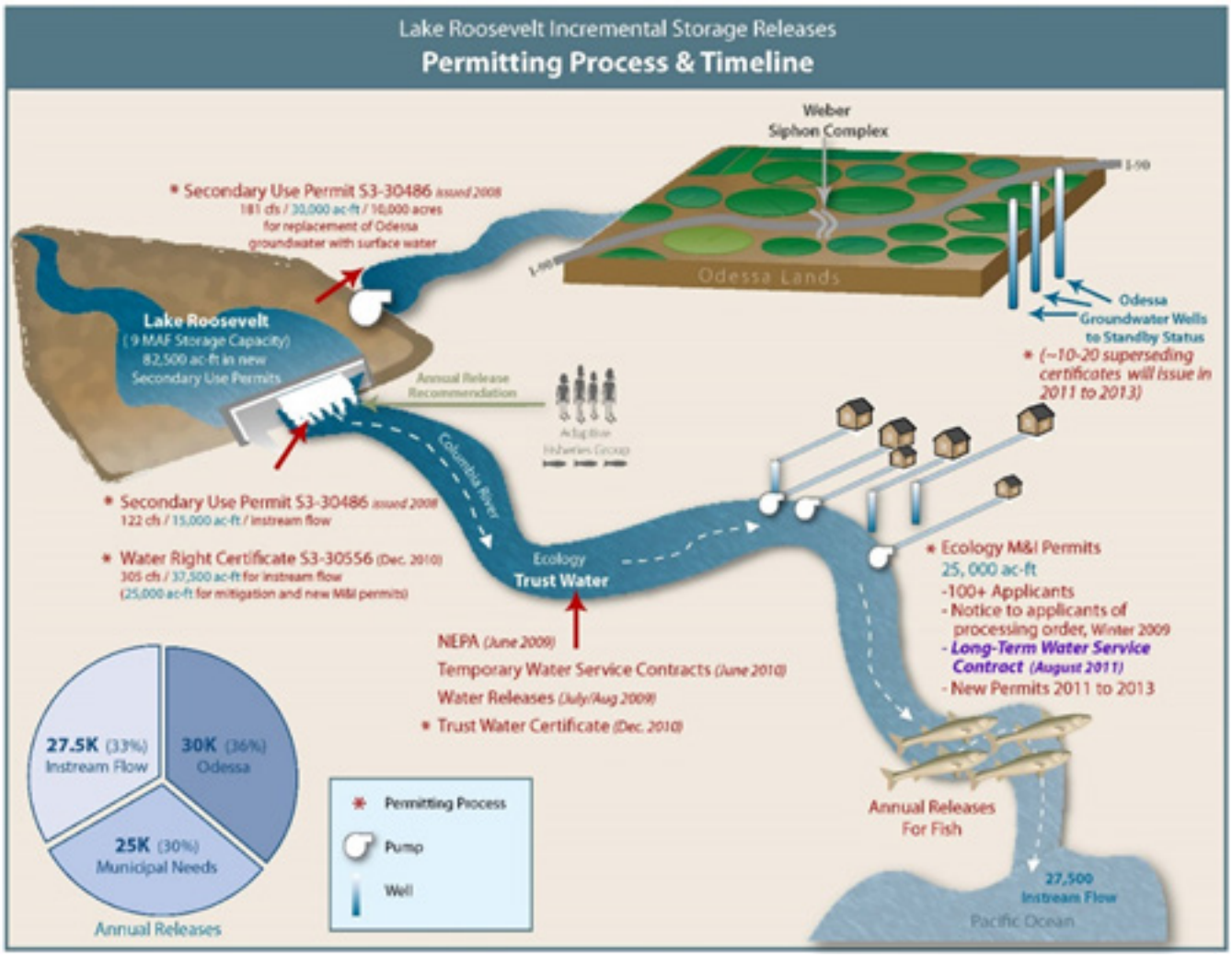

Figure 3: Example of Physical Availability

(labeled PARW on Figure 4). This TWSA neutrality prevents impairment of the Bureau of Reclamation right or other senior water rights in the basin. To meet this requirement, water rights have been placed into the TWRP to offset new uses and ensure TWSA is not impacted at Parker. However, the new uses are not necessarily coupled to the banked water in a way that ensures physical access to the water in the bank. In this example, it can be possible to mitigate for impacts to other water users, address legal availability of water, and not physically divert any of the banked water. The management of the Yakima Basin is illustrated in Figure 4.

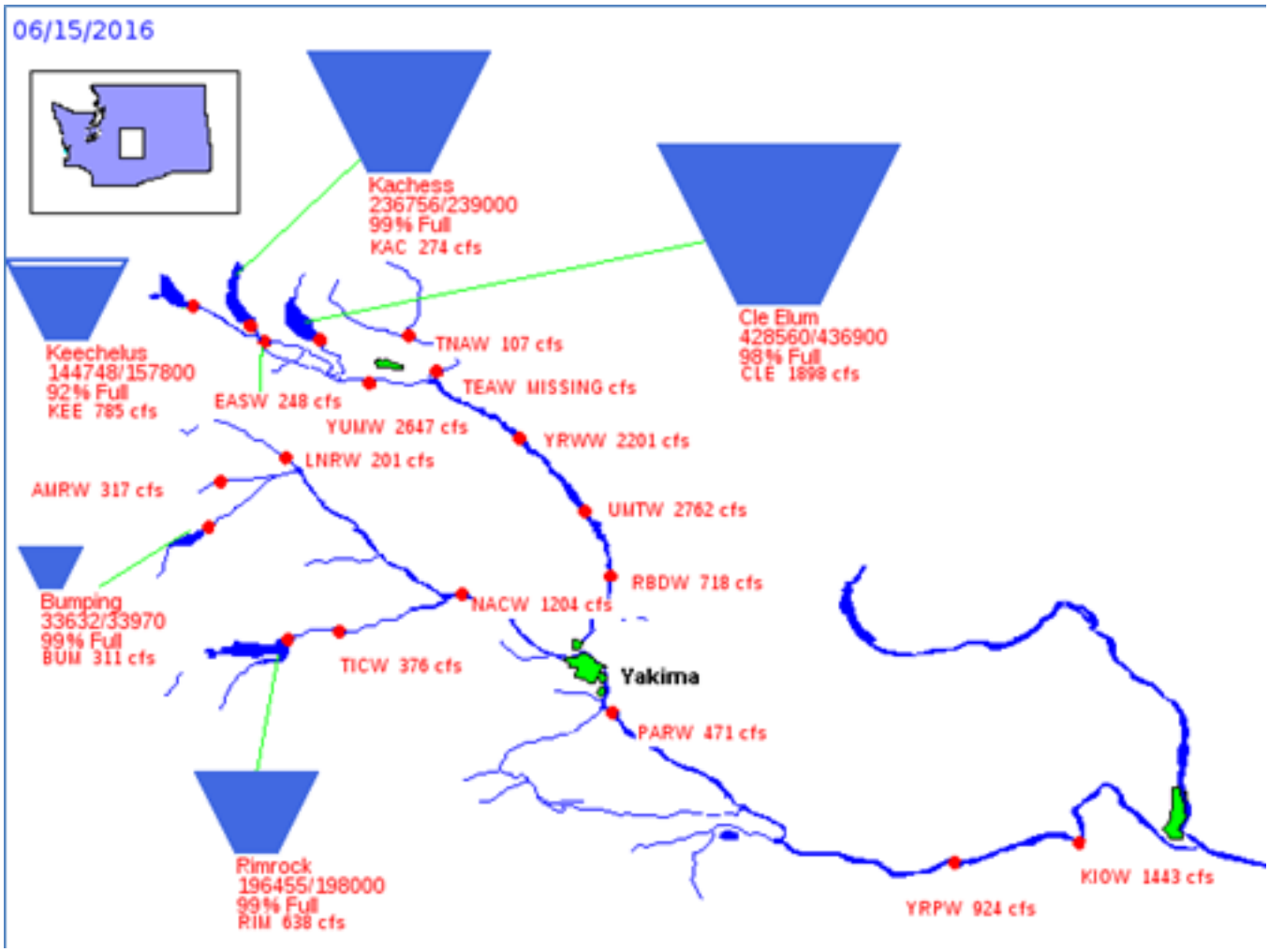

Figure 4: Water Supply Graph for Yakima Basin

Washington State Market Activity and Participation

This chapter discusses Washington's water allocation framework, water banking policy, water banking programs, and compares the water banking models and compares their effectiveness in solving current and anticipated water problems.

Washington Water Allocation Framework

Washington, like other western states, has a prior appropriation framework for water allocation. In times of limited water availability, those who put water to beneficial use first (senior priority dates), have the right to the full use of the water before subsequent users (junior priority dates), or in other words, "first in time, first in right". In dry years, this allocation framework creates a system of "haves" and "have-nots". Those with earlier priority dates enjoy the right to use the full extent of their water right, while those with later priority dates often cannot. Water banking provides a market-based approach to solve this problem by allowing water to be reallocated for new uses.

An illustration of how the prior appropriation system works in Washington is described below for the Yakima Basin. Federal rights in the Yakima Basin were reserved on May 10, 1905, when the U.S. Secretary of the Interior withdrew all the unappropriated surface waters of the Yakima River and tributaries for benefit of the proposed Yakima Reclamation Project, which includes five major reservoirs in the Yakima Basin. This reservation essentially created 3 classes of water users, as described in Figure 5 below.

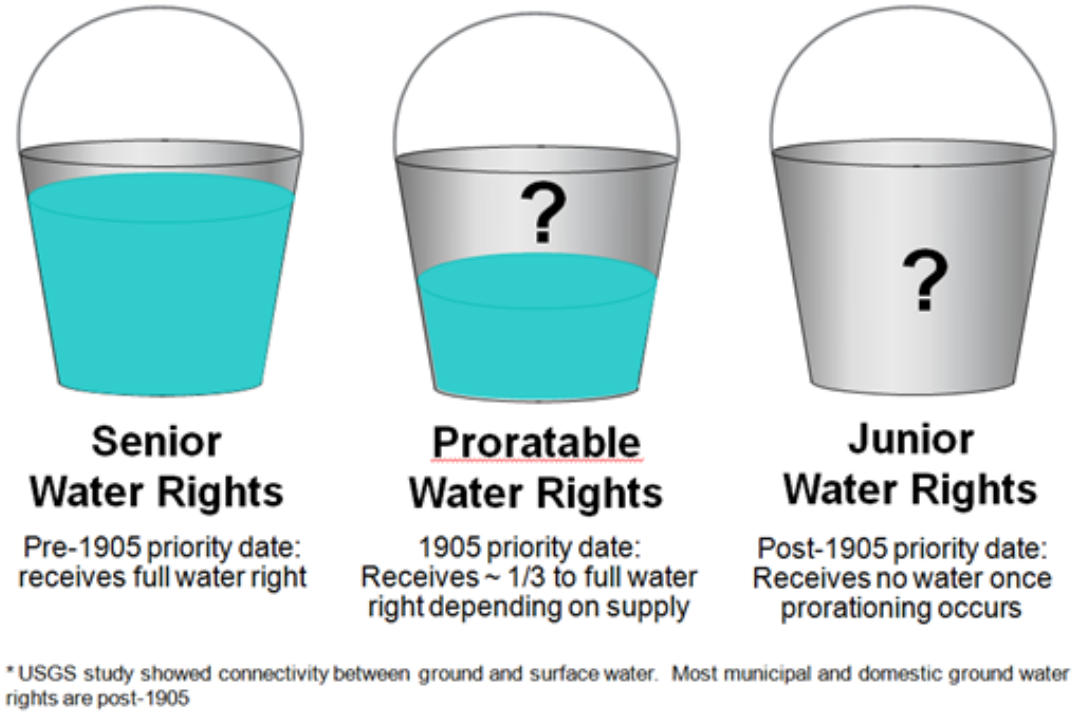

Figure 5: Prior Appropriation System in Yakima Basin, Ecology Presentation, 2015

Historically, this has meant that in four out of five years on average, there is sufficient water supply for all users in the basin. However, when drought occurs, which is on average once every five years, junior water right holders get no water, and proratables'[3] supplies are curtailed, but senior water rights receive their full water right. This is to ensure senior water users are not impaired. In principle, water banks and water markets allow proratable or junior water rights who suffer large losses from curtailment to lease or purchase water from senior water rights holders. Senior water users may choose to market water because they are harmed less economically by drought due to farming choices like forgoing late cuttings of hay or fallowing during a crop conversion.

Washington Water Banking Statutory Review

Water Banking Authority

Washington's statute governing water banking is authorized in RCW 90.42[4]. While the concept and use of the term water bank has been around for years, comprehensive state-wide water banking legislation was not passed by the Legislature until 2009[5]. A trust water right is any water right acquired by the state for management in the TWRP on a temporary and/or permanent basis. The TWRP provides a way to legally hold water rights for future uses without concern for the relinquishment for non-use per RCW 90.14.140(2)(h). Water rights are typically held in trust to benefit instream flows or preserve groundwater, to protect them from relinquishment, to be considered beneficially used, or to offset new out-of-stream uses.

While in the TWRP, the water right maintains its original priority date, with a specified place of use (stream reach or aquifer), an instantaneous and annual quantity (typically specified as a monthly schedule), and a period of use (e.g., irrigation season, or year-round). These instream flow water right attributes are necessary for the trust water right to be beneficially used and account for the water right as instream flow to offset (mitigate) new water uses. Ecology's use of a water right it holds in trust is typically governed by a TWRA, which is a contract between the state and the owner of the water right describing the terms of trust.

Trust water rights are considered beneficially used when they are exercised for incremental enhancement of instream flow. Ecology can provide notice of exercise of trust rights through a public notification process via the internet (http://www.ecy.wa.gov/programs/wr/market/trstdocs. html).

Ecology has a statutory role in setting up water banks via the TWRP, though day-to-day administration of the banks range from full Ecology administration (e.g., Port of Walla Walla, Lake Roosevelt, Sullivan Lake, Cabin Owners) to 3rd party administration (e.g., Dungeness, Walla Walla). Potential water bank managers need to reliably fill this function in a way that meets the public trust standard. Managers currently include local government, such as counties or cities, creation of a watershed-based water resource management entity, non-profit NGO's, or private companies or individuals.

TWRP provides the fundamental authority for water banking. The source water right that is "banked" is held by Ecology in the TWRP. To use the water for out-of-stream mitigation, or issue mitigation credits from the bank, the TWRA specifies many of the rules such as location, quantities that can be used for mitigation, and the quantity of the mitigation credit. The water is held in the TWRP until its diversion authority is formally conveyed to the buyer. Ecology policy requires the use of the TWRP to ensure water availability at the new

3 Proratable water rights are water rights that receive a pro rata portion when there is not enough water to meet demand.

4 A Yakima basin trust water statute also exists in RCW 90.38; however, it focuses strictly on the trust water right statute applicable to that County.

5 See in general RCW 90.42.100 through 130.

location, because it is a mechanism to protect water from other intervening users. Typically, this involves four procedural steps:

1. Attributes of a senior water right are changed, either by Ecology or a local conservancy board, including:

   a. The purpose of use, typically changed to instream flow and mitigation of new out-of-stream uses.

   b. The place of use changed from the former appurtenant land to the portion of river or aquifer where the bank will operate.

   c. The point of diversion is eliminated and replaced with a description of the "primary" and "secondary" reaches of the trust water right. The "primary" reach is quantified based on total use from the historic point of diversion to the historic return flow point. The "secondary" reach is quantified as the consumptive portion of the right below the historic return flow point (Figure 6).

   d. Extent and validity of the water right is analyzed.

2. Water is conveyed to trust by a contract or deed. Ecology must have ownership interest in the water right seeding the bank in order for it to reside in the trust program for water banking purposes.

3. A TWRA is adopted. The TWRA is a contract that describes the conditions under which Ecology will hold the water right in trust and release and/or permit water from the water bank, explaining the purposes, metrics, and the water right processing framework.

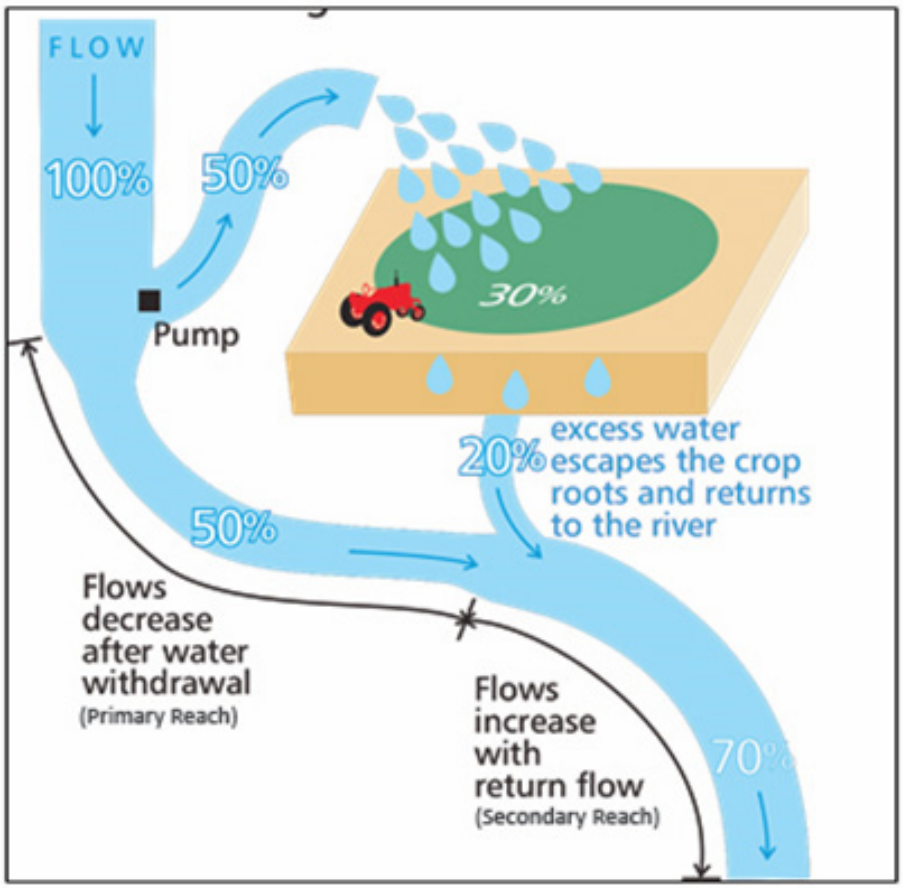

Figure 6: Primary / Secondary Reach Example

4. New mitigated water rights are issued by Ecology and debited from the water bank. Ecology issues water budget neutral (WBN) determinations for permit exempt uses and Reports of Examination (ROE) and permits for all other uses. Accounting ensures that new "withdrawals" do not exceed the original "deposit".

Although Washington's TWRP was authorized in 1991, water banks have only significantly expanded in the last 10 years in response to several factors including:

- River basin closures (i.e., basins closed to new water uses, such as in Upper Kittitas County); Adoption of new instream flows rules (e.g., Dungeness water exchange);
- Response to local collaboration to solve water supply problems (e.g., Walla Walla, White Salmon, Little Spokane and Methow Valley banks); and
- Through new legislative focusses (e.g. Office of Columbia River (OCR), Yakima Basin Cabin Owners (Cabin Owner) bank).

Proposed Water Banking Legislation

Over the last five years, several bills have been introduced the concern water banking:

SSB 6179 (2016) Concerning water banking (Prime Sponsor: Senator Honeyford): This bill requires water rights accepted into trust to be "adequate". This bill also included transparency measures such directing Ecology to maintaining cost and fees, priority dates, and amount of water available for all water banks on their website. Additionally, the bill required consultation with stakeholders on water banking.

EHB 1187 (2016) Concerning best practices for water banks; originally introduced in 2015 with companion SB 5014 (Prime Sponsors: Representative Chandler and Senator Honeyford): These bills only applied to the Yakima Basin. The bill included transparency and consistency measures for water banks, like the posting of cost and fee schedules for water banks to agency websites and prohibiting preferential treatment in granting mitigation credits for similarly situated water uses. Additionally, these bills required water supplies for water banks to be "adequate, reliable and uninterruptible".

HB 2760/SB 6533 (2014) Concerning best practices for water banks (Prime Sponsors: Representative Chandler and Senator Honeyford): This bill included transparency and consistency measures such as filling fee schedules with Ecology and prohibiting preferential treatment in granting mitigation credits to similarly situated water uses with a few exceptions. Additionally, the bill required water supplies for water banks to be "adequate, reliable and uninterruptible."

SHB 1350 (2013) Providing options for local communities to balance growth of the community with water resource goals (Prime Sponsor: Representative Chandler): The purpose of this bill was to provide counties with dimmer switch authority, set exempt well withdrawal limits between 350 and 5000 gpd, establish county run water banks, and give counties reviewing prospective subdivisions the ability to rely on exempt wells as adequate sources for potable water.

HB 1589 (2011) Concerning trust water rights (Prime Sponsor: Representative Blake): This bill required Ecology to review trust water right applications within 45 days of receipt. Though, applicants could request an extension of 30 days.

Of these bills, only SB 6179 has passed. The passing of SB 6179 has resulted in the enactment of RCW 90.42.130. Currently, Ecology is reformatting their website and soliciting information from water banks to meet the requirements of RCW 90.42.130.

Water Banking Case Law

Case law on water rights issues has been evolving based on several relevant recent decisions and will continue to affect water rights decisions in the state, given that several more key decisions are pending. Below is a summary of significant legal cases that impact water bank development.

- *Postema v. Pollution Control Hearings Board* (Supreme Court of the State of Washington 2000). This decision defined the "one molecule" standard for instream flow impairment, meaning impairment does not need to be physically measureable, but scientifically-acceptable methods that demonstrate de minimus impacts can constitute impairment.

- *Swinomish Indian Tribal Community v. Ecology* (Supreme Court of the State of Washington 2013). This decision invalidated reservations established in rule for new water uses, including exempt wells, created through amendments to the Skagit instream flow rule. It also decided that Ecology went beyond its statutory authority in applying overriding consideration of the public interest (OCPI) to rulemaking that conflicted with the established instream flows.

- *Whatcom County v. Hirst* (Court of Appeals of the State of Washington 2015). This decision essentially directs local governments to follow Ecology's interpretation of instream flow rules. According to the decision, if Ecology interprets a particular instream flow rule to provide a specific exemption for domestic exempt wells, then a county can rely on that interpretation in making water availability determinations related to land use decisions. This is the case even if there are unmet senior instream flows. This decision also acknowledges that each instream flow rule must be interpreted individually. Ecology has indicated that they are completing an analysis of each rule, and plan to provide their interpretation to local governments in the future. There is now a petition pending before the Washington Supreme Court on behalf of the appellants to review this decision, and as a result some uncertainty still exists regarding the final outcome of this case.

- *Foster v. Ecology* (Supreme Court of the State of Washington 2015). In this decision the Washington Supreme Court (Court) reversed Ecology's approval of the City of Yelm permit. The approval of this permit was based on the use of OCPI and an out-of-kind mitigation package. Ecology uses OCPI as a tool to approve water right permits when water availability is limited, but it believes the public benefits of approval outweigh any impacts on stream flows. This decision implies a fundamental change on how water-short basins can access water. The implication of this ruling is that no permanent water right will be able to rely on anything other than water-for-water mitigation, in-time and in-place, and no amount of out-of-kind or out-of-time mitigation can offset even de minimis (one molecule) impacts to adopted instream flows. This ruling makes it imperative that banks appropriately match supply and demand spatially and temporally because Ecology no longer has the ability to use OCPI and out-of-kind mitigation to permit new water uses.

Case law on exempt use, impairment of instream flows, conjunctive management of surface and groundwater, county building permit and Growth Management Act (GMA) responsibilities, and OCPI standards continue to be clarified by the court system. There is a corresponding trend towards county co-management with Ecology of the risk of future curtailment and the associated impacts on property values, on the ability to develop property, and on property transactions when instream flows are not met.

Ecology and counties are exploring ways to co-manage risk based on the direction being provided by the courts, such as the evaluation of water bank feasibility for particular basins. In addition, Ecology is preparing an updated guidance document (Guidelines for Determining Water Availability for Subdivisions and Buildings, 1993) and has convened a stakeholder workgroup to provide input to Ecology during development of the guidance. The guidance document will address the roles and responsibilities of both Ecology and local governments in physical and legal water availability determinations.

One of the emerging challenges that is playing out in the courts, in stakeholder forums, and potentially the Legislature, is the standard under which OCPI authority can be exercised by Ecology. This becomes important when seeding a water bank, and trying to match supply and demand through banking transactions while striving to reduce the risk of future curtailment, often to meet public health and safety reliability criteria.

The ability to use OCPI to address imperfect supply and demand matching in water banking is in a state of flux at this time. The Swinomish Indian Tribal Community v. Ecology case invalidated the 2006 Amendment to the Skagit Rule that provided water for new uses of the permit exemption and clarified that OCPI should be used less broadly than Ecology applied it in this case. In Foster v. Ecology the courts determined OCPI in the context of an individual permitting decision was inappropriate despite relying in part on out-of-kind benefits (e.g. habitat, water quality, passage). The recently settled Okanogan Wilderness League and Center for Environmental Law and Policy v. Ecology and Kennewick General Hospital case considered under what standards OCPI needs to be used, and whether impairment exists if the functions and values of the instream flow are still met. This case was settled based on a combination of out-of-kind mitigation and a component of interruptibility of water use.

Washington Water Banking Programs

Water Bank Structures

The existing approaches to water banking in Washington have strengths and weaknesses. To date, water banks have operated under four general water bank formational, operational, and managerial structures. The operational structures include:

1. Public
2. Quasi-Government
3. Nongovernmental Organizations (NGO)
4. Private

Figure 7 provide a summary of the locations and types of water banks operating in Washington.

Public

Public entities for the purpose of this section are considered to be State, County, City, or other local governments. Many public entities in the State operate water banks. In some cases, these are called “water banks”, in others “water exchanges”, in some cases by the entities served (e.g. Cabin Owners), or by the supply that seeded the bank (Lake Roosevelt Drawdown). Regardless of whether the public entity calls it a “water bank”, it is a water bank if it uses the TWRP to convert senior water rights into new appropriations. However, the footprint of the public entity could range from merely their typical regulatory function to also include all

formation, operation, and management functions of a water bank. Hybrid banks result when a public entity contracts with a third party to perform the non-regulatory functions.

Washington water banks formed, operated, and/or managed under the jurisdiction of local public entities for the purposes of providing domestic mitigation to-date include:

- Chelan County Reserve Program (County)
- Kittitas County Water Bank (County)
- White Salmon Water Bank (City)

Other water banks are being studied or are in development to facilitate counties in meeting legal availability requirements for domestic, exempt well water demand. These developing water banks are associated with areas of heightened groundwater management and groundwater rules in the following areas: Yakima County, Skagit County, Douglas County, Klickitat County, Water Resource Inventory Area (WRIA) 55 (Little Spokane) and WRIA 59 (Colville Basin).

In addition, Ecology, through the Office of Columbia River and Water Resources Program, is operating water

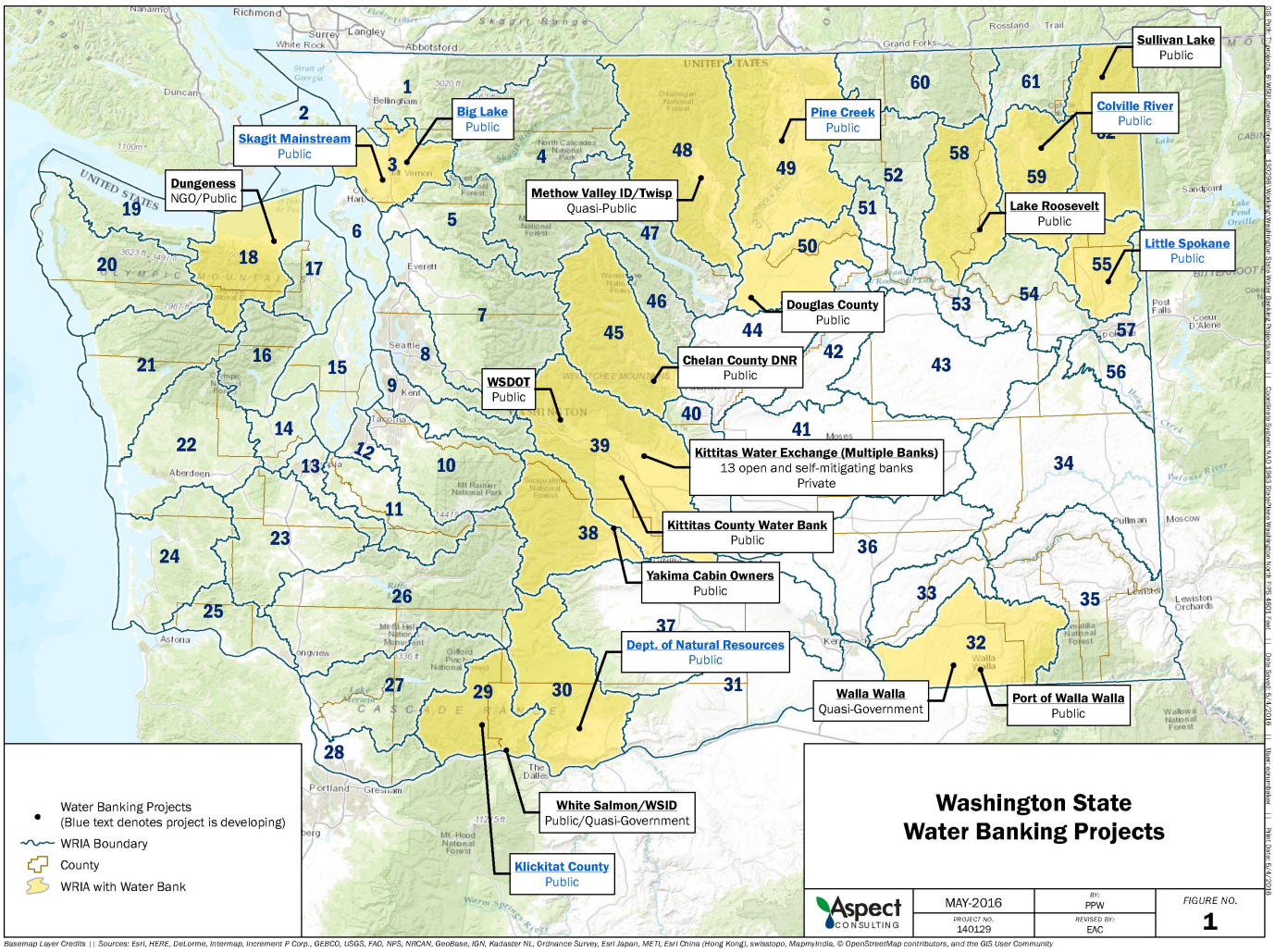

Figure 7: Water Banking in Washington State by WRIA

banks and permitting water rights for new uses (inclusive of both domestic water use and other water uses) with the following programs: Lake Roosevelt Drawdown, Sullivan Lake, Cabin Owners, and the Port of Walla Walla.

Quasi-Government and Nongovernmental Organizations (NGO)

Quasi-government organizations for the purpose of this section are considered to be entities formed by the legislature (i.e., Irrigation Districts, Walla Walla Watershed Management Partnership). Nongovernmental Organizations (NGO) are considered to be entities operating under IRS tax code 501(c)3 (i.e. Washington Water Trust). Washington water banks formed, operated, and/or managed under the jurisdiction of quasi-government and NGO entities for the purposes of providing mitigation include:

- Dungeness Water Exchange (for domestic, rural irrigation, and stockwater uses)
- Walla Walla Water Exchange (for rural irrigation)

Private

Private entities for the purpose of this section are considered to be private for-profit corporations incorporated under State and Federal Law. Private water banks currently in operation are limited to the Yakima Basin where an Ecology Upper Kittitas County Emergency Groundwater Rule, and now permanent Groundwater Rule, WAC 173-539A, requires mitigation of all new groundwater uses in Upper Kittitas County (specifically exempt wells).

In response, private water banks formed to fill the new market demand of individual rural landowners needing to mitigate for new permit exempt wells for domestic purposes. In December 2015, Kittitas County opened a County public water bank in many areas formerly dominated by private water banks.

Summary of Washington's Water Banks

Yakima Basin Cabin Owners (Public)

The Cabin Owners water bank is a public water bank operated by Ecology. Washington State Senate Bill 6861, with an effective date of June 07, 2006, provided guidance and funding to Ecology to develop a water bank to help cabins and camps that get curtailed in dry years. Ecology seeded this bank with senior irrigation water rights they purchased, and are using the Storage Exchange Contract to between U.S. Bureau of Reclamation's (Reclamation) and Ecology to manage seasonal rights to mitigate for new and out-of-priority uses. Because there is storage in the basin that is managed to meet federal instream flow targets, Reclamation and Ecology can mitigate instream flow impacts from the Cabin Owners water bank without having shoulder season impacts. To date, Ecology has mitigated for 349 cabins[6] at an average rate of $60/unit and $3,600/acre-foot consumptive.

Website: http://www.ecy.wa.gov/programs/wr/cro/sb6861.html

Port of Walla Walla Lease Program (Public)

The Port of Walla Walla Lease Program is a public bank operated by OCR. The purpose of this bank is to provide term leases to those needing temporary water from the Columbia River in Walla Walla County (or downstream). The bank was seeded through a lease from the Port of Walla Walla for 4,761 acre-feet of water. All leases are temporary and seasonal, and cost $105 per acre-foot per year.

Website: http://www.ecy.wa.gov/programs/wr/cwp/pww-permits.html

6 As of April 2016

Lake Roosevelt Incremental Storage Releases Program (Public)

The Lake Roosevelt Incremental Storage Releases Program is operated by OCR and provides a source for up to 25,000 acre-feet of water to permit new municipal, domestic, and commercial/industrial uses from the Columbia River and groundwater in close communication with the river. To date, 41 water rights have been issued under this bank, totaling 5,056 acre-feet. Water rights issued under this program are permanent and cost $35 per acre-foot per year.

Website: http://www.ecy.wa.gov/programs/wr/cwp/cr_lkroos.html

Sullivan Lake Water Supply Project (Public)

The Sullivan Lake Water Supply Project authorizes 9,400 acre-feet of water for use within Okanogan, Ferry, Stevens, Pend Oreille, Douglas, and Lincoln counties. In this legislatively defined project, half of the available quantity is to be used for domestic, municipal, commercial, and industrial uses, while the other half may be used for any other purposes, such as irrigation. The Sullivan Lake Water Supply Project is operated by OCR. Permanent water rights can be established under this program for $60 acre-foot per year for 25 years ($1,500 per acre-foot total).

Website: http://www.ecy.wa.gov/programs/wr/cwp/sullivan.html

Kittitas County Water Bank (Public)

The Kittitas County Water bank is administered by Kittitas County. This bank was created after a settlement agreement between the County and Department of Ecology to resolve a case before the Eastern Washington Growth Management Hearings Board. To provide mitigation water to domestic water users, the County purchased four existing water banks and uses the Ecology/Reclamation Storage Exchange Contract to manage seasonal rights to mitigate for year-round new uses, just like the Cabin Owners program. Kittitas County issues water budget neutral determinations for mitigation that is likely suitable, as determined by Ecology's suitability maps. The cost of participating in this program is $2195 per equivalent residential unit (ERU).

Website: https://www.co.kittitas.wa.us/health/programs/environmental-health/water-resources.aspx

Washington State Department of Transportation (Public)

The Washington State Department of Transportation (WSDOT) established a water bank to offset water used for the I-90 construction project. WSDOT seeded their water bank with a senior surface water right to mitigate the potential impacts of their water use. This bank is not open to the public. WSDOT has recently applied to Ecology for a new temporary permit to irrigate vegetation associated with the Highway 410 Reconstruction project. This new permit would be mitigated by a small amount of water left in their bank that is not being used by the I-90 project. When the I-90 expansion project is complete, WSDOT may use the bank to mitigate water use for future WSDOT projects within the Yakima Basin.

City of White Salmon/ White Salmon Irrigation District (Public)

The City of White Salmon created a public water bank, within WRIA 29b, to provide for instream flow enhancement, municipal water supply, and other out-of-stream uses. The water bank was created by transferring 5,781acre-feet from the White Salmon Irrigation District and the City to the trust water rights program. To date, this water bank has been used for self-mitigation. The City currently has permitting authority to contract surplus water to new users through direct service from their municipal system. If indirect service were to be provided, additional authority from the state would be required under their TRWA.

White Salmon Irrigation District converted some of its surplus supply to instream flow and is in the process of negotiating a TWA with Ecology on how best to allocate it.

Dungeness Water Exchange (Public/NGO Partnership)

The Dungeness Water Exchange is a Public/NGO partnership water bank operated by Clallam County and Washington Water Trust (WWT). The Dungeness Water Management Rule, Chapter 173-518 WAC, went into effect on January 2, 2013 and required new uses of groundwater to be mitigated. Ecology provided administrative and seed funds to develop the water bank through the acquisition of senior irrigation rights, which were environmentally-protective in this case because it was determined that mitigation was not necessary outside the irrigation season. A portion of the bank involves development of infrastructure projects to retime and recharge high flow events to increase base flow through groundwater augmentation. To date, WWT and Clallam County have conveyed an estimated 50 units of mitigation at a rate of $1,000/unit and $11,100/acre-foot consumptive.

Websites: http://www.washingtonwatertrust.org/water-exchange; and http://www.ecy.wa.gov/ programs/wr/instream-flows/dungeness.html

Walla Walla Water Exchange (Quasi-government)

The Walla Walla Water Exchange is a Quasi-government water bank operated by the Walla Walla Watershed Management Partnership (WWWMP). The Walla Walla River Basin Rule, Chapter 173-532 WAC, was amended in September 2007 to require new outdoor irrigation uses of groundwater under the permit exemption to be mitigated. Ecology provided state administrative and seed funds to develop the water bank through the acquisition of senior irrigation rights. Only irrigation season offsets are being provided, so the use of irrigation rights for bank seeding is appropriate. To date, WWWMP has conveyed less than 10 units of mitigation at a rate of $2,000/unit and $3,600/acre-foot consumptive.

Website: http://www.wallawallawatershed.org/partnership/participate/138-wb-ewmp

Yakima Basin Water Exchanges (Private Sector)

The Yakima Basin Water Exchanges are predominately a series of private water banks operated for-profit. The Yakima Basin Water Exchanges began when Ecology enacted a series of emergency groundwater rules in Upper Kittitas County beginning on July 16, 2009, requiring all new permit exempt groundwater uses to be mitigated. On January 22, 2011, Ecology formalized the permanent Upper Kittitas Groundwater Rule, Chapter 173-539A WAC, creating long-term groundwater mitigation requirements. The State of Washington, through Ecology, has used public funds to provide regulatory administrative services (issuing Water Budget Neutral Determinations) and regulatory oversight. Private investors have seeded their own water banks and manage all of the administration, other than permitting and regulatory oversite of water accounting. Seeding has occurred through acquisition of senior irrigation rights, and either the use of the Ecology/Reclamation Storage Exchange Contract to cover offseason impacts, or use of private on-site storage-and-release ponds for off-season mitigation. To date, there have been several private water banks in the Yakima Basin established as part of the Yakima Basin Water Exchanges. Several of these banks have been purchased by other entities, and currently the Roth-Clennon and the Williams and Amerivest banks are operated as public banks by Kittitas County. Northland Resources, Starkovich, and the Land Lloyd Development banks are self-mitigating and not currently open to the general public.

- Bourne Bank
- Suncadia Bank
- Roth-Clennon (Kittitas County)
- Northland Resources

- JP Roan Bank
- Swiftwater Ranch
- Masterson Ranch
- Reecer Creek Golf Course (SC Aggregate)
- Williams and Amerivest (Kittitas County)
- Burchak Tillman Creek
- Williams – Cabin Owner Bank
- Starkovich
- Land Lloyd Development
- Central Cascade Lands Company (Yakima Mitigation Services)

These banks have conveyed an estimated 827 units of mitigation[7] at rates ranging from $1,250 per mitigation unit or $41,600/acre-foot consumptive, to $10,000 per mitigation unit or $72,900/acre-foot consumptive.[8] These banks generally operate on the basis of suitability maps developed with Ecology as part of their TRWA's, and published on Ecology's website[9]. The suitability maps are based on potential impairment and show areas in green where the bank can supply mitigation water, areas in yellow where they may supply mitigation water in the future if additional study on Yakima River tributary impacts is completed, and areas in red where mitigation from a particular bank is likely unsuitable.

Methow Valley Irrigation District (Quasi-Government)

Methow Valley Irrigation District (MVID) created a water bank to improve irrigation reliability, serve additional lands, provide municipal water for the Town of Twisp, and improve instream flows in the Twisp and Methow Rivers. The water bank was created by transferring 2,996 acre-feet of irrigation water to the TWRP. The Town of Twisp has received a new mitigated water right, based on a purchase and sale agreement between the MVID and the Town of Twisp. MVID received a new mitigated water right for their reconstructed irrigation delivery system. MIVD is currently working through an assignment process for members who received individual wells as a part of a district-wide improvement project managed by Trout Unlimited. This bank is self-mitigating and not currently open to the general public.

Developing Banks

Currently, there are several water banks being developed to address local water availability or reallocation needs. These banks are at different development stages.

- ***Pine Creek, Okanogan County***
  The Pine Creek water bank is an OCR project. OCR purchased a 958-acre-foot irrigation water right in Okanogan County to seed the Pine Creek bank. Currently, OCR is developing business rules on where and how to operate the bank. The water right was purchased by OCR and is held as an irrigation right in the TWRP, and a trust water ROE is pending.

- ***Department of Natural Resources, Paterson***
  The Department of Natural Resources (DNR), Patterson water bank is seeded by a 1,248 acre-foot DNR irrigation water right in Klickitat County. DNR has donated the water right into trust, and is developing their banking framework, but it would likely be for use on DNR public lands. Before the bank launches, Ecology would change the right to instream flow and negotiate a Trust Water Right Agreement with DNR.

- ***Big Lake Water Rights Mitigation Bank, Skagit County***
  Ecology purchased 28.56 acre-feet of water from the Big Lake Water Association, a public water system in the Skagit Basin. Ecology will soon be announcing a draft mitigation proposal for the Big Lake water rights, including the area served by the mitigation and the process for obtaining mitigation credits. Ecology will be seeking input on the proposal before finalizing the mitigation project.

7 Base data from 2015, with April 2016 updates for seven banks.

8 The Starkovich bank and Land Lloyd Development bank were not included in price analysis provided here and elsewhere in the report because of the self-mitigating nature of these banks.

9 Yakima County Water Banks on Ecology's website: http://www.ecy.wa.gov/programs/wr/cro/wtrxchng.html.

- ***Upper Skagit Tribe Water Bank***
  Ecology has awarded a grant to the Upper Skagit Tribe to launch a groundwater recharge and mitigation project in the Fisher Creek drainage or the Skagit Basin. Currently, this basin is closed to new water uses, including domestic permit exempt wells. This proposed mitigation bank will utilize groundwater infiltration, retiming runoff and enhancing groundwater and streamflow levels. Currently, this project is still in the planning stages.

- ***Little Spokane Water Bank***
  Spokane, Stevens, and Pend Oreille Counties are working together to evaluate the use of a water bank to address existing and potential regulatory constraints on existing and new water uses in the Little Spokane Watershed. Spokane County commissioned a water banking Feasibility Study, and is currently in the process of developing a banking model and identifying potential seed water.

Summary of Washington Water Banking Metrics

Comparing Water Banks

Water banks transact quantities of water for a variety of purposes, from groundwater use under the permit exemption of generally less than one acre-foot (i.e., indoor and outdoor domestic use for a single residence) to permitted water rights in the tens, hundreds, or thousands of acre-feet (i.e., irrigation, industrial and municipal uses). For example: one transaction from a private water bank in Kittitas County conveyed 0.137 acre-feet per year consumptive for indoor domestic use and irrigation of 500 square feet. Another transaction from OCR for the Sullivan Lake Water Bank conveyed 1,100 acre-feet per year to the City of Bridgeport as a new water right permit.

For the purposes of comparing water banks' activity, we have consolidated the significant variation in quantities of water involved in each transaction to a "unit of mitigation". A unit of mitigation is the quantity of water a water bank does business in. A unit of mitigation is a term of art used for comparison purposes here and is not defined in statue or rule. However, this helps compare one water bank to the next when reporting transaction volumes (i.e., units of mitigation sold) and unit pricing (i.e. cost per unit). To standardize reporting across different bank metrics, when reporting acre-foot consumptive pricing, we have quantified water conveyed by the residential unit, and water conveyed by the acre-foot, to the acre-foot consumptive equivalent. Significant variation exists between water banks based on market forces, demand, purpose, and regulatory requirements. The above assumptions are built into the analysis to provide a foundation to equally compare the overall productivity of water banks.

Water Bank activity and prices

Selection of the type of water banking model is dependent on the regulatory environment, timing of the need for water bank development relative to regulatory actions, and ability of Ecology and counties to agree on the standards for legal water availability and physical availability.

Price, or the amount of money paid for one unit (not including fees), and volume of units transacted is highly variable between water banking models, as shown in Table 1. Public water banks have the lowest overall price per unit and price per acre-foot, but with the lowest number of units transacted to date. Private water banks account for the highest cost per unit and cost per acre-foot, and include the highest number of units transacted.

Private water banks appear to the be the most productive based on the number of units transacted, but the units transacted is skewed in favor of private water banks based on the nature of regulatory actions related to rural growth and scale of Upper Kittitas County in the Yakima Basin. A summary of transaction differences between public and private banks is shown on Figure 8 and Table 1.

Private water banks in Washington state appear to be most active. Private banks have issued 827 mitigation credits compared to 53 for non-profit/quasi-governmental, and 381 for public water banks. This is likely related to locations and markets served, as well as regulatory requirements for water banking. All of the private banks are located in Kittitas County, where WAC 173-139A withdrew all public groundwater within the upper Kittitas county from appropriation. Figure x show how many units have been transacted by banking model.

Table 1. Summary of Price of Water charged by Public/Private Water Banks (transactional fees not included)

	Cost of Water/Unit	Cost/acre-foot con-sumptive
Public		
Average	$920	$1,290
Minimum	$60	$3,600
Maximum	$1,700	$1,000
Quasi-Government/NGO		
Average	$1,500	$7,350
Minimum	$1,000	$3,600
Maximum	$2,000	$11,100
Private		
Average	$5,250	$41,600
Minimum	$1,250	$27,000
Maximum	$10,000	$131,200
Note: Excludes annual rate programs and lease programs Data collected through spring 2015		

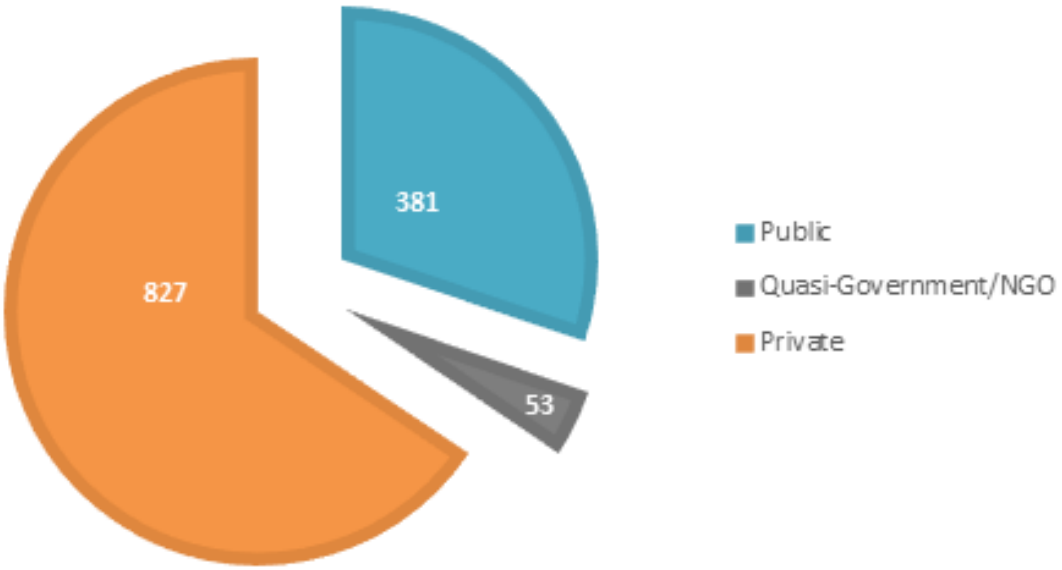

Figure 9: Units Transacted by Banking Model

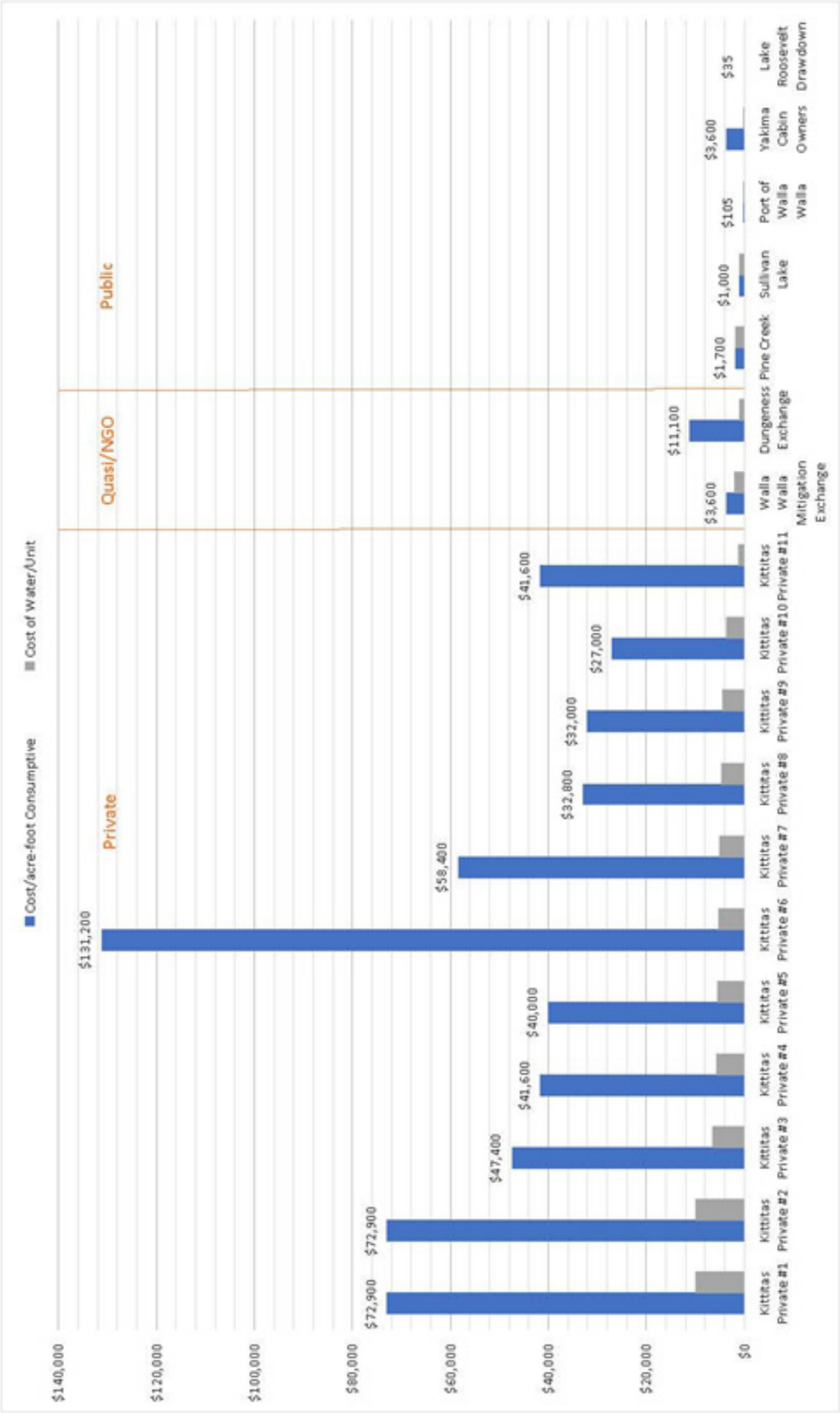

Figure 8: Comparing Price of Different Water Bank Models

Within private water banks, there is competition for market share. Two of the water banks, Suncadia and Yakima mitigation Services, have much higher activity than the others. Some of the reasons for this are hard to determine, but in at least one case it is likely due to being the first into the Kittitas County market, a high visibility and marketing strategy, and partly a built-in customer base.

Summary of Banking Effectiveness in Solving Water Problems

Comparing Models

While there are various ownership models of water banks, all of the above listed water banks have been initiated with the goal of providing reliable and legally defensible water transfers to the customer base. The following sections compare the effectiveness of each model to solve water problems. The sections below discuss the pros and cons of each model with respect to issues such as time and cost.

Public Water Banks

As illustrated in Figure 6 and Table 1, public water banks have accounted for an estimated 230 units of domestic mitigation transacted. With new public water banks coming online, the number of units transacted by public water banks may increase. Costs ranged from $1,000 per mitigation unit and consumptive acre-foot (Sullivan Lake), to $60 per mitigation unit and $3,600/acre-foot consumptive (Ecology, Yakima Basin Cabin Owners). Table 2 below summarizes the pros and cons associated with public water banks.

Table 2. Summary of Pros and Cons of Public Water Banks

Pros	Cons
May be formed, operated, and/or man-aged by public entities	Timing – generally slow to establish (1 to 3 years)
Set parameters on pricing, unit volume, service area, etc., through public process; ability to manage market activity, trading zones, targeted users	Potential concerns over divestiture of as-sets; potential third-party litigation
Most favorable pricing to buyers	Minimal returns to sellers. Sustainabil-ity/duration based on low cost
Typically established and seeded through public funds	Restrictions on availability and use of public funds
Established to serve basic and extended public services (outside irrigation, stock-water, etc.)	Costs associated with bank management
	Reduced incentives for private banks to de-velop within the basin

Quasi-Government/NGO Water Banks

A summary of Quasi-Government and NGO water bank transaction costs and volumes is provided in Figure 6 and Table 1. To date, Quasi-Government and NGO water banks have accounted for an estimated 53 units of domestic mitigation transacted at a price ranging from $1,000 per mitigation unit and $11,100/acre-foot consumptive (Dungeness Water Exchange, Clallam County/Washington Water Trust), to $2,000 per mitigation unit and $3,600/acre-foot consumptive (Walla Walla Watershed Management Partnership, Walla Walla Water Exchange). Table 3 summarizes the pros and cons of quasi-government and NGO Water Banks.

Table 3. Summary of Pros and Cons of Quasi-Government / NGO Water Banks

Pros	Cons
May be formed, operated, and/or managed by public interest entities	Timing – generally slow to establish (1 to 3 years)
Typically set parameters on pricing, unit volume, service area, etc. through public process	Decreased concerns over divestiture of assets, although retained as a concern if NGO works on behalf of a public entity
Generally mid-range prices	Restrictions on availability and use of pub-lic funds
Usually established and seeded through public funds	Management of the water bank likely to be less costly than public banks
Established to serve basic and extended public services (outside irrigation, stock water, etc.)	Potential long-term fiduciary liability to managing entity
Ability to establish market activity, trading zones, etc.	
Sustainability, higher prices than public banks can extend longevity	

Private Water Banks

As illustrated in Figure 6 and Table 1, private water banks have accounted for an estimated 818 units of mitigation transacted in the Yakima Basin at a price ranging from $1,250 per mitigation unit, $41,600/acre-foot consumptive (Kittitas "Private" #11), to $10,000 per mitigation unit, $72,900/acre-foot consumptive (Kittitas "Private" #1 and 2). Table 4 summarizes the pros and cons of private water banks.

Table 4. Summary of Pros and Cons of Private Water Banks

Pros	Cons
Timing – generally the quickest to establish (6 months to 1 year). This is because most private banks are seeded through trust wa-ter right rather than infrastructure changes (e.g. Lake Roosevelt drawdown, MVID).	Formed, operated, and managed to gener-ate profit, with associated higher pricing.
Profit motive provides incentive to make water available for sale, and yields high return on investment for sellers	Generally highest prices and highest trans-action costs, which do not incentivize bank participation
Usually serves basic and extended public services (outside irrigation, stock water, ext.) based on market demand	Limited ability to establish market activity, trading zones, etc.
Control over divestiture of assets	Sustainability – limited controls on longevity

The analysis of the benefits and challenges of different water banks in this report is tempered by the incomplete transparency within individual water banks. Some banks have little incentive to provide complete clarity on transactions, price points, internal business rules, and internal bank goals. In reality, each group of banks designed in this report (e.g. private, public, NGO), operates as a spectrum with different levels of service characteristics, so wholesale comparisons likely fall short. These factors will undoubtedly be more clear in the future as a result of legislative intervention via SB 6179 which requires water banks to operate in a more transparent manner and Ecology to publish this information.

While each of the different models provide benefits and challenges, overall each water bank allows for the reallocation of water to new uses. Using market forces and the regulatory framework provided in Washington, water banks provide a mechanism for those who would otherwise be excluded from a resource because of scarcity to gain access.

Water Banking in the Western U.S.

This section summarizes the state of water banking activities in eleven western states of United States – Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Utah, and Wyoming. The description of water banking for each state is different depending upon the nature of water banks operational in those states and availability of information. The information presented in this section, which varies between states, include number of applications processed for leasing or renting water rights, the associated prices, groundwater banking balances, number of water rights mitigation transactions etc. They were collected from various sources including water bank annual reports, water bank websites and personal communication with authorities.

Arizona

Overview of Water Banking in Arizona

All water banking activity in Arizona is governed by the Arizona Water Banking Authority (AWBA). The AWBA was established in 1996 in order to increase utilization of the state's Colorado River entitlement and to develop long-term storage credits for the state. The overarching purpose of the AWBA is to provide secure and reliable water supplies to municipal and industrial users, provide water to Native communities as required by settlement agreements, and assist California and Nevada through interstate banking arrangements.

In order to fulfill these objectives, the AWBA sponsors the storage and delivery of water from the Colorado River into central and southern Arizona through the Central Arizona Project (CAP) every year. The water is stored underground in existing aquifers (direct recharge) or is used by irrigation districts in lieu of pumping groundwater (indirect or in-lieu recharge). For each acre-foot stored, the AWBA accrues long-term storage credits that can be redeemed in the future when Arizona's communities or neighboring states need this backup water supply. Since its inception, the AWBA has banked approximately 4 million acre-feet of long term storage credits; 3.4 million acre-feet of credits to provide back-up supplies during shortages to certain Arizona cities and Indian communities, and 600,000 acre-feet of credits for interstate purposes on behalf of the state of Nevada.[10]

The AWBA has historically purchased excess water from the CAP when it is available. However, the water supply in the Colorado River is predicted to diminish in coming years. According to current projections, a water supply shortage is expected to be declared as early as 2016 in the lower basin of the Colorado River and might persist for the next decade.[11] Furthermore, excess water is available to the AWBA only after the Central Arizona Water Conservation District (CAWCD), a tax-levying public improvement district that manages and operates the Central Arizona Project canal, has fulfilled the water demands of its higher priority users. According to the priority system outlined by the U.S. Secretary of the Interior's 1983 Record of Decision, the excess water is the most junior priority behind municipal and industrial users, Indian water users, and non-Indian agriculture water users.[12] The AWBA focuses on various planning processes to identify specific actions to help them fulfill their objectives and responsibilities. Examples of such action planning processes include the following:

a. The Indian Firming Program dedicated to addressing the state's obligations towards various water rights settlements.

b. Amendment of AWBA's governing statutes to facilitate buying long term storage credits even when excess CAP water is not available.

10 Annual Report. 2014. Arizona Water Banking Authority.
11 Annual Report. 2014. Arizona Water Banking Authority.
12 Arizona State Senate: Issue Brief. 2015. Arizona State Legislature.

c. Planning intended to provide a framework for the recovery of long term storage credits and the delivery of that water during future shortages.

d. dynamic modeling that can incorporate new information as it becomes available to predict the intensity and timing of water shortages.

Trading Activity in Arizona

The following tables summarize the water banking trading activity in terms of long term storage credits for the AWBA. Table 5 shows the number and location of long-term storage credits accrued in 2014, Table 6 shows the cumulative long-term storage credits accrued through December 2014 and Table 7 shows the average annual cost to obtain a long-term storage credit for intrastate storage.

Table 5. Number and location of Long-term Storage Credits Accrued in 2014 (Acre-feet)[13]

Funding Source	Phoenix AMA	Pinal AMA	Tucson AMA	Total
4-cent Ad Valorem Tax	23,435	6,584	17,977	47,996
Withdrawal Fees	3,144	6,429	2,314	11,886
General Fund	-	-	-	-
Shortage Reparation	-	-	7,750	7,750
Intrastate Total	26,579	13,013	28,041	67,632
Interstate-Nevada	-	-	-	-
Total	26,579	13,013	28,041	67,632

Table 6. Cumulative Long-term Storage Credits Accrued through December 2014 (Acre-feet) [14]

Funding Source	Phoenix AMA	Pinal AMA	Tucson AMA	Total
4-cent Ad Valorem Tax	1,358,825	205,214	422,292	1,986,330
Withdrawal Fees	320,679	408,459	103,306	832,445
General Fund	42,316	306,968	54,546	403,830
Other Intrastate:				
Indian Firming Appro-priation	-	-	28,481	28,481
Shortage Reparation	20,642	60,507	17,822	98,970
GSF Operator Full Cost Share	-	14,125	-	14,125
Intrastate Total	1,742,462	995,273	626,477	3,364,181
Interstate-Nevada	51,009	440,241	109,791	601,041
Total	1,793,471	1,435,514	736,238	3,965,222

13 Annual Report. 2014. Arizona Water Banking Authority
14 Annual Report. 2014. Arizona Water Banking Authority

Table 7. Average Annual Cost to Obtain a Long-term Storage Credit for Intrastate Storage[15]

Year	Credits	Funds Ex-pended($)	Average cost ($/acre-foot)	Ratio of groundwater storage facility (GSF) to underground storage facility(USF)
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	272,123	11,163,000	41.02	60:40
2001	275,406	10,893,000	39.55	62:38
2002	262,317	13,700,000	52.23	64:36
2003	200,168	11,077,666	55.34	47:53
2004	251,456	17,855,997	71.01	41:59
2005	85,782	5,615,201	65.46	58:42
2006	162,342	14,720,277	90.67	17:83
2007	245,221	14,589,390	59.49	37:63
2008	203,373	8,168,100	40.16	65:35
2009	99,453	6,977,590	70.16	76:24
2010	181,214	26,027,947	143.63	21:79
2011	127,605	16,543,540	129.65	33:67
2012	125,503	17,314,052	137.96	42:58
2013	72,404	10,963,900	151.43	31:69
2014	67,795	12,048,490	177.72	24:76

California

California water banking programs, including physical storage of groundwater as well programs for leasing of water rights have historically been supported by state and federal policies in California. The concept of water banking was introduced in the state after the droughts of 1980s and early 1990s. However, water banking or leasing programs in early years were mostly temporary. The trend has shifted to more permanent transfers in recent years and has also become larger in scale.

Most of California's surface water is governed by the appropriative water rights doctrine. According to this doctrine's 'use it or lose it' requirement, water rights lapse for any water not used for five consecutive years. The transfer of groundwater is less regulated by the state because California's water code does not apply to most groundwater in the state. In most counties, the transfer of groundwater depends on local ordinances. However, since many groundwater basins in the state are connected to a surface water source, pumping groundwater can reduce surface flows of these sources. The Department of Water Resources in California has developed guidelines that include restrictions on the locations of wells that can be used to pump groundwater.[16]

Table 8 provides a summary of groundwater banking balances in various regions of California.

15 Annual Report. 2014. Arizona Water Banking Authority

16 California's Water Market by the numbers: Update 2012. 2012. Hanak and Stryjewski.

Table 8. Groundwater banking balances and activity by region and end use in California (acre-feet)[17]

	Agriculture	Urban	Mixed Use	Total balance	Total withdrawals
S.F Bay Area	-	551,277	-	551,227	130,343
Kern County	1,140,803	17,743	241,679	1,400,225	1,226,805
Other San Joaquin Valley	202,045	1875	-	203,920	93,467
Southern California	-	826,378	-	826,378	752,181
Unspecified Region	-	-	10,032	10,032	81,631
Total Balance	1,342,848	1,397,273	251,711	2,991,782	
Total Withdrawls	1,101,055	284,523	898,849		2,284,427
Note - Balances are as of 2011, withdrawals are cumulative (1990-2011).					

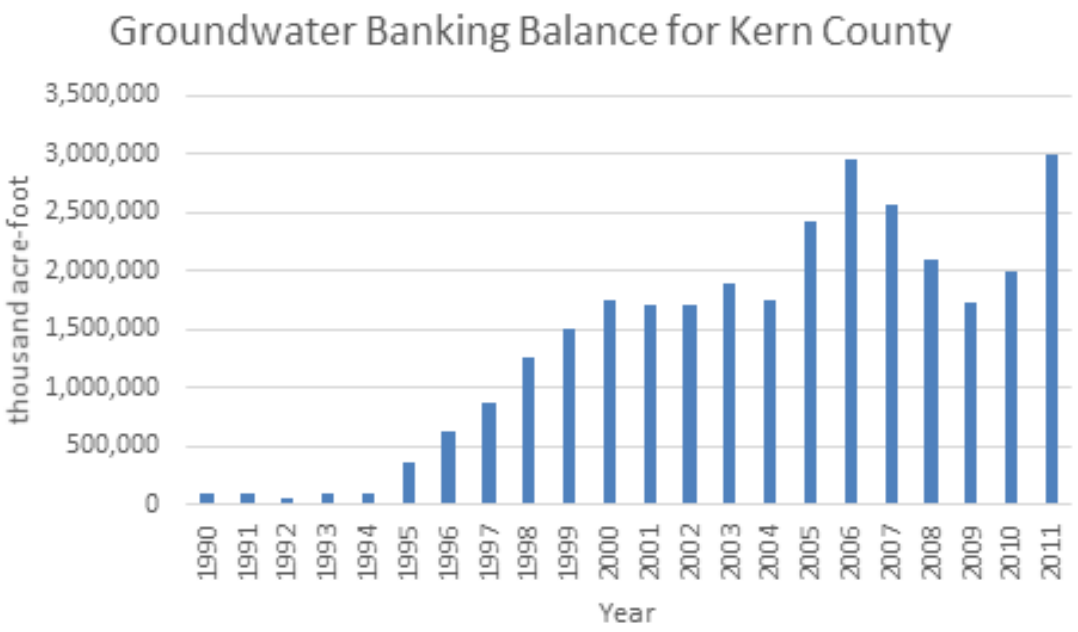

Figure 10: Groundwater balances in Kern County, CA (1990-2011) [20]

Water Banks in Kern County

Since the 1990s, numerous local agencies in Kern County, California have developed banks. Today, there are 11 operational groundwater banks in Kern County. Among them, the Kern Water Bank is the largest bank that serves various public and private water agencies. Between 1990 and 2006, approximately 3 million acre-feet of physical water has been stored in these water banks. The majority of this water was withdrawn during dry conditions of late 2000s. However, storage levels were restored back after a wet 2011.[18] Figure 7 below shows the groundwater banking balances for Kern County from 1990-2011. The balances represent the amount of groundwater remaining at the end of the given year. These banks mainly store water for offsite parties including agricultural agencies, urban agencies and the state of California. These banks do not have a formalized management regime and are dependent on local ordinances. They do have protocols to protect the local users from injury due to withdrawals from offsite parties.[19]

17 Table 3. California's Water Market by the numbers: Update 2012. 2012. Hanak and Stryjewski. Data have not been found for subsequent years.
18 California's Water Market by the numbers: Update 2012. 2012. Hanak and Stryjewski
19 California's Water Market by the numbers: Update 2012. 2012. Hanak and Stryjewski
20 Adapted from - California's Water Market by the numbers: Update 2012.Figure 13. 2012. Hanak and Stryjewski

Southern California Water banks

The water banks in southern California are administered by the Metropolitan Water District of Southern California (MWDSC). The MWDSC works with different local water agencies to meet the water needs of the region. It coordinates various groundwater banking operations in Southern California with various water districts in the region and provides the funding for infrastructure necessary for such operations. MWDSC initiated a storage program in the 1990s involving adjudicated basins and special groundwater management districts. The water was physically stored in these basins and pumped out when needed by the local agencies. The pumps and additional infrastructure funded by the MWDSC can be used by the local agencies for their own operations when not being used for MWDSC pumping.[21] Figure 8 below shows the groundwater banking balances for Southern California from 1990-2011.

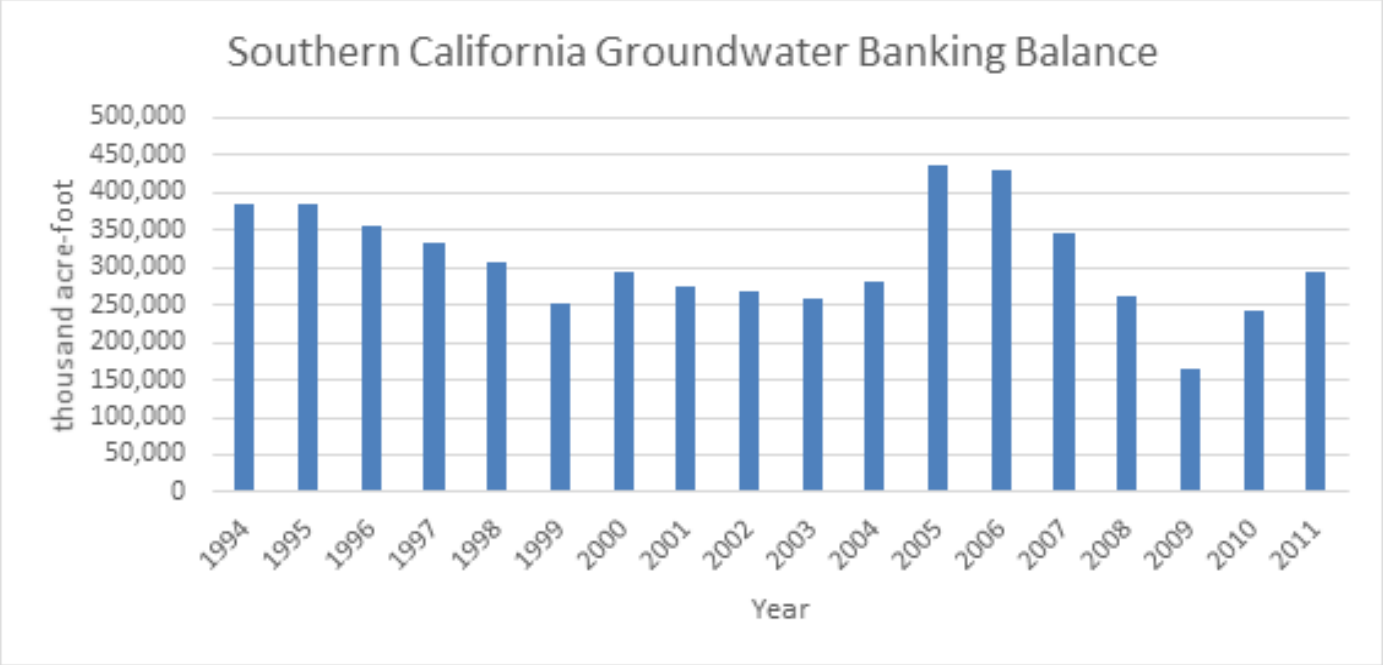

Figure 11: Groundwater banking balances for southern California (1994-2011) [22]

The Semitropic Groundwater Storage Bank

The Semitropic Groundwater Storage Bank, located in Kern County, California began its operation in the 1990s. It is one of the largest groundwater banking operations in the world. It has currently six major banking partners who have supplied their surplus water to the bank totaling 700,000 acre-feet. The project is capable of storing 1.65 million acre-feet of water and if necessary, deliver 90,000 acre-feet of water to its banking partners via the California aqueduct.[23] Semitropic is the largest water bank in Kern County, and stores water for entities outside Kern County. It operates an informal conjunctive use program for its customers, who are mostly farmers. Semitropic has banking partners who deliver their surplus water to Semitropic during wet years. Semitropic's water banking is done in basins that already have secured the rights to store and withdraw water based on formalized through adjudications or special management districts. On the other hand, Kern County Water bank is operated based on semiformal agreements. [24]

21 California's Water Market by the numbers: Update 2012. 2012. Hanak and Stryjewski
22 Adapted from - California's Water Market by the numbers: Update 2012.Figure 14. 2012. Hanak and Stryjewski
23 Semitropic water storage district website - http://www.semitropic.com/BankingPartners.htm
24 Adapted from - California's Water Market by the numbers: Update 2012. 2012. Hanak and Stryjewski

Table 9. Allocation of stakes between Semitropic's banking partners [25]

A. Original Water Bank	Stake (AF)
Metropolitan Water District of Southern California (MWDSC)	350,000
Santa Clara Valley Water District	350,000
350,000	
Alameda County Water District	150,000
Newhall Land and Farming Company	55,000
San Diego County Water Authority	30,000
Zone 7 Water Agency	65,000
B. Stored Water Recovery Unit	
Poso Creek Water Company, LLC	60,000
San Diego County Water Authority	15,000
City of Tracy	10,500
Homer, LLC	15,000
Harris Farms, LLC	10,500
Unallocated	64,250
Uncommitted (used by all customers)	474,750
TOTAL	650,000

The Semitropic water bank can be divided into the original water bank and the stored water recovery unit. The stored water recovery unit is a special groundwater banking program within the Semitropic Groundwater Storage Bank designed to increase storage, water recovery and pump-back capacity of the bank. Table 9 shows the breakdown of water allocation stakes between Semitropic's various banking partners.

Colorado

Arkansas River Basin Water Bank

The Arkansas River Basin water bank was created in Colorado following the approval of Arkansas Water Bank Program by the Colorado General Assembly in 2001. The water bank was created with a goal to increase the availability of water for farmers, ranchers and cities through proper valuation of water rights. It allowed for one year leasing programs for stored water within the Arkansas River Basin and its tributaries. The South Eastern Colorado Water Conservancy District was the chosen bank operator for this pilot program.

The water banking program was primarily designed to work through a website. The depositors and bidders were supposed to register themselves and detailed information about them would be available through the website. The price was supposed to be determined through negotiations between interested buyers and sellers. Various documents, sample contract agreements and forms were made available through the website to facilitate transactions between interested buyers and sellers. However, the program gathered very little interest. Only 4 individuals deposited water in the bank and 3 of them withdrew in light of no interest from the bidders.[26] Therefore, the original set up of the water bank created in 2003 was a failure. Some of the reasons for this failure were prices that were higher than market prices, long timeline to complete transactions, question marks on the deliverability of water to various regions and the fact that it was a virtual water bank with no physical storage capabilities.[27]

25 Semitropic water storage district website - http://www.semitropic.com/BankingPartners.htm
26 Analysis of Water Banks in the Western States. 2004. Department of Ecology and WestWater Research.
27 Update of the water banking in the Arkansas presented to the interim water resources review committee. 2013. Upper Arkansas Water Conservancy District

A new statute was adopted in 2006 that made the water bank permanent. The Upper Arkansas Water Conservancy District (UAWCD) was authorized as the water bank operator in the Arkansas Basin. Various changes were made to the original water bank created in 2003. Some of the changes included expedited transaction timeline and more authority to the water bank operator, including setting the minimum asking price. However, these modifications have not resulted in any trading activity through the bank. The UAWCD proposed to take over as bank operators but it never really came about and the project is currently not active.[28]

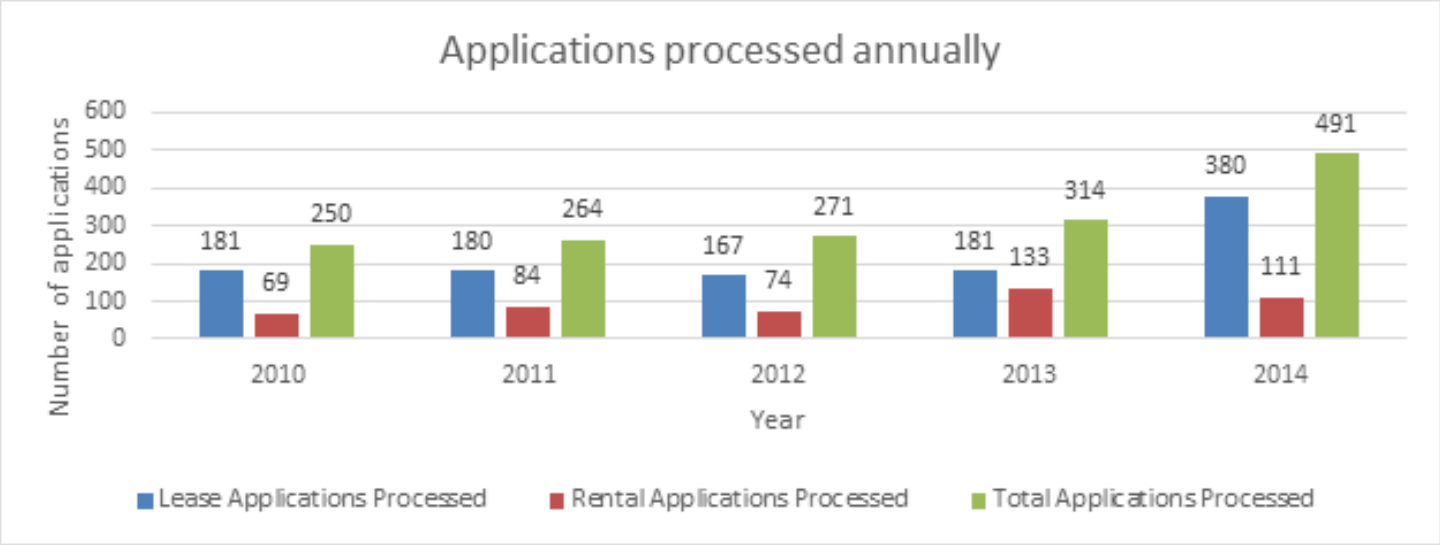

Figure 12: Number of applications processed each year from 2010-2014 [29]

Table10. Application processing data for IWRB's water supply bank for 2014 [30]

Month	Lease Applications Received	Lease Applications Pending	Lease Applications Processed	Rental Applications Received	Rental Applications Pending	Rental Applications Processed	Total Applications Re-ceived	Total Applications Processed
Jan	136	136	24	37	37	1	173	25
Feb	40	152	27	18	54	3	206	30
Mar	49	174	39	14	65	11	239	50
Apr	38	173	41	13	67	14	240	55
May	55	187	57	8	61	17	248	74
Jun	14	144	23	5	49	18	193	41
Jul	22	143	31	6	37	12	180	43
Aug	7	119	18	3	28	8	147	26
Sep	16	117	12	6	26	5	143	17
Oct	4	109	31	0	21	14	130	45
Nov	2	80	27	1	8	6	88	33
Dec	0	53	50	0	2	2	55	52
Sum	383	3	380	111	0	111	3	491

28 Personal communication with Upper Arkansas Water Conservancy District. December, 2015.
29 Report for the Board's Water Supply Bank. 2014. Idaho Department of Water Resources Board
30 Report for the Board's Water Supply Bank. 2014. Idaho Department of Water Resources Board

Idaho

Water banks in Idaho are separated onto two categories by the Idaho Department of Water Resources Board (IWRB) as water supply banks and local rental pools. The Board's water supply bank handles water rights-related cases for all surface and groundwater throughout Idaho and is governed by the Idaho Department of Water Resources.

Board's Water Supply Bank

The Idaho State Water supply bank was officially established in 1979 and is governed by the IWRB. The bank rules were amended once in 1980 and again in 1993. Through this bank, interested parties can lease their water rights into the bank or rent water rights from the bank for all surface and groundwater within Idaho. The leases and rentals are generally for one to five years in duration. The filing fee to lease a water right to the bank is between $ 250 - $ 500 per water right, with the potential for additional rental fees. The rate to rent a water right from the bank is $14 per acre-foot.[31]

The owner of a water right may offer to lease a portion or all of the water right through an application. The board then makes the water under such leased right available to interested users. After a water right is leased, 90 % of the rental fees are paid to the water rights owner and 10 % of the rental fees goes to the board to cover administrative costs. To rent a water right through the bank, the interested party must submit an application to the board for the designated rental fee and then the board will try to match the needs of the renter with one of the rights in the bank.[32]

Trading activity in Idaho

The 2014 annual report for the Idaho state water supply bank mentions that there were 835 water rights leased into the water bank that represents 250,000 acre-feet of water on approximately 75,000 irrigable acres at the time of the report. The following figure summarize the recent trading activity for Idaho State Water Supply Bank. Figure 9 shows the number of applications processed each year by the bank from 2010-2014, and Table 10 summarizes the application processing information of the IWRB's water supply bank for 2014.

Rental Pools

Besides IWRB's water bank, there are five state managed rental pools in Idaho. They are the Snake River rental pool (Water District 1), Boise River rental pool (Water District 63), Payette River Rental Pool (water District 65), Payette River Basin on Lake Creek (Water District 65) and Lemhi River rental pool (Water District 74). Rental pools are governed by various committees appointed by the Idaho Water Resource Board. The rental pools are generally for reservoir storage water with the exception of Lemhi River basin, which uses natural flow water.[33] Information on the water banking activities of these rental pools were not readily available. However, the authorities at IWRB have informed us that they will publish the annual report for these rental pools later this year. We hope to be able to incorporate their water banking activities in the final version of this report.

Montana

No state water banks are in operation in the state of Montana. However, a private company named Grass Valley French Ditch Co. which is one of the oldest and largest irrigation companies in Missoula County, has recently created a private water bank. There has not been enough trading activity to report through this private water bank.

31 Report for the Board's Water Supply Bank. 2014. Idaho Department of Water Resources Board.
32 Report for the Board's Water Supply Bank. 2014. Idaho Department of Water Resources Board.
33 Idaho Department of Water Resources Website - https://www.idwr.idaho.gov/water-supply-bank/overview.html

Nevada

Water banking in Nevada is not as advanced as its neighboring state of Arizona. However, the Southern Nevada water authority (SNWA), which is a non-profit water agency established in 1991 to manage southern Nevada's water resources, oversees various banking programs and agreements in the state. The SNWA is currently engaged in three different water banking projects that accounts for nearly six years' worth of Nevada's allocation of the Colorado River water. The Colorado River water is shared by seven different US states as well as Mexico. Under the Colorado River Compact, Nevada receives 300,000 acre-feet of Colorado River water per year from the lower basin of the river.

Agreements with Arizona and California Water Banks

The SNWA is currently engaged in agreements with the Arizona Water Bank and the California Water Bank for storage of water for future use by Nevada. As per the agreement with the Arizona Water Bank, SNWA has about 600,000 acre-feet of water stored in Arizona's aquifers for future use. Storing water in Arizona's aquifers costs the SNWA about $200 per acre-foot.[34] The SNWA can use 40,000 acre-feet of water stored in any given year and up to 60,000 acre-feet of water during a declared shortage. If the SNWA needs to use this water, Arizona will use the specified amount of water stored in its aquifers and forgo using the same amount of water from the Colorado River. Such water flows into Nevada and the SNWA distributes this water via various facilities located at Lake Mead.

Similarly, the SNWA has entered various agreements in the last decade with the California Water Bank. These agreements facilitate the storage of unused water from the Colorado River in California for future use by Nevada. More than 205,000 acre-feet of water had been stored in California as per these agreements by 2014. Another 150,000 acre-feet was stored in 2015 resulting in a total storage of 355,000 acre-feet. California pays $30 per acre-foot to store water in their banks.[35] The agreement between California and Nevada allows California to pay Nevada and use the stored water during drought. However, Nevada can withdraw and return the funds to California and recover water from this storage if needed. Nevada is eligible to use 30,000 acre-feet of this water per year.[36]

Southern Nevada Water Bank

Starting in 1987, the Las Vegas Valley Water District and the City of North Las Vegas, both SNWA agencies, began pumping water from the Colorado River into the valley's primary groundwater aquifer whenever water demand was lower than Nevada's allocation of Colorado River water. This arrangement constitutes the Southern Nevada Water Bank (SNWB). The SNWB has stored about 337,000 acre-feet of water for future use since its inception until 2014. The stored water can be recovered by the SNWA under any water supply conditions.[37]

New Mexico

There is no comprehensive water banking program operating in New Mexico at present. In New Mexico, "the State Engineer is statutorily charged with supervising the state's water resources through the measurement, appropriation, and distribution of all ground and surface water in New Mexico, including streams and rivers that cross state boundaries" [38]. The State engineer has not authorized any water banking programs. The Water Resource Allocation Program (WRAP) administers water rights throughout the state. During 2009-2010 and

34 Personal communication with Mack Bronson, Southern Nevada Water Authority. December 15, 2015.
35 Personal communication with Mack Bronson, Southern Nevada Water Authority. December 15, 2015.
36 Southern Nevada Water Authority website - http://www.snwa.com/ws/future_banking.html.
37 Southern Nevada Water Authority website - http://www.snwa.com/ws/future_banking.html
38 Annual Report.2011. New Mexico Office of the State Engineer Interstate Stream Commission

Table 11. Surface water documents processed in NM (2009-2011) [39]

District								
	1	2	3	4	5	6	7	State totals
Document Type	-	-	-	-	-	-	-	-
Application for Extension of Time	-	17	2	4	34	6	-	63
Certificate of Construction	-	-	-	-	-	-	-	-
Change of Own-ership	63	75	61	13	124	471	11	818
Change Point of Driver & Place/Pump of Use	26	10	2	1	3	31	2	75
Combine & Comingle	-	1	-	1	-	-	-	2
Declaration	154	9	16	3	-	15	6	203
Dedication of Retired Rights	-	1	-	-	-	-	-	1
Emergency Au-thorization	-	-	-	-	1	2	-	3
License to Ap-propriate or to Change Place and or/ Purpose of Use	-	-	-	-	-	-	-	-
Livestock im-poundment Dec-larations	2	2	-	8	1	1	-	13
Livestock im-poundment Per-mits	3	-	1	-	28	28	1	35
Meter Readings Processed thru WATERS	-	14	-	-	27	27	-	41
Miscellanous Sur-face Water Per-mits	-	25	-	1	1	1	-	30
Notice for Publi-cation	34	-	17	5	33	33	4	101
Notice of Intent to Appropriate	42	-	-	-	-	-	-	42
Permit to Appro-priate	-	1	-	2	1	1	-	4
Permit to hange Place and/or Purpose of Use	2	6	4	1	6	6	2	27
Permit to Change Point of Diver-sion	3	-	-	-	8	8	1	12
Permit to Change Point of Diver-sion from GW to Surface	3	2	-	-	1	1	-	6
Proof of Applica-tion of Water to Beneficial Use	9	6	3	-	5	5	2	29
Conservation Plan	-	0	5	-	-	-	-	5
Proof of Comple-tion of Works	-	0	6	-	3	3	1	13
Supplemental	1	9	6	1	1	1	1	19
Totals	342	178	123	40	188	640	31	1542

39 Annual Report.2011. New Mexico Office of the State Engineer Interstate Stream Commission

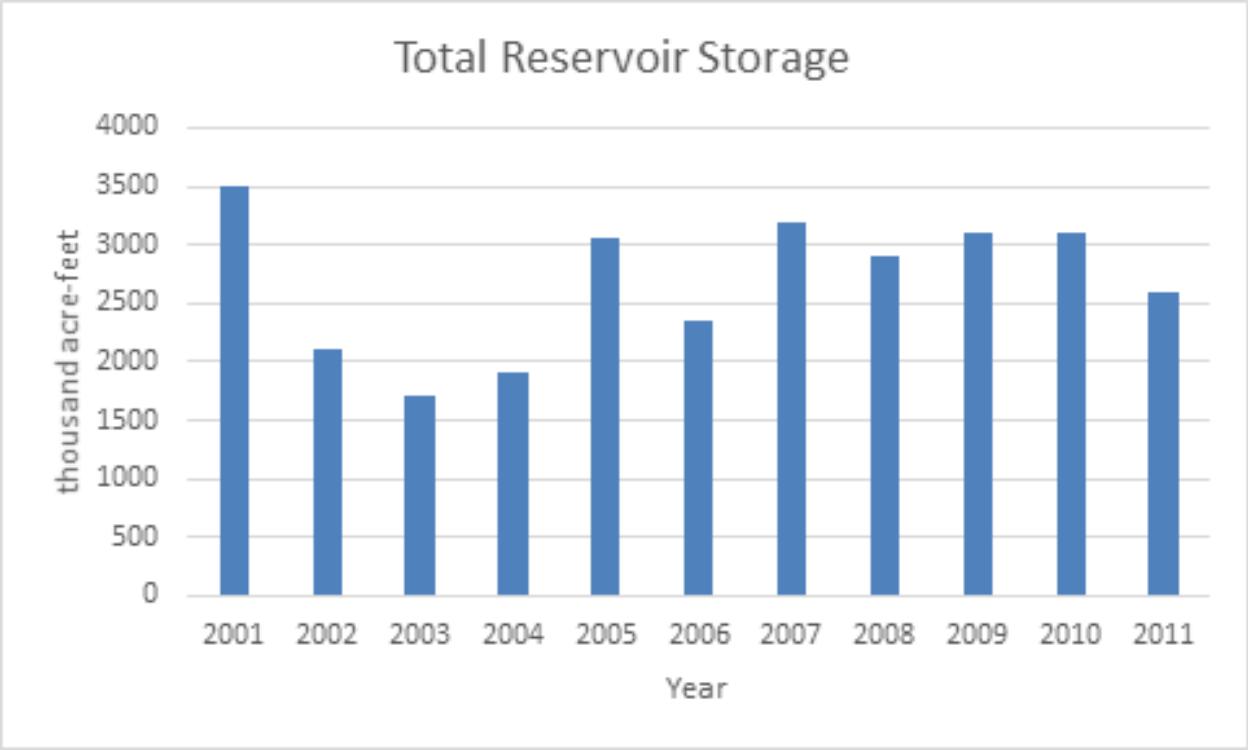

Figure 13: Reservoir storage in New Mexico (2001 – 2011) [40]

2010-2011, 2,904 surface water and 87,046 groundwater documents pertaining to the appropriation and use of surface water and groundwater were processed. The office of the state engineer also keeps track of total water stored in various state reservoirs. Table 11 below shows the data on the surface water documents processed in New Mexico from 2009-2011. Although there are no water banking programs in New Mexico, this table provides the information about the surface water rights documents processed in the state. This information can be useful when considering the viability of a new water banking program or a new water market in the state. Figure 10 shows the total reservoir storage for New Mexico from 2001-2011. Reservoirs are essentially stored surface water. Therefore, even though there are no formal water banking programs in New Mexico, these reservoirs can be used as water banks.

Oregon

Deschutes River Conservancy Mitigation Bank

Deschutes Water Exchange Mitigation Bank was first established in 2003 after authorization from the Oregon Water Resources Commission (OWRC). In 2008, its name was changed to Deschutes River Conservancy Mitigation Bank. Anyone can apply to become a mitigation bank and successful applicants will be required to enter an agreement called the mitigation bank charter. In its first five years, this mitigation bank worked extensively with groundwater applicants, permit holders, irrigation districts, and landowners in the basin to lease water rights to instream use and generate mitigation credits. These mitigation credits were mostly temporary in nature ranging from one to five years. Participation in the bank has steadily increased, beginning with only one client in 2003 versus 33 clients in 2007.[41] Since 2007, the bank has shifted away from temporary mitigation credits generated by instream leases and focused primarily on other permanent sources of mitigation. Since 2007, the bank has had an average of 30 clients each year.[42]

40 Adapted from Annual Report.2011. New Mexico Office of the State Engineer Interstate Stream Commission
41 Deschutes Groundwater Mitigation Program: Five-Year Program Evaluation Report. 2008. Oregon Water Resources Department
42 Deschutes Groundwater Mitigation Program: Five-Year Program Evaluation Report. 2014. Oregon Water Resources Department

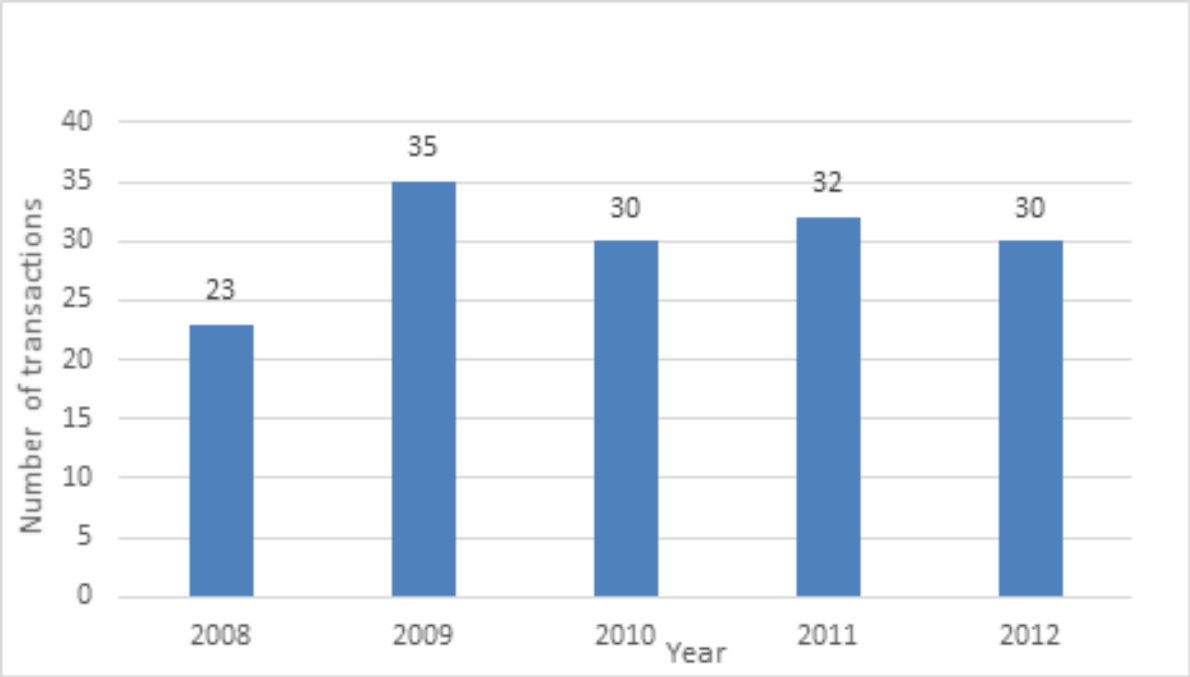

Figure 14: Number of DRC bank mitigation transactions by year (2008-2012) [43]

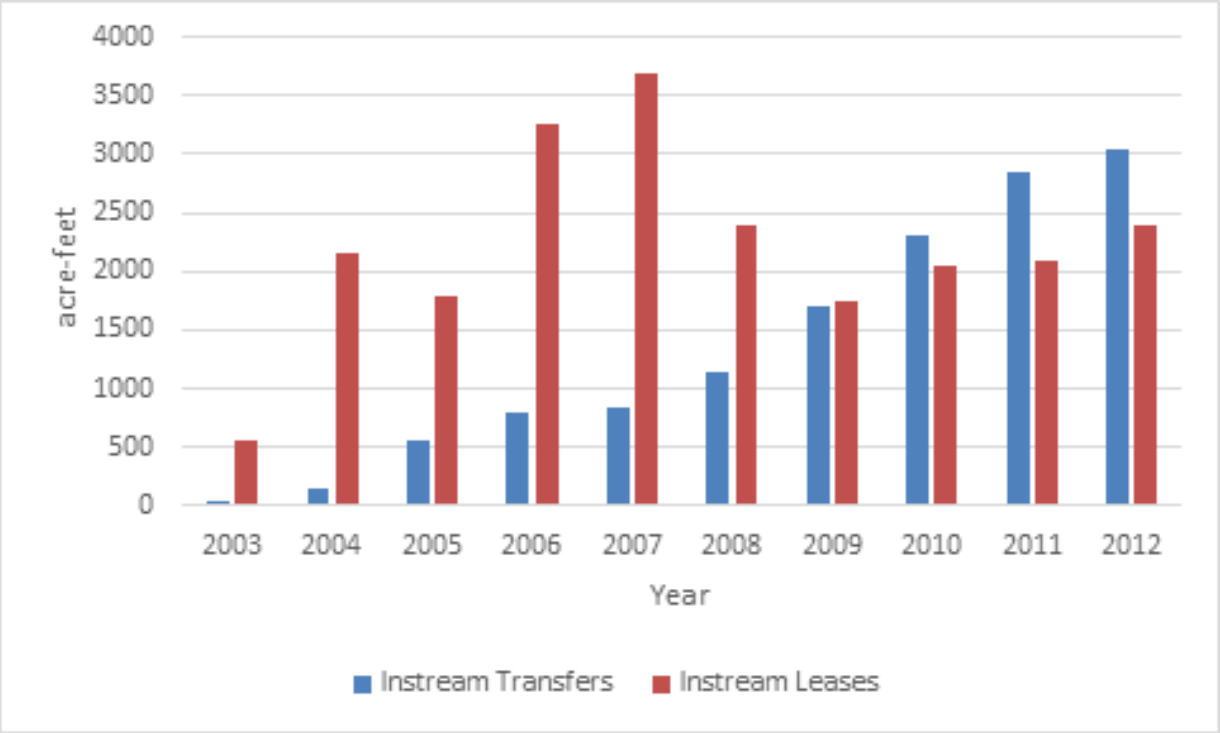

Figure 15: Annual volume of mitigation water generated through instream transfers and instream leases (2003-2012) [44]

43 Adapted from Deschutes Groundwater Mitigation Program: Five-Year Program Evaluation Report. 2014. Oregon Water Resources Department

44 Adapted from Deschutes Groundwater Mitigation Program: Five-Year Program Evaluation Report. 2014. Oregon Water Resources Department

Trading activity in Oregon

The following Figure 11 shows the number of mitigation transactions through the Deschutes River Conservancy (DRC) bank between 2008 and 2012. Figure 12 shows the annual volume of mitigated water generated through instream transfers and instream leases between 2003 and 2012.

Table 12 below comprises summary information on groundwater permits through the Deschutes Groundwater Mitigation Program for various regions by the end of 2012.

Table 12. Summary of mitigated groundwater permits by zone by the end of 2012 [45]

Zone of Im-pact	Number of Permits	Rate Ap-proved by Permit	Maximum Volume(AF) Approved by Permit	Total Mitigation Obligation(AF)
General	58	67.3	12746.4	6370.2
Middle Deschutes	8	0.92	221.5	129.8
Crooked Riv-er	10	14.8	5680.7	2385.5
Whychus Creek	11	4.4	1213.7	585.5
Little Deschutes	3	0.48	368.3	13.2
Upper Deschutes	5	0.29	76.8	46.1
Totals	95	88.2	20,307.40	9,530.30

Texas

Texas Water Bank

The Texas Water Bank is governed by the Texas Water Development Board (TWDB). The Texas Water Bank was established in 1993 to facilitate the temporary or permanent transfer, sale, or lease of water and water rights throughout the state. The water bank maintains records of registry of water, water rights by potential buyers and sellers, and a listing of deposits. It also acts as a clearing-house for water marketing information and may facilitate the price negotiations between potential buyers and sellers.

Any party interested in depositing their water rights for sale or lease can apply through the TWDB website. Surface water rights deposited in the bank are protected from cancellation while on deposit in the bank for an initial 10-year period and for an ensuing 10 years following the Texas Commission on Environmental Quality's approval relating to water rights transferred while on deposit in the bank. The TWDB may charge as much as 1 percent of the value of the water or water right received into or transferred from the water bank to cover its administrative expenses.[46] One can also choose to simply post their water rights to the TWDB website without depositing it through the application process. Such water rights will not cost anything but will also not be protected by the water bank rules.

Trading Activity in Texas

Following tables - Table 13, Table 14 and Table 15 below show all the registry of deposits, buyers and sellers respectively through the Texas Water Bank.

Texas Water Trust

The Texas Water Trust is a program administered within the Texas Water Bank. However, it is designed specifically to acquire water rights through donations, sale or purchase for environmental purposes.

45 Deschutes Groundwater Mitigation Program: Five-Year Program Evaluation Report. 2014. Oregon Water Resources Department
46 Texas Water Development Board website - http://www.twdb.texas.gov/waterplanning/waterbank/bank/index.asp

Any water right issued by the Texas Commission on Environmental Quality can be enlisted through the Texas Water Trust to preserve aquatic life and habitat. All deposits made to the trust are exempt from any fees from the TWDB. This can be done by following a simple procedure. One can contact a TWDB staff and interact with the Texas Parks and Wildlife Department to establish specific details of the trust contract for the water rights. Then the water right can be transferred to the trust after the approval from the Texas Commission on Environmental Quality.[47]

Trading Activity

Table 16 that follows shows all the deposits made at the Texas Water Trust.

Utah

Although there are bills and statutes in the state legislature to allow for the creation of water banking programs in Utah, there are no formal water banks in operation. However, people from various regions within the state have voiced their concerns about the future availability of water in the state and suggested water banking as a potential solution to the expected decline in water supply.[48]

Wyoming

There are no water baking programs in place in the State of Wyoming. Currently, there is no legislation under consideration to help facilitate water banking actives.

Table 13. Texas Water Bank: Registry of deposits [49]

Basin	River/ Stream	Quantity Available	Location	Comment	Posted
Colorado	Celery Creek	27.93 acre-ft	Near the City of Menard	Lease	5/1/00
Colorado	Clear Creek thence San Saba	41.47 acre-ft	Menard County, West of Menard	lease, at $50 per acre-ft per year	7/16/02
Colorado	Colorado Riv-er	203 acre-ft	Mills County, North of Rich-land Springs	5 year lease, at $50 per acre-ft per year	8/21/01
Colorado	San Saba River	23 acre-ft	Menard County	Lease	6/05/01
Colorado	San Saba River	15 acre-ft	Menard County	Lease	3/30/04
Colorado	San Saba River	17 acre-ft	Menard County	lease, at $30 per acre-ft per year	6/9/05
Colorado	South Llano River	145 acre-ft	Kimble County	Lease	5/14/09
Rio Grande	Rio Grande	47 acre-ft	Zapata	Lease or Sale	2/27/03

Table 14. Texas Water Bank: Registry of Buyers [50]

Basin	Quantity Desired	Location	Comments
Canadian (Lake Mere-dith)	Seasonal (not pro-vided)	Near the City of Can-yon	Recreational facil-ity
San Antonio (Medina River)	~3000 acre-feet	Upstream of Lake Medina	Purchase or trade

47 Texas Water Development Board website- http://www.twdb.texas.gov/waterplanning/waterbank/bank/index.asp
48 Utah's Water Future Developing a 50 -Year Water Strategy for Utah: Summary of Public Listening Sessions. Flint, 2013.
49 Texas Water Development Board website - http://www.twdb.texas.gov/waterplanning/waterbank/bank/index.asp
50 Texas Water Development Board website - http://www.twdb.texas.gov/waterplanning/waterbank/bank/index.asp

Table 15. Texas Water Bank: Registry of Sellers [51]

Basin	Quantity Available	Location	Comments
Brazos - Mainstream	2,440 acre-ft/yr	Waller County	Posted 2-28-09
Brazos (on Slaton Draw trib - White River - Salt Fork)	80 acre-ft/yr	Hale County, just upstream from Plainview	Posted 1-20-06
Rio Grande	743 acre-ft/yr	Presidio County	1925 Priority Date - Sell or lease - Posted: 11-9-00
Rio Grande (Groundwater)	90 mgd (est.)	Val Verde County	Trinity-Edwards for-mation
Rio Grande (Groundwater)	6 mgd (est.)	Val Verde County	Posted: 8-24-00
Rio Grande (potable water)	0.3 mgd (de-sign desal facility)	Zapata County	Desalinized Groundwater
Colorado (South Llano River)	25 acre-ft/yr	Kimble County, near Junction	lease; 1893 priority date - Posted: 8-6-01
Colorado (South Llano River)	120 acre-ft/yr	Kimble County, near Junction	lease; 1911 priority date - Posted: 8-6-01
Colorado (San Saba River)	100 acre-ft/yr	Menard County, west of Menard	sell; 1904 priority date - Posted: 2-16-01
Colorado	140 acre-ft/yr	San Saba County	lease - 1912 priority date
Colorado	1000 acre-ft/yr	San Saba County	Certificate of Adjudica-tion
Colorado (Kickapoo Creek within the Concho water-shed - above Lake Ivy)	63 acre-ft/yr	Concho County	Priority Date: 2-27-1956, Permitted Use: Irrigation
Guadalupe River	5 acre-ft/yr	Guadalupe Coun-ty near Lake Dun-lap	Lease, permitted for municipal or irrigation use - Posted: 03-29-2011
Guadalupe River	262.7 acre-ft/yr	Victoria County	sell or lease; 1951 priori-ty date - Posted: 10-14-02
Guadalupe River	~1500 acre-ft/yr	Near Victoria	Lease. Prefer Long-Term
San Antonio (Medina Wa-tershed)	27 acre-ft/yr	Bandera County	Elam Creek
San Antonio River	284 acre-ft/yr	Goliad County	Lease for irrigation - Combine with 86 acre-feet right noted next
San Antonio River	86 acre-ft/yr	Goliad County	Lease for irrigation - See above
San Antonio River (Elm Bayou)	500 acre-ft/yr	Near Tivoli	Lease - Prefer Long-Term
Nueces	720 acre-ft/yr	Uvalde County	Lease
Brazos (Brazos River)	125 acre-ft/yr	Robertson Coun-ty	Lease at $34.50 per acre-ft. Posted: 1-26-03
Brazos	1,300 acre-ft/yr	Milam County	Sell, Priority Date Au-gust 31, 1956
Brazos (Little River)	300 acre-ft/yr	Milam County	$45/af to lease; sale price negotiable: 1984 priority date
Rio Grande	1500 acre-ft/yr	Hudspeth County	800acft at 1924 priority, 700acft at 1909 priority; sale, posted 9/24/2013

Table 16. Texas Water Trust: Deposits [52]

River/Stream	Quantity	Term	Location	Date of Deposit	Comments
Rio Grande	1236 Acre-ft	Perpetuity	Hudspeth Co.	08/18/2003	2 Water Rights: (1) Certificate of Ad-judication No. 23-914, (2) Permit No. 3041
San Marcos Tributary to the Guadalupe River	33,108 Acre-ft	Perpetuity	Hays Co.	04/24/2006	Certificate of Ad-judication No. 18-3865D

51 Texas Water Development Board website - http://www.twdb.texas.gov/waterplanning/waterbank/bank/index.asp
52 Texas Water Development Board website - http://www.twdb.texas.gov/waterplanning/waterbank/bank/index.asp

Innovations in Water Allocation

Researchers, policy makers, water resource managers, and others have been working to develop efficient systems for water allocation. Efforts to create water banks and more water markets designs, mutually beneficial water rights contracts, and efforts to refine the existing laws are ongoing. Many researchers have worked on a system that is suitable to a particular region based on the geography, type of water rights holders, climate and other peculiar characteristics of the region. These efforts or innovations in water research can be broadly categorized into the four types discussed below:

1. Water Banks
2. Smart Markets
3. Contractual Forms
4. Spot Markets

Following the discussion below of the types of ongoing market facilitation programs is a summary of the current state of water law initiatives to improve water allocation.

Market Facilitation programs

Market facilitation programs help simplify the market by matching buyers and sellers interested in trading. Water banks and smart markets can be categorized as market facilitation programs. These programs focus on facilitating the water markets by identifying the interested buyers and sellers of water rights and creating a simpler way for them to trade. Usually, the water rights holders are not entirely aware of the worth of their water rights. Individuals interested in buying or selling water rights often find it difficult to coordinate transactions on their own. Even if they can do so on their own, transactions take a long time and involve high transaction costs.

Water Banks

A water bank is an institutional mechanism designed to facilitate the voluntary trading of water on a temporary or a permanent basis.[53] Water banks can be used to sustain proper supply during droughts or dry years, store water for future use, promote water conservation and enforce laws regarding instream flows and others.[54] Water banks may also be used to match buyers and sellers, set prices, handle administrative water rights issues and ensure the validity of water rights.[55] The western United States has numerous operating water banks in various states. Water banks have also been successfully implemented in Australia.

Water banks can be set up in different ways. They can be set up as surface storage (reservoirs), as underground storage (aquifers) or as water trusts. Water banks vary in structure according to the needs and characteristics of the local community. Water banks in Southern California mostly serve the needs of the farmers. In contrast, Kittitas County Water Bank in Washington is established to provide mitigated water for domestic users after a legal case settlement between the county and the Department of Ecology. When water is physically stored in a reservoir, a surface water bank may be used to facilitate accounting and transactions over the use of the stored water over time and space. Such banking requires investment in infrastructure for moving the water to the reservoir and also for storing the water. With groundwater banking, the water that would have been pumped normally is left in the aquifer or surface water is directly added to the aquifer for future use. Often times, the laws governing groundwater are often less robust or well-developed than those for surface water in western

53 Water Banks: A Tool for Enhancing Water Supply Reliability.2010. Colby and O'Donnell.
54 Analysis of Water Banks in the Western States. 2004. Washington State Department of Ecology and WestWater Research
55 Northwest Water Banking: Meeting instream and out of stream water needs in the Pacific Northwest. 2012. Cronin and Fowler

United States. For example, the water code in California does not apply to most groundwater in the state. Therefore, groundwater banking in California is dependent upon the local ordinances. The state only provides basic guidelines when it comes to groundwater banking. As a result, groundwater banking may be difficult to manage in western United States since a formalized management regime is often lacking. Finally, water trusts or institutional water banking only involves the transfer of water rights instead of physical storage of water for a certain period. Physical storage is not a defined component of institutional banking and hence the supply of water may not be very secure.[56] They only deal with the transfer of water rights or legal documents that entitles someone with access to specific amount of water from a specific place at a specific time.

An example of a water bank in the western United States is the Arizona Water Bank, which is set up as groundwater storage and is run by the AWBA. The AWBA cannot create or own any storage facilities or recover the water on its own. AWBA also does not act as an institutional bank to match the buyers and sellers. It is only concerned with the physical storage of water. The Colorado's Arkansas River Basin water bank is an example if a water bank that is not concerned with storage. See Section 3.3 for further discussion of Colorado's water bank.

Smart Markets

Smart markets for water are usually auction-based markets that are run with the assistance of computer models that can manage the complexities of the given water market.[57] Such markets usually have a central hub or a website where buyers and sellers can trade without having to find trading partners on their own. Such markets can also incorporate various environmental and administrative constraints such as restrictions on withdrawal of water in a way that negatively affects some aspect of environment, and legal constraints between two parties for transfer of water rights. These markets may reduce the transactions costs and make trading simpler by matching interested buyers and sellers more efficiently.

New Zealand

Researchers from the University of Canterbury in New Zealand have developed a smart market for groundwater rights based on analytical hydrology and a linear program. They use a hydrology simulation model to predict the behavior of a given aquifer and then use a program to maximize the economic value of pumped water subject to constraints on flows in the lowland streams. The objective of the program is to maximize the value of water instream flow constraints. A smart market like this eliminates the need to manually match buyers and sellers and carefully examines all the transactions simultaneously to ensure that all the regulatory constraints are satisfied. The smart market makes the price data immediately available and updates it temporally and spatially.

Nebraska

Mammoth Trading (https://mammothtrading.com/) algorithm to match interested buyers and sellers of groundwater rights in the Twin Platte Natural Resources District. The algorithm is designed to reduce the complexity of local physical and regulatory systems and make trading groundwater rights easier. Mammoth Trading is currently developing a certified irrigated acreage market for groundwater rights in Nebraska. The computer-based marketsystem that facilitates the purchase and sale of water rights. In this system, the transaction fee and benefits from trading are split evenly between the buyer and the seller, which is different from a typical brokerage.[58] This system could be expanded in size to national or international levels and in scope to broader markets like surface water, wetland mitigation, storm water management etc.

56 Water Banks: A Tool for Enhancing Water Supply Reliability.2010. Colby and O'Donnell

57 A Smart Market for Groundwater using the Eigenmodel Approach. 2007. Plagmann and Raffensperger.

58 Selling and buying water rights. National Science Foundation website - http://www.nsf.gov/mobile/discoveries/disc_summ.jsp?cntn_id=133173&org=NSF

New Mexico

In New Mexico, a team of researchers developed a market structure based on a hydrological and economic model that evaluates if water leasing or a short term reallocation of water rights is feasible in a river basin. The project aims to foster a flexible system during times of drought and reduce the traditionally long processing time for permanent transfers. A hydrological model is used to model the Rio Grande River between Cohiti and Elephant Butte Reservoirs in New Mexico. This model is then used in conjunction with an economic market model to facilitate water leasing if deemed feasible. The model can determine if water is actually available for potential trade and how much of it can be traded. It allows the buyers and sellers to voluntarily make offers and reach an agreement that helps to determine the price for water for the market.[59]

Texas Water Exchange

Other smart water markets include Texas Water Exchange based in San Antonio, Texas that helps to match buyers and sellers of water rights efficiently. Texas Water Exchange helps the water users with buying, selling, and leasing of their water rights and acts as a consulting firm as well for the buyers and sellers. They claim to have numerous analytics packages geared to best serve the interest of their clients and large collection of water related data. They also provide hedging and mitigation services. Private companies like this can reduce a lot of the transaction costs and allow the water markets to work efficiently.

Contractual Forms of Water Reallocation

Water sales and leases can be carried out as a one-time transaction (e.g. a transfer of water use from a seller to a buyer for one growing season), for a mutually agreeable price. But more complicated lease contracts that allow for planning and better address the complexities and uncertainties of water use. Option contracts and spot markets are two common types of contractual forms in the water market.

Spot markets

Spot markets are usually a one-time transaction between the buyer and the seller. It is essentially the leasing of water rights for a temporary period. They are used especially in emergency situations like drought or a dry year. The price of water rights in spot markets reflect the existing situation at the time of the transaction. In other words, price during a drought may be higher than during a time when water is available in abundance. Therefore, the buyers usually bear most of the risk associated with such transactions during droughts. The spot market also provides the benefits offered by option contracts. The water rights holders with excess supply of water can sell the surplus water easily without permanent transfer of water rights. Hence, the water can reach the user with the highest willingness to pay. They are usually even faster to work out than the option contracts and as a result involve even lower transaction costs. Since the ownership stays with the seller after the transaction, it provides the seller with a sense of security, especially in regions where rainfall and water levels can fluctuate.

An active spot market for water is in operation in Texas along the Rio Grande River. The Rio Grande Watermaster (RGW) office is charged with monitoring the water use and enforcing water rights in the region. They are required to keep water balances for each individual water right owner. There are more than 800 water rights holders in the region with the rights distributed between farmers, municipalities, industries and individuals.[60] Therefore, it is a relatively broad and extensive market. The price in the spot market is determined by negotiations between the buyer and the seller and reflects the changing demand and supply of water. The RGW office behaves like a broker or a mediator to bring the buyers and sellers together. In other words, it acts like a smart market without charging any fee for the service.[61] The RGW office actively enforces

59 Creating Real Time Water Leasing Market Institutions: An Integrated Economic and Hydrological Methodology. 2010. Broadbent, Brookshire, Coursey, and Tidwell.

60 Spot Market for Water along the Texas Rio Grande: Opportunities for Water Management. 1999. Yoskowitz

61 Spot Market for Water along the Texas Rio Grande: Opportunities for Water Management. 1999. Yoskowitz

the water rights and monitors the activities along the river to make sure that there is no breach of the rules such as illegal pumping of water. This is important as there is no incentive to buy water through a market mechanism if the rules are not strictly enforced.

Options contracts

Option contracts are contracts that are contingent upon a specific set of circumstances. They may be contingent on circumstances like drought, increased demand etc. and are designed for temporary transfer of water rights. There is usually a fee associated with the activation of the contract.

The sellers usually need to evaluate the value of their water rights given current and future demands. This is not always easy, especially if the transfer of water rights is supposed to be permanent. The sellers have to risk selling their rights at a lower price than their worth if they cannot realize the true value of their water rights. Such risks and uncertainties lead to significant transaction costs. Option contracts can help mitigate such risks and uncertainties as it only provides temporary access to the buyers without compromising the ownership of the seller. The value of a water resource for a temporary period is much easier to estimate. Moreover, the time required to work out a permanent transfer is often long and complex.[62] Even after the buyers and sellers reach an agreement, it needs to be approved by a governing body. This adds more legislative and administrative costs to the process. All of these drawbacks can be mitigated by the use of option contracts in the water market.

Option contracting has been in practice in California for more than a decade now. The Metropolitan Water District of southern California (MWD) introduced option contracting by signing option contracts for water rights in 2003 with the Sacramento Valley agricultural water districts. The contract provided MWD with the access, but not the obligation, to purchase 146,230 acre-feet of water months into the future. They signed this contract following a two-year dry period as the water storage levels were decreasing. They opted to sign another option contract in 2005 following a dry year. However, the 2005 options were not called as spring rain improved the water storage situation that year.[63] Therefore, option contracts can be flexible in terms of implementation. These contracts were effective when there was increasing pressure on the state water supply. Research suggests that gains in joint payoffs for both buyers and sellers increased by 70 – 85 % after these contracts were signed.[64] Working out a permanent transfer instead of option contracts would have taken a lot longer and the transaction costs would have been huge. Option contracts can skip these inconveniences while allowing the interested parties to realize the benefits of their trade faster.

62 Option contracting in the California water market. 2009. Tomkins and Weber.

63 Option Contracts in Practice: Contractual and Institutional Design for California Water Transfers. 2008. Tomkins, Weber, Freyberg, Sweeney, and Thompson.

64 Option Contracts in Practice: Contractual and Institutional Design for California Water Transfers. 2008. Tomkins, Weber, Freyberg, Sweeney, and Thompson.

Washington Water Banking Barriers and Improvements

This section summarizes water banking barriers and improvements identified through stakeholder surveys. This section includes our outreach approach, survey questions, and responses. We also provide a summary of the cost of water banking to the state, and a summary of regulatory, funding, and operational barriers identified through our outreach efforts.

Outreach Approach and Survey

In order to identify issues, obstacles and improvements for water banking in Washington, we surveyed 12 water bank managers and stakeholders.[65] Surveys were generally conducted over the phone, with survey questions emailed to interviewees beforehand. All interviewees were informed prior to the interview that names would not be attributed to responses and responses would be aggregated across multiple survey respondents. This level of anonymity was provided so respondents would feel comfortable providing their opinion. Water bank managers were asked to answer questions about specific bank operation, and questions about their working relationship with Ecology. We interviewed seven bank managers that included representatives for Ecology, private Kittitas County water banks, Kittitas County, Washington Water Trust, Trout Unlimited Washington Water Project, Spokane County, Methow Valley Irrigation District, and Walla Walla Watershed Management Partnership. Below is a list of the questions we asked the water banking managers:

Banker-Centric Questions

- What are your most significant categories of expenses (e.g., water purchase costs, labor/time, legal fees)?
- What is your schedule of charges (e.g., application fees, contracting, title fees, closing fee, deed, covenants, per acre-foot fees)?
- What factors led you to structure your schedule of charges as you have (i.e. transaction-based charges to cover transaction-specific costs, per acre-foot charges to cover per acre-foot costs, etc.; comparable sales, percent return on investment, buyer willingness to pay, etc.)?
- How do you accommodate varying degrees of certainty within each suitability zone? Do you pass uncertainties on to the buyer (i.e., contingency fee, retainer, higher up-front cost, etc.)?
- Have clients requested services/options that you do not currently provide? Are you considering such services? Why or why not (i.e., outdoor irrigation greater than 2,500 sq ft, no outdoor irrigation, indoor use greater than 350 gpd, stock watering, etc.)?
- What are the most important services that your water bank provides that were not available without the bank (e.g., outreach, information for the public, certainty of legal water availability, permanent and guaranteed solutions, and economic growth)?
- What services and activities do you offer that provide information, time savings, and reduce the administrative burden to your clients?
- For potential clients who inquire about water purchases from your bank but do not ultimately purchase water, what seem to be the most important reasons for non-purchase?
- What is the primary driver for a customer to participate in a water bank?
- If you were to change some things about water banking, what would you change?

65 Note that more interviews with water bank managers and stakeholders were attempted than were actually interviewed. In particular, the response rate amongst private water bank managers was lower than desired from the original outreach.

- What are the most important difficulties and concerns that your clients voice when purchasing or considering water from your bank? How have you tried to address these? If you have been unsuccessful, what needs to change for these concerns and difficulties to be overcome?

Ecology-Centric Questions

- We understand that you hold an agreement with Ecology to operate your water bank, or otherwise conduct business with Ecology. Is our understanding correct?
- Did you visit Ecology's websites about water banking? Before or after starting to negotiate with Ecology?
- Did you review any examples of trust water right agreements before negotiating with Ecology?
- Was the water right transfer to instream flows to establish the water bank accomplished through Ecology or through a conservancy board?
- Did you talk about your water right with Washington Water Trust or Trout Unlimited at any point?
- Did you work with an attorney or water consultant? From the beginning of the process? If not, at what point in the process?
- If so, does your attorney or consultant have experience working with Ecology?
- Did you or your attorney draft the trust water right agreement based on an example or template?
- Whom did you work with from Ecology?
- Did you consistently work with the same person at Ecology?
- Did you get a consistent message from Ecology about how the process of establishing a water bank would go? If not, what part of the experience deviated most from the message?
- Please provide recommendations for how Ecology could improve its working relationship with your bank and streamlining its activities in relation to water banking.
- Describe any legislation you feel provides an unnecessary or unwarranted barrier or cost to your banking activities.
- Describe any legislation that would facilitate water markets and/or your water bank activities.

For water bank stakeholders, we interviewed individuals that are professionally affected by water banking, including lenders, well drillers, and developers. Below is the list of questions we asked bank stakeholders:

- What is your business's region or service area?
- In what capacity do you work with water banks, and/or Ecology on groundwater management, if at all?
- Do you perceive any groundwater-related regulatory or legal risks to your business activities in your region or service area? If so, please describe these risks and any steps you have taken evaluate and/or mitigate those risks?
- Have you attended any Ecology public meetings, or workshops in your service area or region? If so, how effective was Ecology at communicating to the public? How would you recommend they communicate with the public next time?
- Do you feel Ecology has developed effective regulatory, legal, and management solutions to any groundwater issues you face? Please provide any recommendations you may have for Ecology to improve its regulatory and administrative process from your perspective.
- Anything else you would like to share?

Surveys of Water Bank Managers and Stakeholders

Water Bank Managers

Water bank managers provided a variety of opinions to the above listed questions. However, there were some common themes that emerged from the survey. These included details on the cost of water banking, how price structure for banks is developed and benefits of water banking. Additionally, the respondent provided insight on public concerns regarding water banking and barriers to water bank development. Table 17 illustrates some of the key themes and concepts that resulted from the survey.

Table 17. Summary of Water Bank Manager Survey

Survey Themes	Responses
Most Significant Costs?	Labor/Time; Legal Fees; Cost of Water
Reason for Cost Structure of Bank?	Bank Model; Affordability; Cost Recovery; Market Value
How is Uncertainty Addressed?	Limiting work to "likely suitable" zones; Conditional on Ecology Approval
How Do You Address Market De-mand for New Services?	consider Providing New Services; Do Not Consider Providing New Services
What Benefits Does Your Bank Provide?	Legally available water; Affordability; Streamlined process; Permit coordination; Economic Growth; Education; Streamflow benefits
Why Do Customers Participate?	Required; Legal certainty of water supply
Reasons for Non-Participation?	Cost; Limitations; Time; Risk; Process
Concerns Voiced by Clients/Public?	Price; Cost recovery; Metering requirements; Regulatory over-reach; Confusing process; Time
What Would You Change About Water Banking?	Better metering technology; More agency coordination; Com-prehensive groundwater modeling; General permits; Increased funding; Decreased costs; Priority dates of new rights; General Permits; Streamlined process
How Could Ecology be More Help-ful?	Consistent policy on mitigation requirements; More evaluation and follow-up after bank launch; More staff/faster processing; Better communication; General Permits
What Legislative Barriers Exist?	No legislative barriers, but case law barriers
What Could the Legislature Do to Improve Water Banking?	Defining impairment; Address challenges created in case law; Funding for Groundwater Modeling; Regulate out-of-WRIA trans-fers; Financial support

The majority of bank managers structured the price of mitigation credits around cost recovery, although affordability is a consideration for public banks and market value is a consideration for private banks. Most of the banks also strive to be responsive to demand for new services, although some in basins with multiple banks look to serve a niche and others are unsure if flexibility to provide new services would be in violation of their Trust Water Right Agreements. All those surveyed believe their banks are providing important benefits and solutions to water resource challenges. Benefits named included providing legally certain water supplies, economic development, technical assistance and education, and streamflow/ecological benefit.

The water bank managers also noted several concerns they hear from the general public. Many reported concerns over price of water and one indicated public concern regarding funds spent on bank development. Several interviewees indicated that people are skeptical about the science behind groundwater/surface water

connection, regulatory rules, and basin closures. Additionally, public concern about regulatory overreach was cited by most. Metering requirements and data collection are also a concern for those interested in participating in water banks. Additional concerns included confusion over the process and the time to receive a permit or mitigation certificate. Most bank managers discussed outreach and education strategies they have employed to ease public concern.

When asked questions related to improving water banking, responses ranged from improving metering technology to legislative fixes for problematic case law. One recommendation when asked, "What would you change about water banking," was improved groundwater modeling to better understand spatially and temporally appropriate mitigation. Other recommendations included improving coordination between Ecology, Department of Health, and local government, finding ways to reduce costs, increased funding for bank development, and providing a more streamlined approach and reduced processing time to issuing mitigated permits, including the use of general permits.

While all bank managers reported having a positive working relationship with Ecology, and found Ecology's support helpful, most had recommendations on how Ecology could better serve bank managers. It was noted that Ecology does not currently have a consistent policy on what appropriate mitigation is, and that it varies by basin.[66] However, it was also recommended that Ecology maintain flexibility in water banking approaches in different basins. It was also recommended that Ecology do more evaluation and follow-up after a bank launches to provide recommendations on how to improve banks and also lessons learned for future banks. One also stated that there were surprises during the development of their bank, and that Ecology needs to communicate potential issues and have solutions that fit within contractual obligations for bank managers. Additionally, most bank managers recommended more staff at Ecology, so that water banks can be developed and permitted more quickly. Additional recommendations revolved around speeding up the process of getting a mitigated permit, such as using more general permits or privatizing those portions of the process.

When asked, "What could the legislature do to improve water banking?", a common answer was for the legislature to address challenges created through case law. Specifically called out was the one molecule standard that arose from Postema, OCPI limitations from Swinomish and Foster, and permit requirements from Campbell and Gwinn. These cases and their implications for water banking are discussed in Section 5.4 and Section 2.2 of this report. It was recommended that the legislature define when and how Ecology can use OCPI. Additionally, respondents recommended the legislature define impairment, limit out-of-WRIA transfers, and provide more financial support for bank development.

Water Bank Stakeholders

All stakeholders surveyed were directly impacted by the Upper Kittitas County Rule. As lenders, well drillers, and developers, their businesses depend directly on access to water and legal certainty. When asked what risks exist for their business, they expressed concerns with the cost of water from private banks and "red zones", which are areas in Kittitas County that do not have suitable mitigation. There were also responses regarding decreased property values and impacts to the local economy. To address the perceived risk of groundwater regulation, one interviewee established a water bank.

All those interviewed have attended Ecology's public meetings. When asked how effective Ecology was at communicating at public meetings, some stated that they felt Ecology did not listen to or address public comments. One interviewee stated that Ecology was not effective at communicating because water law and hydrology are complex issues and they were trying to explain them in an emotionally charged environment. This interviewee recommended working closer with local government and developing a comprehensive

66 Ecology Policy 2035 provides guidance on water right mitigation

communication strategy that includes articles publishing information in local newspaper and agricultural and real estate trade journals.

All agreed that Ecology has not yet developed an effective management solution, but for different reasons. One stated that Ecology needs to develop alternative access to water before issuing moratoriums. Additionally, it was suggested that the state should work with counties to develop public banks, because private banks price many out of the market. Another recommended slowly implementing closures and grandfathering people in and/or buying people out. It was also noted that water is still not available in much of Kittitas County. Another issue cited with the current management strategy is the process to obtain a WBN determination is long, cumbersome, and legally complex. It was recommended that Ecology receive additional resources and staff to assist in water banking, and that the WBN process needs a legislative fix to allow easier and faster processing. Other concerns raised by bank stakeholder included out-of-WRIA transfers, encouraging intergovernmental cooperation, and ensuring Ecology staff are properly trained and have sufficient oversight to ensure consistent messaging.

Costs to Washington State

Establishing a water bank requires public investment, whether it is a public water bank or private water bank. Ecology may incur costs as a regulator, funder, incentivize, banker, and auditor. Depending on the specific bank business rules, some of these costs can be recovered through program operation. This has been especially true with funding water purchases, where the cost of the water purchased is generally recouped through the sale of mitigation credit. However, one cost to the state that has not been recouped by any bank is the cost of staff time for state employees. Generally, Ecology works closely with bank developers to help with formation, permitting, and oversite. This creates a large workload and cost burden to Ecology.

Hours Spent on Bank Development (per bank)

Based on discussions with Ecology staff, we estimate between 72 and 90 hours are spent developing a water bank. This development time includes working with an applicant to approve a concept, negotiating and drafting a trust water agreement, transferring the water right to the TWRP, consultation with stakeholders, developing suitability maps, transferring ownership, setting up a database record to track the bank, and posting to Ecology's website. This does not include the time spent to initially develop a water banking database, which took a large amount of staff time over a two-year period. Additionally, this does not include the amount of time required to train staff on water banking and the details of each individual water bank, or the amount of staff time spend on customer service and responding to questions about water banking.

Bank Tracking and Issuing Mitigated Permits (per bank)

As part of providing regulatory oversight, Ecology sets up a mitigation portfolio in their water banking database to track each water bank. They track the amount of mitigation water available in each bank, and the amount of water taken out of each bank. Ecology estimates they spend 2-4 hours setting up mitigation portfolios for each water right used for water banking. Ecology also spends approximately 30 minutes per transaction tracking water that comes out of water banks.

In addition to tracking the amount of water in each water bank, Ecology is responsible for issuing mitigated permits and WBN determinations. A WBN determination is an approval for the use of mitigation for permit exempt uses. Based on information provided by Ecology, there is one full-time employee (FTE) that spends all his/her time on issuing mitigated permits and WBNs. Ecology has 1.2 FTEs that do hydrological work to support permitting and WBN decisions resulting from water banks, and 0.5 FTE that supports this work, conducts stakeholder consultation, and provides management, review, and oversight. There are additional time

expenditures on customer service, and supervisory input, which we estimate increases the amount of staff-time spent on water banking by 25% to 50%.

An internal review from 2011 found that between June of 2010 and May of 2011, approximately 4 FTE worked on water banking actives in Upper Kittitas County alone. This survey only including permitting staff, not administrative and management time. Only 1.7 FTE was allocated in rule implementation for Upper Kittitas County Water Banking.

Summary of Barriers to Water Banking Identified in Surveys

Regulatory

The water bank surveys revealed several regulatory barriers to water banking. Most of the barriers were identified as case law:

- *Postema v. Pollution Control Hearings Board.* This decision defined the "one molecule" standard for instream flow impairment, and was cited during interviews as an impediment to developing water banks. This makes it very difficult to find spatially and temporally appropriate mitigation.
- *Swinomish Indian Tribal Community v. Ecology and Foster v. Ecology.* These decisions have brought into question how Ecology has used OCPI in water right permitted decisions. These decisions bring uncertainty over the security of reserves and permitting decisions that depend on OCPI.
- *Ecology v. Campbell and Gwinn.* This decision specifies when permit exempt[67] wells are appropriate for development and when a water right permit is required. Some interviewees cited the permit requirement from Campbell and Gwinn made it more difficult to provide mitigation water to domestic uses. This is because when a mitigated water right permit is required rather than a WBN an impairment analysis and more process is required.

Funding

Funding was another commonly cited banking barrier. The cost of forming, permitting, and managing a water bank can be very large. Water right valuations on the order of $1,500 to $6,500 per acre-foot of consumptive use are common, along with permitting costs on the order of $10,000 to $50,000, and further bank administration costs (marketing, processing, fee collection, escrow, etc.). And while some banks have received funding from the state to help develop and seed a bank, others have been ineligible to receive state funding. Some banks have been able to facilitate their formation by selling a portion of their water rights for instream flow enhancement. The cost of bank formation and limited funding from the State both impedes bank development and creates high costs for bank participation.

Operational Barriers

The two main operational barriers to water banking cited by interviewees were public buy-in and comprehensive groundwater modeling. Many bank managers have conducted educational outreach to address public buy-in This includes one-on-one discussions, open houses, and websites. Groundwater modeling is a more difficult and expensive operational barrier for water banking. Without groundwater modeling and studies, it is difficult for bank managers to determine appropriate mitigation and creates uncertainty around availability and ESA impacts.

67 A permit exempt well is a well that meets that stator exemption for a permit under RCW 90.44.050

Alternative Models and Recommendations

Following the evaluation of water banking in Washington State and a review of water banking models from western states and other parts of the world, this section provides recommendations on improving the water banking environment in Washington State. These recommendations are based on survey results, evaluations, and review of water banking in other states.

Metering Issues

Concern over metering requirements was raised during our water bank surveys. Currently, all water use must be metered, regardless of withdrawal size or permit exempt status. Metering has been a requirement dating back to the origins of the water code in 1917 (RCW 90.03.360).

There are several reasons for the current metering protocols, including a 1999 Settlement Agreement that requires that 80% of all water use by volume be metered, reported, and tracked by Ecology. Although Ecology is in compliance with the 80% volumetric requirement, Ecology staff has an extensive amount of metering data to review and process, creating constraints on staff time and the usefulness of the data. Ecology achieved its initial compliance largely through metering of the largest water users in each of the fish-critical basins. However, maintaining compliance becomes increasingly challenging as many new small uses are added.

Additionally, this metering standard raises the cost to participate in water banking and requires additional processing for certification. Beyond just increasing Ecology staff to meet the current metering requirement, there are several policy and legislative changes that could improve efficiency:

- **Change Metering Requirements to No Metering for Permit Exempt Uses.** Indoor domestic use would be assigned a conservative permitting assumption (e.g., 350 gpd). Aerial photos and lawn evapotranspiration estimates would be used to verify outdoor use.
- **Change Metering Requirements to Outdoor Use Only.** Indoor uses would be assigned a conservative permitting assumption (e.g., 350 gpd), but outdoor uses would be required to be metered because they are much larger and have a significant consumptive use fraction.
- **Privatize Metering Data Reviews.** Legislation could be passed to privatize metering data reviews and water bank audits to reduce the burden on Ecology. This would be similar to the business models adopted by the Legislature for Certified Water Right Examinations (CWRE) and Cost-Reimbursement processing, which is discussed in more detail below.

Cost and Oversight for CWRE Reviews

A certified water rights exam (CWRE) is a privatized certification process for water rights. Bringing small permits through the CWRE process is expensive and requires a great deal of paperwork. For large permits, CWRE costs are relatively small to the overall water cost, value of the water right, and in some instances permitting the water right. However, for small domestic uses, CWRE costs as a fraction of permitting/water right value is high. In addition to keeping the current requirement, one potential policy choice for improving the CWRE process to consider includes:

- **Waive CWRE requirement for small uses or streamline CWRE process.** Ecology reserves authority under the CWRE rule[68] to waive the CWRE requirement for small uses, or allow for a streamlined CWRE process that might include a one page form and a photo of a water meter and outdoor use.

68 WAC 173-165-120 states: "Ecology may waive the requirement to secure the services of a certified water right examiner if ecology has conducted the proof examination or determines that one is not necessary to issue a certificate of water right".

Permitted Domestic Users

The water banking survey identified the lack of process parity between permit exempt and permitted uses for established water banks. Permit exempt uses can typically receive mitigation certificates under water banks faster and at a lower cost than permitted uses. Since the bank's job is to fully offset impacts, regardless of whether they are permitted or exempt, a case can be made for streamlining permitting requirements similar to those required for permit exempt uses. With the current additional permitting requirements, the time and cost to obtain mitigated permits for non-exempt domestic uses is much higher. In addition to keeping the current requirement, there is one option for improving parity between permit exempt and permitted uses to consider:

- Change Legislation: Ecology could request a legislative change or adopt rules to streamline mitigated domestic permits similar to the process employed for permit exempt uses. For example, RCW 90.03.290 could be modified to eliminate the 4-part test for fully mitigated uses under a water bank established by a trust water agreement. Alternatively, Ecology could create a rule under RCW 90.42 that provides this same parity.

Out-of-WRIA Transfers

Out-of-WRIA transfers appears to be a concern for both water bank managers and stakeholders. Although no specific constraints exist on transfers other than impairment, in practice, transfer mechanisms are predominately one-way (i.e., downstream). The issue is once water rights are permanently transferred, it is challenging to transfer them back, because of perceived instream flow impacts of a secondary transfer (perhaps 5 years later) with no credit given to original transfer. The current system creates pressure for downstream marketing only, which will eventually limit the pool of available rights for transfer and cause inflationary pressures on market pricing. Adverse economic impacts will be felt in upstream counties, but the current system creates instream flow reach benefits.

This is a concern that has been raised to the Legislature before. In 2008, a legislative report was prepared over concerns regarding transfers out of northern Washington counties and the resulting economic impacts.[69] In addition to keeping the current process, there are several legislative and policy options that could be used to improve out-of-WRIA transfers:

- **Change legislation.** Legislation could be passed to prevent out of WRIA transfers that change the purpose of use to mitigation (similar to Family Farm Act (RCW 90.66.065(5)) and Office of the Columbia River out of WRIA transfer limitations (RCW 90.90.010(2)(a)) out of WRIA transfer limitations).
- **Adopt Public Interest Rules.** Ecology could adopt rules for a public interest test on water right transfers that would include environmental, tax, and job benefits/impacts. Ecology rules could provide greater clarity on detrimental impact to the public interest.
- **Change SEPA Requirements.** SEPA changes could require consideration of socio-economic impacts and mitigation options related to water right transfers to affected counties.
- **Incentivize Local Banks with Local Water Supply Mandate.** The Legislature could require counties to be consulted on local bank formation policies. Currently, RCW 90.03.380(9)(a) requires electronic notice to the board of county commissioners in the county of origin, but does not specifically require consultation. Alternatively, the Legislature could incentivize banks operated by local entities such as counties and public utility districts with special powers including:
    - First right of refusal to buy any out-of-WRIA transfer.

69 Protecting Local Economies (2008), http://www.ecy.wa.gov/programs/wr/wrac/images/pdf/wa_local_econ_web.pdf.

  - Cost subsidy for local government banks with resource protection policies to give these kinds of banks a competitive advantage.

- **Allow for Upstream Transfers / Mitigation Credits.** Ecology could adopt rules or policies to allow for upstream transfers based on other equivalent downstream transfers. This would require a database tracking the upstream and downstream movement of water right changes to ensure no net change in water supply availability to the environment or senior water users. For example, if a 1 cfs water right is transferred from River Mile 25 on the Okanogan River to River Mile 100 on the Columbia River, then that 1 cfs credit would be available to offset an equivalent upstream transfer in that same reach in the future.

Cost of Water Banking to the State

Even for private water banks, there are substantial costs to the State for bank formation, permitting, and oversight. Each new bank that is formed creates a new unfunded obligation for Ecology. Currently, Ecology is struggling to meet demand for new bank formation because of obligations related to existing banks, and other Ecology business functions. Fees could be used to help cover bank formation or operational costs, or incentivize certain bank attributes that reduce Ecology staff impacts. In addition to keeping the current economic model, we have identified three options that could be used to reduce the cost of water banking to Ecology by providing a dedicated funding source to address the current competition of water bank formation with other Ecology business functions:

- **Charge a flat fee for developing a water bank.** RCW 90.03.470 could be amended by the Legislature to provide a water bank formation fee. This would cover Ecology upfront costs, and incentivize banks that solve larger regional problems, but would not cover ongoing costs.

- **Develop a scalable fee that is based on the size or life cycle of the water bank.** A scalable fee could be done in a way that would accommodate a larger range of bank options.

Groundwater Modeling

Lack of groundwater modeling makes it difficult to know how effectively the mitigation being sold from a water bank will offset the impacts posed from new uses. The issue of groundwater is discussed in more detail in the Groundwater Module of this report, and water banking may be a way to help address water shortages in areas of declining groundwater. To address issues with groundwater modeling we recommend increasing groundwater modeling efforts. This could be done by Ecology, USGS, or via a privatization model (e.g. using contractors to measure or model groundwater declines).

Rural Water Availability

Challenges exist to protecting instream flows and senior water right holders, while providing water for rural development. Current measures to address this issue include work by the Water Resources Advisory Committee and the development of a guidance document on this topic. Additional measures that could help Ecology address these challenges include:

- **Address *Postema* limitation through legislative change.** The impacts of Postema on water banking is discussed in section 2.2 of this report. The Legislature could harmonize the Postema "one molecule standard" with a "functions and values" approach to addressing instream flow impacts.

- **Address OCPI limitations through legislative change.** The Legislature could adopt mitigation standards for in-kind and out-of-kind mitigation to address the limitations to using OCPI resulting from Foster and Swinomish decisions.

Funding Inequities

Legislative funding for water bank development comes in many forms: lump sums given to Counties for bank development, grants for planning efforts, and acquisition funds to seed water banks through competitive grants. Developing funding guidelines could ease confusion on the funding process and help create a sense of equity in the funding system.

Public Interest Bank Formation Guidelines

There are statutory advantages to forming a water bank. Trust water is exempt from relinquishment, permitting is often streamlined, and consumptive use calculations for trust conveyances can be more favorable than under typical changes triggering the annual consumptive quantity test (RCW 90.03.380). As a result, Ecology is requested to form water banks associated with projects that have a wide range of public and private benefits. Some banks may rely on a single trust water right to meet a multitude of end uses, while others may rely on multiple trust water rights to mitigate one large proposed new use. Some banks are established to provide significant environmental benefit, and others have marginal or no environmental benefit. Given the increasing pressures on limited staff, Ecology could benefit from guidance on prioritization of bank formation, including the following options:

- **Adopt water bank criteria.** The Legislature could adopt criteria for water bank formation to give Ecology guidance on how to prioritize its work.
- **Amend WAC 173-152-050 Criteria for Priority Processing of Competing Applications.** Ecology could adopt a policy or initiate rulemaking to amend WAC 173-152 to prioritize its work.

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